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MAJOR FUTURE ECONOMIC CHALLENGES

International Commission chaired by
Olivier Blanchard and Jean Tirole

MAJOR FUTURE ECONOMIC CHALLENGES

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In memory of Emmanuel Farhi

JUNE 2021

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FOREWORD

OLIVIER BLANCHARD AND JEAN TIROLE

Scope

For the next year or so, the key challenge will be to deal with Covid-19 and its legacy. The exit from the pandemic, the high unemployment and the potential bankruptcies, the economic recovery, the handling of public and private debt: these issues are what will make the headlines and will be the main topics of political attention.

As important as this short-term challenge is, structural problems pre-dating Covid-19 are still present and have been made even more acute by the pandemic. So, when we were asked in January 2020 by President Macron to organize and head a commission addressing these structural challenges and were granted free rein in choosing the commission's members and full independence in stating our conclusions, we accepted this mission with enthusiasm.

In agreement with the President, we have chosen to focus on three long-term structural challenges: the climate change, the economic inequalities, and the demographic challenge. Technological change is a central aspect of these three themes, being both part of the problem and part of the solution.[1]

[1] In all three cases, we tried to look beyond the Covid-19 crisis, and focused on what we saw as the longer-term issues. Were the Covid-19 to last longer, it would clearly have implications for each of the three challenges we discuss in the report. It would affect the budgetary margins to fight global warming. It would reinforce pre-Covid-19 inequalities. It might even change population dynamics and affect the retirement system. While we could have added something to that effect in the introductory chapter, we thought it was too early to speculate.

Team

We formed a commission of 24 economic experts, plus the 2 of us acting as rapporteurs.[1] One of the members, Professor Emmanuel Farhi (Harvard University), sadly passed away on July 23, 2020, a couple of hours after participating in one of our plenary sessions. This report is dedicated to the memory of this extraordinary researcher and human being.

We chose members first and foremost based on their economic expertise. They are very diverse in their intellectual and political choices and they expressed themselves freely. We decided to select a team of economists rather than a larger group of social scientists and practitioners. The economics of the post-Covid-19 world are an essential brick in the overall thought-building. But, while we paid careful attention to the views of experts in other fields and of civil society, our report is obviously only one of the pieces needed for policy makers to decide. It must be complemented by other views, from experts in other fields, practitioners, citizens, interest groups, and independent associations.

We also deliberately went for a commission with an international membership: one third French, one third American, and one third non-French European. There are pros and cons to this approach. On the benefit side, the geographic diversity avoided localism, the Franco-French discussions that often obscure that there are other ways of doing public policy; it also enabled us to draw on international evidence to benchmark the French situation and propose policies. Finally, many of the challenges have a European, if not a world dimension. The cost was a more limited knowledge of the granularity of French institutions and constraints, which, as we freely admit, makes our propositions for reforms at times not quite ready for use.

The report consists of an introductory chapter and three main chapters, each on one of the three themes. The seven writers of the three underlying chapters spent many months on the project and were compensated according to standard research contract practices. The seventeen other members as well as the two rapporteurs contributed pro bono.

Commission's modus operandi

Three teams were put in charge of drafting the chapters corresponding to the three themes. They presented their views at three different stages of their work in July, September, and November/December 2020. Overall, we had 12 plenary video conferences, in which the authors received suggestions and comments from other members. Numerous spontaneous bilateral interactions and e-mails added to the overall discussion and collective wisdom, and head authors also benefitted from research support from France Stratégie. While these month-

[1] The list of members appears at the opening of the report, and a more detailed presentation of the members is given at the very end.

long interactions shaped the content of the three chapters – divided into sections –, the latter remain the responsibility of the individual authors.

The introductory chapter presents what we, the two rapporteurs, see as the main conclusions of the three thematic chapters. A commission with 24 members and 2 rapporteurs is bound to reflect a variety of views. Nonetheless, there was broad agreement on the diagnoses, on the relevant arguments and on the main recommendations. Where problems are complex and evidence lacking, though, there is understandably some disagreement about specific recommendations and indeed even how some of the problems are framed. Many policies involve trade-offs, and one can reasonably be on one side or the other. We have indicated points or issues where there was significant disagreement within the commission; more broadly, members are not bound by statements in the introductory chapter. Like the underlying chapters, it is the responsibility of its two authors, even though it was discussed at length with the head authors and all the commission's members.

Accordingly, readers are urged to read the three underlying chapters and not to rely on just the introductory chapter. First because it inevitably embodies our own views. And mainly because it cannot reproduce the richness of the facts and arguments developed in the three chapters and their appendices.[1]

The commission's propositions

Our policy propositions fall in two groups: recommendations, and more tentative propositions. Some recommendations include measures which have been repeatedly discussed but have not been implemented. The issue there is why it did not happen: bad design, lack of consideration of distributional effects, or misperceptions? One of our conclusions is that, to succeed, some unpopular measures, such as a sufficiently high price for carbon or an increase in the retirement age, if they are proposed, must be part of a holistic approach, a larger set of measures, which deal with distribution effects, perceptions, and trust.

Some propositions are more tentative because they are new, or their effects are not well understood, or their implementation risks are substantial. Some of these are still sufficiently raw that they should be looked at by researchers. Others are closer to implementation and could be explored further and subjected to experimentation.

The chapters on climate change and inequality, while going into some design and implementation specifics, focus by and large on general principles. The chapter on demography goes more into the weeds. The reason is simple: there is already a retirement reform on the table, and the existing proposals have already been looked at by policy makers, social partners, and citizens. We had to be specific about how our conclusions coincided or differed from those of the reform under examination.

[1] The Appendices are gathered in a second volume, also available online.

Thanks

Our first thanks go to head authors and commission members. For the quality of their contributions; it was a privilege for us to collaborate with and learn from them. For their commitment, first prior to the installation of the commission (only 2 people we approached said no, feeling already overcommitted). And for their diligence, their constructive mood, and their cheerfulness at a moment that the pandemic made rather dark. It is remarkable that top economists, who were already overcommitted and with many alternative options for their time, accepted this time-consuming public-service task. That two-thirds of them are foreigners makes it even more remarkable. It warms the heart. *Un grand merci !*

France Stratégie brought superb research support to the endeavor; special thanks go to its Commissaire général, Gilles de Margerie, and to its Commissaire général adjoint, Cédric Audenis. Not only did they manage to mobilize France Stratégie teams in support, but they themselves continuously brought savvy advice and insights on the French economic challenges. Specific France Stratégie and OECD researchers who helped us are thanked in each individual part.

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EXECUTIVE SUMMARY

OLIVIER BLANCHARD AND JEAN TIROLE

Overall Picture

Common themes

- The commission chose to focus on three challenges: global warming, inequality, and aging.
- All three challenges raise fundamental distribution issues both across and within generations.
- All three challenges are time bombs. Their immediate effects are much weaker than their long-term ones, prompting public decision-makers to procrastinate.
- All three challenges are complex, and decisions must be taken under substantial uncertainty.

For each of these three challenges, solutions exist. So why has there been so little progress?

- *Badly thought-out reforms?* To design a reform, one needs to understand the nature of the challenges, the potential effects of alternative policies. This requires contributions from many experts, from different fields.
- *Badly explained, unpopular, reforms?* Without popular support, reforms are likely to fail, as shown by the recent experience in France. One must thus pay special attention to winners and losers. This requires a global approach to reforms, in effect a combination of reforms, implemented simultaneously.
- *Badly implemented reforms?* The devil is in the details. Judicious reforms can turn into failures if their implementation is not well-thought-out carefully.

Those considerations led our commission to define our mandate as follows: Give our best economic advice on both the nature of the challenges and the set of potential solutions; think hard about how to make these policies popular or at least acceptable; suggest how they may be put into practice.

On Climate Change

In short

- The climate urgency calls for swift and large-scale action.
- Success will depend on technological breakthroughs.
- The fight will be expensive.
- A holistic approach is needed.
- Carbon pricing is necessary but far from sufficient.

Representations and reality

- There is a disconnect between the general belief that global warming is happening and is due to humans, and the reluctance to accept the changes and the costs that come with the need to fight it.
- A lack of transparency about the costs of various measures has led people to focus on the costs that are visible, such as the carbon tax, rather than on those which may be much larger but are harder to see and assess, such as those caused by some inefficient bans and subsidies.

Our recommandations

- *A full endorsement of "carbon pricing done well"*
  - Although it is unpopular, carbon pricing is an essential piece of any coherent plan. It leads households and firms to adopt a more ecological behavior; it gives incentives to researchers to develop green technologies, and to firms to adopt them; it allows for better policy choices.
  - Although carbon pricing exists already, its effect is weakened by its low level, by the many exemptions, and by the large subsidies to fossil fuels. The price of carbon must be set in accordance with our climate ambitions, exemptions limited, and fossil fuel subsidies eliminated.
  - Two other conditions are essential. The distributional implications must be taken into account and dealt with. And, to prevent production from moving abroad to evade the tax, a carbon tax must come with a border tax adjustment.

- *R&D subsidies, standards, and bans*
  - Green R&D is on the rise, but its funding must be increased.
  - But more is needed, and targeted R&D subsidies, standards, bans and adoption incentives are justified, especially where carbon pricing does not do the job. However, these interventions are more discretionary than carbon pricing and therefore more prone to lobbying, regulatory capture, and red tape.
  - For a proper governance, we propose the creation of two independent agencies, if possible at the European level: one to fund high risk/high reward R&D projects ("EU-ARPA-E"); another to inform citizens and public officials of the cost of alternative ways of achieving the same environmental impact.

- *A role for France and Europe*
  - France by itself will have a very minor direct impact on climate mitigation.
  - But, especially if designed at the European level, its indirect impact can be substantial: leading by example and showing that "things can be done", putting pressure on free-riding countries through border tax adjustments, promoting technological and policy innovation that will benefit poor countries, and playing an intellectual leadership role in the building of effective international agreements.

On Inequality

In short

- Inequality has many dimensions. A major one is the degree of access to good jobs and satisfying working lives.
- More equal access means more equal education and more equal financial resources.
- The traditional approach has been to prepare workers for jobs as well as for changing jobs. Professional training is indeed essential and can be substantially improved.
- There is no reason however to take the evolving distribution of jobs as given, and not try to improve it. This suggests promoting a better internal organization of firms, labor market reforms – such as genuine financial (dis)incentives for employers – fostering good jobs, taking measures to affect the direction of technological change, and developing trade rules to prevent social dumping.

Perceptions and facts

- France's statistics on income, wealth, and regional inequality do not look bad in international comparisons. Contrary to many other countries, they have not become worse in the recent past. France redistributes heavily, especially toward very low incomes.

- A large majority of the French however perceive inequality as a serious or very serious problem.
- Standard statistics miss essential dimensions of inequality, such as the ability to acquire a good education or to hold a good job.
- People do not believe that there are equal educational and job opportunities. They are skeptical about social mobility. This indeed accords with the facts.
- People worry that good jobs will disappear; they blame trade, more so than technological progress, which in fact plays a dominant role.
- This led the commission to put some emphasis on “good jobs”.

Our recommendations

To reduce inequality, one must work at three margins and thus consider three types of measures. Those that take place before production (more equal chances, education, financial resources), those that take place after production (redistribution, protection), and finally those that affect the nature of production (creating more good jobs and more access to good jobs). The traditional focus has been mostly on redistribution. It needs to shift more to the other two margins.

- *Equal opportunity*. France has a serious equal opportunity problem. We make several recommendations to reduce educational inequality, most of them not original, but still very relevant. The inheritance tax also does not play the role it could in creating more equal opportunity. More than its rates, at fault are its design and its loopholes. To make its goal clearer and increase support, inheritance tax revenues could be explicitly allocated to financial redistribution that fosters equal opportunity.
- *Fairer taxation*. The weight of taxation is already high in France and there are limits to redistribution. Still, we give several examples where taxation can be made fairer, for example through the use of artificial intelligence, better information exchange (third-party reporting, international cooperation), and international agreements.
- *Prepare workers better for jobs*. France should follow international best practice regarding continuous education: clean certification, design of training through interactions with private-sector employers.
- *Stimulate the creation of good jobs, bend technological R&D and redefine trade rules*. The organization of firms, and the nature of technological progress, trade rules, should not be taken as given. This remark leads to the most provocative part of the chapter. While this is largely unexplored territory, it suggests several ways in which the state may intervene.

On Demography

In short

- Aging, and aging in good health are good news, indeed major societal achievements. Yet, they require adjustments in the way life is organized, the main one being maintaining the right balance between work and retirement.
- To keep the retirement system in balance, a longer life expectancy requires either a decrease in benefits, or an increase in contributions, or else a higher retirement age.
- Public pension expenditures are high in France, due to a very low activity rate of 55-64-year-olds and an early effective age of retirement compared to other countries.
- The pension system should be unified, become more transparent and fairer. It should allow for individual flexibility in the choice of retirement age versus the level of retirement benefits. It should recognize the large differences in life history and life expectancy across workers.
- The pension system should be flexible enough to maintain financial balance, now and in the future, while respecting societal preferences.
- Pension reform should be accompanied by health and other measures that increase both the supply and the demand for senior workers.

Perceptions and facts

- Employers and employees often believe that decreases in productivity should motivate early retirement, even though there is no evidence for this except in the case of chronic diseases.
- For many workers, the current reform is perceived as technocratic and lacking transparency.

Our recommendations

- *A transparent system*. Workers would accumulate points on an individual account over their entire work life until claiming a pension at the earliest eligibility age (EEA) or later. Each point would give a right to the same pension income.
- *A redistributive system.* Low income workers and workers with checkered work history would receive “bonus points” when retiring, to ensure a decent pension. Unlike in the current system, the pension would grow with accumulated points even in the low-points range, to preserve incentives.
- *A system allowing for individual flexibility.* Workers who keep working beyond the EEA and do not claim benefits until later, would keep receiving points for both additional

years worked and for the decrease in the expected number of years they will receive a pension.

- *A system taking into account painful working conditions*. Workers in arduous jobs would be able to retire earlier than the EEA. However, to use decentralized information, to incentivize firms to engage in the prevention of chronic illnesses, and to avoid a cross-subsidization among firms or industries, social partners at the industry or firm level would define what constitutes a hard working condition and employers would bear the extra cost associated with retirement before the EEA.
- *A sustainable and transparent determination of the computation of pension benefits*. All pensioners would receive the same number of euros per point. This number (the "service value") would be computed to balance the system. Assuming that the pension contribution rate (which is currently very high at 27.5%) remained constant, the service value of a point would grow at the rate of wage inflation minus the variation in the system dependency ratio (the ratio of pensioners over active workers).
- *A system dependency ratio reflecting societal preferences*. A rule that maintained a 2:1 ratio of work vs. retirement years (any 3-year gain in life expectancy would translate in 2 more years of work and 1 more year of retirement) would keep the system roughly in balance. But society may prefer a rule that leads to a smaller increase in the retirement age, and, by implication, a lower replacement rate.
- *An independent governance structure.* To deal with the trade-off between adjusting the retirement age or the replacement rate, we propose the creation of an independent board, taking decisions reflecting societal preferences, together with the creation of a reserve fund to deal with transient, demographic or economic, shocks and to serve as an indicator of the financial soundness of the pension system.
- *The need to go beyond retirement reform.* An essential part of an overall reform should be to make it more attractive for older workers to work; by engaging in more prevention against chronic diseases; by improving the quality of continuous training; by making work more flexible for older workers (possibility of part-time work, employer accommodation practices to help older workers with health problems to stay in work). Foreign experiences show that these accompanying reforms can make a large difference.

Improving the labor market integration of immigrants is the other demographic issue the commission took on. This group's low labor force participation is a challenge on its own, but it is also relevant to balancing the retirement system. The report offers several measures which could be taken to improve the situation.

INTRODUCTORY CHAPTER
FRANCE IS FACING THREE MAJOR CHALLENGES

Olivier Blanchard and Jean Tirole

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ON THE REPORT

The challenges

We decided to focus on three challenges, global warming, inequality, and aging, which we saw as the top challenges facing us. We realize that we could have extended the list substantially. Some important topics – the long lasting health and economic effects of Covid-19, the need to prepare for other pandemics, the redefinition of fiscal and monetary policy in an era of very low interest rates, competition policy and privacy in the digital age, financial regulation, the implications of social media for politics and by implication for economic policy… – are outright absent. Some others – education, reform of the state, labor laws, health… – appear piecemeal in the three main chapters. Even the treatment of the three selected topics is far from exhaustive: for instance, we focus on climate change, but leave aside biodiversity and air pollution. For aging, we emphasize pension reform and devote too little discussion to other implications of an aging population.

All three challenges raise fundamental intra- and intergenerational issues: what life shall we leave to our kids? What planet? What kind of jobs? What balance should there be between the interests of the young/workers and those of the old/retirees? Will we be able to address existing inequalities and the new ones created by Covid-19, which will hit particularly hard younger generations, especially the lower educated?

All three challenges arise, in their own way, from the complex nature of economic growth, and its main driver, technological progress. Technological progress has contributed to enormous increases in the standard of living, in France and elsewhere. But it is also at the root of the challenges we face today. The industrial revolution contributed to the emergence of global warming, and innovations in carbon-based electricity and transportation technologies have fueled carbon emissions. Technological progress, including the advent of applications of artificial intelligence, contributes to the growth in inequality and to the technological obsolescence of skills for older workers. Medical

technological progress has increased life expectancy, a good thing of course, but one which puts pressure on retirement systems.

At the same time, technological progress will have to be an integral part of the solutions. Global warming will not be solved just by emitting less carbon under current technologies; it will require a substantial R&D effort along with the important technical progress that comes from experience with new technologies, commonly known as learning by doing. The fight against inequality will also benefit from technology: innovative teaching methods and ubiquitous access to good education through online courses; the development of new technologies that complement rather than substitute for human skills; better tools to tax mobile capital. Prevention and treatment of chronic illnesses and better continuous education will reduce disability and facilitate the work of older workers, and thereby make our pension system more sustainable. The challenge is how to design policies to stimulate and harness this progress, so as to achieve more balanced and more sustainable growth.

All three challenges have slow fuses. The costs build slowly over time, and this makes it easier for policy makers to procrastinate. Political biases (only the current generation votes, including on matters that deeply affect future ones) and behavioral biases (overconfidence and the belief that problems will work themselves out on their own) also tilt the balance towards avoiding costs today even if there are obvious benefits in the future; they tilt decisions against the future generations. The life-threatening impact of climate change was heralded almost three decades ago, with little actual reaction from governments except in their political discourse. Inequality, poor education and professional training, the lack of preparedness for pandemics or artificial intelligence, the sustainability or social acceptability of the pension system are a few other examples of societal time-bombs. Where there have been substantial efforts, they have often lacked a “big picture” or inadequately addressed the underlying problems.

All three challenges raise complex technical and economic issues. It is difficult to predict the social acceptability of alternative climate policies, which green R&D to subsidize, or the pace of technological progress. Will storage technologies become sufficiently cheap that we can rely on wind and photovoltaic energy, or do we need to keep nuclear energy as backup? How much can we rely on education to level the playing field and lead to wider access to good jobs? How much can we bend technology so that it helps complement rather than substitute for workers?

This uncertainty raises a major policy challenge, combining the need to be flexible with the need to give clear signals about future policy. For example, citizens, firms, green-energy start-ups, and municipalities need to anticipate future climate policies when engaging in long-term choices (housing, electricity generation, R&D, modes of transportation…); similarly, some citizens are understandably concerned that a “green cheque” may not have lasting power while a carbon tax might. Climate-related, jobs and pension-related decisions

are long-term decisions and raise the issue of expectations of future public policies. Economic actors need forward guidance and, failing certainty, have some visibility on how policy decisions that will crucially impact them will be taken in 10 or 20 years.

The right balance is not easy to achieve. Policy predictability requires clear guidelines: how will environmental regulations and the carbon price be determined tomorrow? How will my pension check be computed? And how long shall I be expected to work? At the same time, adjustments to a changing world require flexibility. The longer lifetime and the macro shocks affecting contributions to the retirement system will need to be accounted for. The speed of environmental degradation, the public policy reaction to climate change, the pace of technological discoveries, are all uncertain, creating a need for policy adjustments.

Resolving these apparently conflicting goals of useful guidance and future flexibility requires thinking about institutions which can achieve the proper balance. For that, one must insulate adjustment decisions from political pressure. Adjustments must reflect what is learned, not political expediency. It can be done. For example, the independence of Central Banks has allowed them to successfully create a commitment to tame inflation, but at the same time to adapt to unusual circumstances during the financial and Covid-19 crises by bringing in the necessary flexibility. With this example in mind, the creation of a "central carbon bank" is one of the measures envisioned in Chapter One to best combine predictability and flexibility in the issuance of permits. We suggest that the pension system be run by transparent adjustment rules, but adjustments to unforeseen evolutions be managed by an independent body, with the potential use of a reserve fund as an adjustment stabilizer.

How the commission saw its role

What we have discussed are questions which can only be answered, if at all, by experts (not just economists, but social scientists more broadly and others). They can summarize the state of knowledge, what is known as well as what is unknown, what policies have worked elsewhere, and what policies should be explored.

But they cannot stop there. Reforms that most experts believe are needed have often run into strong opposition and have been abandoned or bastardized. Nearly all economists believe that a coherent strategy to fight global warming must include the use of a carbon price. Yet, the attempt in 2018 by the French government to introduce a carbon tax was at the origin of the revolt of the *Gilets jaunes* (Yellow Vests), and, in 2020, the Convention citoyenne pour le climat decided not to include it in its list of recommendations. Nearly all economists believe that part of the response to the increase in life expectancy must be some increase in the retirement age. Yet, this aspect of the retirement reform presented by the French government in 2020 ran into strong opposition.

Some of the opposition may come from a lack of trust in experts, or from misperceptions of facts or policy trade-offs. The task of experts is then to present their conclusions with the proper degree of humility – which they do not always do – and to correct the misperceptions as best they can – not an easy task either. Transparency can increase trust. Creating such transparency is another cross-cutting theme of the report. The pension reform aimed at introducing more transparency into the system but failed to do so; its features can be improved to raise the citizens' confidence in the system. The carbon tax suffered not only from a feeling of unfairness, but also from a lack of informational level-playing field among alternative approaches to fighting global warming, many rather opaque in their incidence and some, such as the carbon tax, patently visible. But the opposition is more likely to come from groups that feel that, even if the reform is desirable, they will be among the losers. This is clearly the case for the *Gilets jaunes*. Experts cannot brush these concerns away. They have a responsibility to take those perceptions into account.

Thus, if reforms are to pass and be accepted, those who argue for them must understand and deal with these perceptions. Reforms must be perceived as fair. Limiting exemptions and loopholes are no-brainers, at least in principle. The perception of fairness can also be promoted through compensation. No policy can compensate all losers, as information regarding who loses is never fine enough;[1] neither should losers always be compensated, as the status quo, itself a policy choice, is not cast in stone. If a carbon price is put in place, coal producers will lose; coal workers deserve some compensation, but not coal companies which had decades to adjust. Earmarking, i.e. allocating specific revenues to specific expenditures, can also be useful. It is typically frowned upon by economists: Their argument is there is a single state budget, and it is important that the best use of this budget not be hampered by an ownership of some industries or citizens on parcels of public funds. This is a healthy rule, whose violation has often led to waste, for example when highway revenues were dedicated to the construction of new highways when there was no longer a need for them. While aware of the hazards associated with departing from this rule, the Commission however took a less orthodox line, and argued that in specific instances new revenues associated with a policy might be redistributed to losers from the policy or to other actions that are directly related to the policy in question. The direct link from revenues to public policies allowed by earmarking makes the compensation more visible and the losers more

[1] See Conseil des prélèvements obligatoires (2019). *La fiscalité environnementale au défi de l'urgence climatique*, which discusses the difficulty in identifying losers, and (with respect to compensation) recommends (1) making the carbon component an autonomous and visible tax instrument by distinguishing it from, or even dissociating it from, energy taxation; (2) introducing compensation mechanisms for the most affected households, particularly low-income households, in order to promote acceptance of carbon taxation; and (3) ensuring transparency in the use of carbon tax revenues.

confident that the compensation policy will last; similarly, citizens may be more willing to accept a tax if they know that the tax is allocated to a cause they support. This idea can be found in the climate change and inequality chapters, and of course in the demography chapter, as pension-related social security contributions are already earmarked to the payment of pension benefits.

Finally, successful reforms need not only expertise and popular support, but careful implementation. Implementation is as important as the original policy idea itself. Good ideas lose value when implemented poorly. Indeed, they are like medecines and antibiotics. Without diagnostics and an instruction manual, they can do as much damage as good. Beyond just being incompletely realized, well-intended policies can be abused and end up being counterproductive. Policymakers, however well-meaning, do not have time to think about actual implementation. They delegate and do not monitor what becomes of their reform/policy, hence the need for detailed diagnostic tests and instruction manuals.

The efficiency of the French state and the quality of public services, the "elephant in the room", was beyond our mandate but is very relevant here. Public policies will have an impact only if we stop measuring their potency by the amount of money spent on them instead of evaluating their actual impact. An example is supplied by our educational system, which receives much emphasis in the inequality chapter; despite a substantial increase in teaching positions over the last decade, the ranking of French pupils in PISA (Programme for International Student Assessment) and other assessments keeps falling. The chapter emphasizes the need for systematic impact measurement and sunset clauses; the necessity of providing the private sector with proper incentives; the need for streamlining policies and making agencies more agile and more integrated with each other, for creating one-stop windows so as to avoid wasting citizens' and corporations' energy on administrative procedures (an example among many: France has over 60 different windows for R&D subsidies) and to increase the low take-up rate of some policies; the necessity of resisting the French passion for exemptions and loopholes; the benefits of decentralization and experimentation, provided local actors are accountable for their policies. Moving away from the expenditure side of public finances, a similar imperative applies to the revenue side: France should tax better, not more. Compulsory levies (*prélèvements obligatoires*) take 46% of GDP[1] (Gross Domestic Product) and public expenditures represent 56%, the highest levels in the developed world. The inheritance tax, with its high rates but its loopholes and low yield, is an example in point and is discussed in the part on inequality. While in the end the size of the state is a societal choice, it is not hard to agree that taxes should be smart, and that France is not always a role model in that dimension.

[1] 46.2% in 2017 according to the OECD; the average for the OECD is 34.1%. Comparisons of course are difficult as the services covered by the state are not the same.

To conclude, this is how our commission saw its role: bringing expertise, assessing what is known and what is unknown about each of the three challenges; proposing holistic reforms, which take into account potential winners and losers; giving directions about how best to implement them. Our report is optimistic: we believe that solutions to all three challenges exist, and we hope that our commission will help their design.

SECTION 1

CLIMATE CHANGE

Underlying Chapter One written by Christian Gollier and Mar Reguant

Climate change poses an existential threat. It will generate tremendous economic costs, jeopardize ecosystems and biodiversity, bring about social unrest, provoke wide scale migration, and create a resentment from poor and middle-income countries that might trigger wars or other forms of conflict.

We have little time left to act. Despite the sense of urgency, there is still a sharp contrast between the officials' voluntarist political discourse and long-term pledges, and their actual behavior. Almost thirty years after the Rio summit, emissions continue to grow; and public and private R&D on green technologies represents only 4% of total world R&D, chicken feed in view of the stakes. The sizeable and costly transformation of our economies that is required to achieve the Paris agreement (Conference of the Parties/COP 21) targets or the more recent "zero-net-emissions by 2050 or 2060" pledges of some major polluting countries still needs to happen.[1] The longer we wait, the more costly and disorganized the transition will be. In France, the National Low-Carbon Strategy (SNBC), France's roadmap

[1] Changing our agriculture and consumption, phasing out fossil fuel energies for our mobility (cars, trucks, airplanes), industries and living spaces, retrofitting poorly insulated buildings and using smart meters with time varying prices to rationalize our energy consumption for a given comfort level, redefining urban planning and land use with a green mindset, preparing for the electrification of the economy, and spending much more on green R&D.

for combating climate change, defines a greenhouse gas emissions reduction trajectory, broken down into sectoral carbon budgets until 2033. These budgets are not binding: they are indicative, and are re-evaluated on the basis of realized overruns.

Fortunately, there is good news too: Despite the relatively low amount of money spent on R&D, some technologies, such as solar, wind power and electricity storage,[1] LED lighting, electric vehicles or alternative proteins have been progressing faster than expected. Furthermore, many companies realize that their fossil-fuel-based assets may end up stranded, and the innovativeness of the private sector has been unleashed. Some key technologies will come up when more money is devoted to green technologies and the private sector's incentives to turn green are reinforced by, for example, clear carbon price signals around the globe.

Another good news is that the environmental awareness has progressed in the polity; over 90% of the French population believe that global warming is man-made and that we can do something about it. The challenge for this commission and for similar endeavors is therefore to find ways that will put an end to the disconnect between speeches and behavior, to make costly actions politically acceptable while making sure that the cost of these actions remains as low as necessary.

We believe that, despite the grim situation, solutions exist, that combine multiple approaches. Provided that they are implemented rapidly, they will allow us to address climate change at an economic and societal cost that is small compared with the alternative. But, and this is another message of this report, we must be selective. When it comes to proposals for green policies, there is an embarrassment of riches. Our report takes a stance as to what we believe will be impactful, stresses good ideas and screens out bad ones.

In a nutshell, we argue that:

- Carbon pricing is good economics. We describe what France and the EU are doing in the matter and how it can be made much better, with a fair number of details and analysis.
- R&D support is good economics. Low carbon prices not only encourage current emissions, but also are detrimental to the R&D effort. But, even if carbon prices are generalized and given more substance, green R&D is still likely to be smaller than needed. Much more money must be spent on green R&D than is now the case. This money must be spent right if we want it to have an impact; we explain how to do so.

[1] Electricity storage, the very desirable complement to these intermittent productions, includes batteries, but also pumped hydro, compressed air, and green hydrogen produced either by electrolysis or by natural gas reforming plus carbon capture and storage (blue hydrogen).

- Done well, other policies, such as standards, bans and targeted subsidies, can be good economics. But they have often been incoherent in the past and their implementation is delicate. Again, there are ways to do them better, which we review.
- Domestic and international compensation is key to the acceptability of efficient policies.
- When viewed in isolation, France's emissions will not materially alter the course of climate change. Yet France and the European Union can show the way ahead. They can provide leadership / momentum on global agreements and on the need to fund climate change policies in developing countries. The rationale for keeping the rest of the world in sight when thinking about French and European policy is that every ton of CO_2 emissions cuts that take place in China, India, Russia, Pakistan, the United States, and elsewhere, deliver the same benefits to France as a similar cut in emissions in our country.

1. Facts and Perceptions

Despite the general support for policies to fight global warming, a number of perceptions hamper the design of policies that deliver the most reductions in emissions per cost to society. These perceptions, driven by experience with actual policies, disregard for budget constraints, and distrust for market mechanisms must be addressed when designing public policies.

1.1. An unpopular carbon tax

The first observation is the unpopularity of carbon taxation as illustrated by the *Gilets jaunes'* demonstrations (Yellow Vests) against the carbon tax and the absence of mention of carbon pricing in the Convention citoyenne pour le climat (CCC)'s final recommendations. People feel that (a) a carbon tax is "punitive" (so are many alternative policies, as we will see), (b) it is regressive (which is correct: the fraction of income spent on the tax is higher for low-income households), and (c) this would be so even if the French received an unconditional lump-sum refund from the receipts of the carbon tax (which is incorrect). The latter perception may be due to a distrust about the long-term credibility of the compensation: The compensation, once promised, can be whittled down or eliminated over time. If so, institutions must be designed, that will minimize the risk.

1.2. The relative popularity of opaque policies

In contrast, people favor, or at least do not ostensibly oppose policies whose cost is invisible to them. Yet, these policies in nature are as "punitive" as much or even more than a carbon tax.

Let's start with a second way to put a price on carbon emissions and thus make economic actors accountable for their pollution: the cap-and-trade system. Since 2005, Europe has levied a form of carbon tax through the subjection of electricity, aluminum, cement and other companies that represent around 40% of the EU's greenhouse gas emissions, to the European Union's Emissions Trading System (EU-ETS, also called "cap-and-trade" system). In an ETS, the number of allowances, also called "permits", is fixed (the lower the number, the higher the environmental ambition). The emitters must match their emissions with allowances. The market for allowances determines a price through the matching of supply – the number of allowances – and demand – the emissions whose abatement cost exceeds the price of an allowance.

There are 46 cap-and-trade systems for CO_2 emissions on the five continents, from California to China and the European one. No doubt, many still lack ambition and admit too many allowances relative to stated environmental ambitions. Because they force polluters to own an amount of allowances in accordance with their emissions, they are formally a tax on (dirty) production rather than on final consumption. However, because the producers by and large pass the allowance price through to consumers[1], the latter pay for the increase in the production cost. For certain, the price in the EU-ETS – €25 for the emission of one ton of CO_2 in 2020, €50 in May 2021 – has lied below the €55 of the carbon tax that brought the *Gilets jaunes* to the streets; but the fact that this levy on consumers occurs at the production stage has left it largely unnoticed by the citizens.

The next example makes the same observation, with a vengeance. Subsidies to green energies (wind, solar) are popular. In practice, the cost of renewable energy purchase obligations at some pre-specified price ("feed-in tariff") imposed by the regulator on our power supplier is embodied in our electricity bill. Customers' bills include a "contribution to the public electricity service", covering both the additional cost of electricity production in Corsica and overseas and the public subsidies to renewable energies. Again, however, while the levy is formally on producers, it is passed through to consumers, who hardly see it.[2]

Such policies (whether they are justified or not, we focus here on perceptions) would probably be less popular if two facts were rooted in our minds.

First, someone's subsidy is always somebody else's tax, as illustrated by feed-in tariffs (the price at which electricity companies must purchase renewable energy produced externally); in that example it is a tax on electricity consumers. Furthermore, subsidies need not have a nice distributional impact either: In the United States, the subsidies for

[1] The extent of the pass-through to consumers depends on how competitive the industry is (full pass-through obtains if the industry is competitive).

[2] In 2021, the cost of the feed-in tariffs for renewables energies in France will be €6.4 billion, which is also the revenue from the carbon tax.

rooftop photovoltaic (PV) power station, including net metering, burden lower income groups.[1] In France, the regressivity of the renewables policy is equivalent to that of the carbon tax, without the possibility of using a carbon dividend to compensate the poor.

Second, the environmental performance of the policies could have been better. The cost for electricity users of economizing one ton of CO_2 reached €1,000 and beyond for early generations of renewables ten years ago, 20 times the €55 per ton of CO_2 removed that brought our country to the streets in 2019 and about 50 to 100 times the EU-ETS price during that period. Put differently, at the time, France, Germany and other countries may have chosen to buy 1 ton of climate protection when it would have been possible to have 50 tons of CO_2 removed for the same amount of money (of course, this reasoning ignores the fact that mandated renewable purchases contributed to the fall of wind and solar costs: tax incentives and various green mandates helped the private sector to push wind and solar down the innovation/learning curves.[2] To take another angle at it, the same learning could have been achieved with solar capacities installed in Southern Spain rather than in Germany, with a greater environmental impact for the money spent).

Similarly, there has been little backlash against the high subsidies for insulation and boiler installation in France. Well-meaning, this policy has attracted some unscrupulous types driven by the opportunity for short-term profits, led to dissipative commercial efforts (e.g., the phones calls for the "€1 insulation"), and interestingly done little to reduce global warming, as they provide suppliers with a generous supply of energy savings certificates ("white certificates") that are unrelated to actual savings and can be used to satisfy energy savings obligations faced by energy utilities.[3]

Two other cases in point are green standards and laws banning some technologies (e.g. phasing out thermal-engine cars) by a certain date. Both impose extra costs, either on consumers directly or on manufacturers, who pass them through to consumers;[4]

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[1] More broadly, Borenstein and Davis (2016) found that 60% of the income tax credits for weatherizing their homes, installing solar panels, buying hybrid and electric vehicles, and other clean energy investments were received by the income top quintile. See Borenstein S. and Davis L. W. (2016), « The distributional effects of US clean energy tax credits », *Tax Policy and the Economy*, Vol. 30 (1), NBER.

[2] As we later discuss, there is a complex debate about the counterfactual: How much did purchases contribute to renewables' cost reduction? This debate pits those who argue that microprocessors have followed Moore's law despite the absence of subsidy and those who say that pump priming was necessary because technological spillovers prevented early losses from being recovered later on through a competitive advantage. We return to learning by doing later on.

[3] See Glachant, M., Kahn, V., and F. Lévêque (2020), "Quand les économies d'énergie deviennent fictives", *Les Échos*, December 21. See also Crampes, C. and T.O. Léautier (2021), "White Certificates and Competition", *Concurrences*, No. 2021-01, February.

[4] Sometimes the cost of bans is directly incurred by consumers (as opposed to indirectly through a cost pass-through by the manufacturer). The cost of a ban on airline travel when there exists a train alternative taking

furthermore, they can be ill-designed and fail to reach their objective;[1] finally, they can be regressive as well (fuel-efficiency standards cost more as a fraction of income to low-income households).[2] Yet few have ever demonstrated against a ban (with delayed effect) or a standard.

To be clear, our claim here is not that these opaque policies are necessarily inefficient, but rather that perceptions are often more driven by appearances than by reality: the visibility of the levy to the payers (consumers or the taxpayers) often shapes attitudes much more than the actual amount of money levied upon them to avoid the emission of one ton of CO_2. To function well, a democracy must provide its citizens with sufficient information about the relevant trade-offs. The political costs of going against public opinion are real, but allowing these costs to exert undue influence in policy will lead to unnecessarily large climate damages for France and the rest of the world or unnecessary expenses of private or public money to deliver limited progress.

1.3. Motivated beliefs

Social scientists have documented that people hold certain beliefs in part because they attach value to them, resulting in a trade-off between accuracy and desirability. Such beliefs accordingly have been shown to be resistant to many forms of scientific evidence. Motivated beliefs are understandable in that they make for a nicer life (think about savoring a holiday in advance or repressing thoughts about a protracted lockdown or the possibility of death or illness of our loved ones). Relevant for our context, all of us want to believe in a prosperous future.

Spending vast amounts of money in the next thirty years on fighting climate change is not an exciting project. Promising “blood, sweat and tears” is a non-starter in climate politics (maybe because citizens still underestimate the size and ubiquity of the transformation that is required), and it is no wonder that following the Paris COP 21 no chief of state returning home announced that their compatriots would roll up their sleeves. Occasionally, the

less than some number of hours include the value of time lost by users. The cost of a ban on home heating systems using fossil fuel energy includes the cost of building alternative equipment (say a heat pump).

[1] In the United States, cars and trucks became less fuel efficient last year, because the regulation treats cars differently than light trucks/SUVs and preferences have been moving toward SUVs/light trucks (SUVs and trucks accounted for almost 76% in 2020, while they were only 49% of sales in 2012). The regulatory design flaws can be fixed: see Greenstone, M., Sunstein, C. and S. Ori (2020), “Fuel Economy 2.0”, *Harvard Environmental Law Review* 44, No. 1, May, pp. 1-42. Similar remarks can be made with the French system of a bonus-malus on cars. By failing to reward non-owners, it encouraged the latter to buy small cars, made cheaper by a bonus! These observations point at the importance of a proper policy design, not at an overall undesirability of fuel-efficiency standards.

[2] They also have had unintended effects: fuel economy standards have not yielded the promised reductions in emissions because people have switched to SUVs from cars.

soothing concept of "green growth" is even invoked to argue that we can have our cake and eat it too; but if this were true, why haven't we done it in the last 30 years?

The same observation applies to the "green-jobs" argument, also meant to soothe public opinion. Officials and the industry often flaunt the merits of green policies in terms of job creation. In the absence of careful investigation, the argument does not really hold water. Its validity hinges on the answers to the following questions: Are more jobs created with the money spent on green actions than on alternative uses such as healthcare or education that compete for scarce public resources?[1] Can displaced workers fill geographically and educationally the new jobs (a coal miner may not easily become a wind generator technician)? Did we consider the equilibrium effects in the respective labor markets affected with subsidies (to take a topical example, a sharp and rapid increase in the subsidies for the retrofitting of buildings would translate into higher prices for retrofitting rather than in more jobs, if there were no anticipation in the job training and certification process, thus a waste of public funds), or those associated with the funding of the policies (the taxes that enable the subsidies may make some other industries less competitive and thereby destroy jobs)?

The reluctance to say that the planet is worth enough to justify a cost has serious consequences. The problem with this political discourse is that it comforts citizens in their views that painless solutions are available. This Chapter One notes that almost 90% of French citizens feel that the middle-class should not have to pay anything to fight climate change. This may have two interpretations. The first is that "the rich will pay", an opinion which is also relevant to the other chapters in the report. The rich can indeed pay more but their potential contribution is nowhere close to what is needed to fight global warming or reduce inequality.[2] The second is that people feel that there is indeed no need for anybody to pay. Both interpretations are probably relevant and equally problematic.

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[1] Some studies attempt to come up with an answer. Chapter 3 of the *2020 IMF World Economic Outlook* and the International Energy Agency in their *Special Report on Sustainable Recovery* (June 2020) look at the impact of making the economy greener on jobs. There might be a small positive effects on the number of jobs.

[2] Consider some back of the envelope calculations. The top 10% receive a 30% share of income. If France increased its tax rate (broadly construed, to include social security contributions, special levies such as CSG) to tax 10% more of their income, this would yield 3% of GDP more. A similar computation can be performed for the 1%, who receive 10% of income. These numbers are highly optimistic, as many top earners (entrepreneurs, engineers, specialist physicians, academic, finance and law top earners, wealth owners, etc.) are internationally mobile. Even if they stayed, they might also engage in tax avoidance. On the other side – demand for contributions –, the climate effort by itself is estimated at 1% to 2% of GDP in the chapter. Some argue for higher numbers: 4.5% in Germain, J.M. and T. Lellouch (2020), "The social cost of global warming and sustainability indicators: Lessons from an application to France", *Economics and Statistics* 517-518-519, pp. 81-102. There is a lot of uncertainty about such numbers, but it is clear that the effort is significant. Take the pension system: Benefit payments represent 13.6% of GDP. The current demographic dependency ratio is 33%, forecast to increase to 45%, a percentage increase of 36%. Suppose that we do not change the age of retirement, so that the system dependency ratio also increases by the same percentage, and also that the pension benefits over wages remains the same. This would lead to an increase in benefit payments to 18.5%

2. A Holistic Approach

Faced with the urgency of addressing the existential threat of climate change and the political challenges of crafting policies to do so effectively and expeditiously, Chapter One suggests a five-leg, holistic approach: leg 1: carbon pricing; leg 2: an intense R&D effort; leg 3: other actions: leg 4: compensation: and leg 5: international juicing. While commission members agreed on the five legs, some thought more emphasis should be put on legs 3 and 5. Some however were more skeptical. We shall indicate where disagreements arose.

2.1. Leg 1 – Carbon pricing

The conclusion of the commission as well as most experts outside it (see the chapter) is that one cannot do without a sizeable carbon price, despite its unpopularity. Carbon pricing applies the polluter-pay principle contained in the *Charte de l'environnement* attached to the French constitution. Pricing has been shown to substantially alter behavior both for other pollutants as well as for carbon emissions. For example, the United Kingdom has substantially reduced its CO_2 emissions from the electricity sector almost overnight by imposing a mild carbon tax that led to the phasing out of coal production: its coal production fell from 40% to 5% of its electricity generation between 2013 and 2018 (2% in the first half of 2020). The main[1] reason for this drastic change is that the United Kingdom adopted a carbon price floor (around €21 per ton of CO_2) in 2013 on top of the EU-ETS price (which remained under €10 between 2013 and 2018); it is estimated that a carbon price around €35 to €40 per ton suffices to induce a switch from coal to gas, which pollutes half as much. The impact of the Swedish carbon tax, introduced in 1991 and equal to €114 in 2021, has been meaningful as well.[2]

We may dream of a society in which such evolutions would take place spontaneously without need for material incentives (another illustration of motivated beliefs), but history teaches us otherwise: time and again, we have seen that hitting economic decision-makers

of GDP, a 4.9% of GDP increase, again far beyond what the "rich can pay". Substantial reductions in inequality, for example a more generous *prime d'activité*, also lead to very large numbers. And that only focuses on our three challenges. If ambitious policies regarding education and healthcare were undertaken for example, more income would still have to be found. The numbers just do not match.

[1] The carbon price was not the sole instrument. The United Kingdom also pushed wind into the system through government sponsored auctions, which created excess capacity, lower prices, and made coal uneconomical.

[2] The Swedish carbon tax applies to both consumers and businesses. When it was launched in 1991, the tax was €24 for consumers and €6 for companies. For fear of offshoring or unfair import competition, a lower tax rate was applied to industry (namely to sectors outside the EU Emissions Trading Scheme, the EU ETS: to avoid double taxation, sectors covered by the scheme are fully exempted from the carbon tax). From 2018 onwards, however, the carbon tax for sectors outside the EU-ETS is the same as the carbon tax applied to consumers, currently €114.

where it really hurts, namely in their wallets, changes their behavior and unleashes innovations that can solve challenging problems.

A carbon price has at least four virtues:

- It encourages those who can eliminate their pollution at a relatively low cost to do so.
- It boosts green innovation. By monetizing the intellectual property associated with green R&D, it allows start-ups to receive finance from private investors and to reach the necessary scale.
- It requires measuring emissions (which is not always straightforward), but no other information. It therefore reduces bureaucratic red tape and discretion relative to other methods of reducing pollution.
- Finally, it is simple, in that it empowers consumers to act for the climate as the price they pay for a product captures the cost of all emissions along the value chain (they otherwise need detailed information if they want to make an informed choice: see section 3).

The approach for setting a carbon price is detailed in the chapter: scientists and governments have set a "carbon budget", the amount that we can still emit to stay within the bounds allowed by the COP 21 objectives. The Intergovernmental Panel on Climate Change (IPCC) calculates that to keep global warming below 1.5°C, no more than roughly 700 billion tons of CO_2 (up to an uncertainty range) should be emitted looking ahead. In the absence of uncertainty, this carbon budget can be easily achieved by mirroring the carbon budget for Europe[1] in the volume of allowances in the EU-ETS system. The carbon price then results from market clearing: those who find it too costly to reduce their pollution can purchase an allowance from those who hold unused allowances.[2] This "quantity setting" approach will ensure that the objectives are met: There is no more pollution than planned to meet the COP 21 target.

[1] There is no formal carbon budget for Europe, which has selected a specific emission pathway (-55% by 2030 and zero-net-emission by 2050). We stick to this political decision in this report. Notice however that this pathway may not be compatible with intertemporal optimization under a carbon budget for Europe, as it is likely to lead to too little effort in the short-term, i.e., a too low a shadow price of carbon in the next 10 years. See Gollier, C. et al. (2020), "The cost-efficiency carbon pricing puzzle," *TSE Working Paper*, n° 18-952, Toulouse School of Economics.

[2] In practice there are a couple of reasons why some players may hold unused allowances: Firms invest in allowances years in advance of their actual use to hedge against their allowance-price risk (allowances are issued long in advance – 30 years in the case of SO_2 in the United States – and are bankable); they may also have received free allowances as part of a grandfathering scheme (high polluters – firms or countries – receive some allowances as partial compensation). If their production becomes greener than they had anticipated, they resell those tradable allowances. Similarly, market-makers (financial actors who obviously do not have a need for allowance) may hold allowances temporarily.

In practice, though, there is substantial uncertainty, about the speed of global warming, about the advent and cost of green technologies, and, last but not least, about the political willingness to handle climate change. The uncertainty implies that the carbon budget will need to be revised over time as news accrue, with consequences for carbon prices. This unfortunately creates uncertainty for firms, households, and inventors: it is hard for them to fathom how the current carbon budget will translate into future carbon prices and therefore to plan their investments. A power producer builds a plant for 30 or 50 years, a consumer buys an electric car that will last 15 years, inventors' innovations will materialize 10 years down the road, and urban planners and builders take decisions whose effects are even more long-lasting. The financial stakes attached to such decisions hinge not so much on today's carbon price, but rather on the carbon prices that will prevail in the future.

This Chapter One calls for "forward guidance".

- One way to inform private investment decisions about future carbon prices is to set a floor and a cap for the price of carbon emissions, enabling some price stabilization. When, due to an abundance of allowances relative to the demand for them, the price hits the floor, the quantity of allowances offered is reduced (authorities purchase allowances at the floor price), leading to a faster decrease in CO_2 emissions.[1] When the price reaches the ceiling, extra allowances are sold at the price cap, the quantity of allowances offered is increased, leading to a slower decrease in CO_2 emissions. In particular, Chapter One recommends a price floor that starts around €60/tCO_2 in 2021 and grows at a rate of 4% or 5% per year (so around €190-€250/tCO_2 in 2050).
- Another approach discussed in the chapter is the creation of an independent carbon board (labelled "Carbon Central Bank") in charge of adjustments, so as to take such adjustments out of the political lobbying and electioneering process and thereby confer credibility on the policy in the same way independent central banks have kept inflation under control.
- Yet another approach to securing commitment to a strong environmental effort while allowing for some flexibility is to create some skin in the game for governments to abide by their commitment. This can be achieved through the issuance by the governments of securities that would compensate allowance holders if the future price of carbon fell relative to the preannounced path.[2] That would make it costly for governments to increase the number of allowances in the future; presumably, they would do so only in

[1] The UK system works differently: it adds a top-up tax to the market determined price.

[2] In the jargon of finance, such securities are called "put options". For details, see Laffont, J.J. and J. Tirole (1996), "Pollution permits and compliance strategies," *Journal of Public Economics*, 62, No. 1-2, October, pp. 85-125.

case of unexpectedly good news about technological progress, in which case the increase in allowances would not necessarily reflect a reduction in the climate ambition.

To reach its full potential, carbon pricing must be universal. For fairness as well as for efficiency, the carbon tax that we propose must apply to all polluters without exception, unlike the current French carbon tax. This ubiquity requirement also requires avoiding "leakage", the migration of economic activities abroad to enjoy lower costs in countries that practice environmental dumping. We later discuss border tax adjustments that are meant to prevent this leakage.

Even if it is transparent, credible, and universal, carbon pricing is not a panacea. A carbon price is necessary, but not sufficient to achieve the goals of the Paris accord. Furthermore, while its scope can be enlarged compared with its current perimeter, some environmentally friendly projects are not easily amenable to this approach. We will come back to this in leg 3.

2.2. Leg 2 – An intense R&D effort

The ecological catastrophe will not be avoided without a substantial stepping up to the R&D challenge either. There is too little green R&D investment, but the causes are not to be found in a shortage of loanable funds: in the current low-interest-rates environment, there is a lot of money looking for investment opportunities. Rather, it is the insufficient profitability of green R&D that limits current investments. Innovation is critical because it improves the trade-off between damages from the climate and damages to the economy. This current dilemma weighs heavily in particular for Sub-Saharan Africa, Pakistan, India, and even China. If these countries found it more attractive to choose low-carbon technologies, they would deliver benefits to France by reducing global emissions far more than what France can generate itself.

The general R&D subsidies that are meant to compensate innovators in all industries for the partial appropriation of the fruits of their R&D efforts (that is, for the existence of technological spillovers to competing firms) will not suffice, for multiple reasons.

First, even if carbon prices are generalized and given more substance, political constraints are likely to keep them smaller than needed. With low carbon prices, it costs technology users too little to pollute and so they will not be willing to pay much royalties for access to green technologies. The very low carbon prices of the past and the absence of mention of carbon pricing in a number of official documents have created expectations of at best moderate carbon prices in the future and thereby disincentivized green R&D.

Second, and independently of too low carbon pricing, some of the most important green R&D programs involve unlocking the breakthrough technologies that will in the long run enable us to achieve zero or negative emissions. While the pharmaceutical industry shows

that the private sector may take long horizons in their R&D decisions, it is still the case that the public sector plays a fundamental role in supplying the required fundamental research.[1]

Considering this, R&D can be stepped up in two ways. The first is to set achievable technological goals for the private sector. Experience – not least with the recent Covid-19 vaccine – has shown that, when pushed, the private sector may do wonders: multiple vaccines were developed at yet-unseen speed and for some with yet-untested approaches.[2] The second is to create an "EU-ARPA-E", a European equivalent to the American green technology funding institution; this agency will finance high-risk, high-payoff research by the private and public sectors in Europe to unlock the key challenges for green technologies. The governance of this agency must be exemplary. More on this below.

Before concluding this section, the recent report by RTE and the IEA on the conditions necessary for exclusively-renewable electricity production reminds us that the outcomes of R&D efforts are by nature uncertain, even though they condition the feasibility of certain scenarios aimed at achieving carbon neutrality. This uncertainty should obviously not be a pretext for procrastination, but it must be integrated by public authorities in their strategy and in the sequencing of their actions. We must show humility and avoid putting all our eggs in the same basket.

2.3. Leg 3 – Complementary actions

We mentioned that in some domains the carbon price instrument is less perfect than we would wish. The first issue, already mentioned, is that the carbon price may, for political reasons, be lower than needed.

A second issue is measurability of emissions. Not necessarily because of the large number of economic actors: fossil-fuel products used in mobility and heating can be made subject to the overall EU-ETS system; taxes can thereby be collected early in the value chain and not from each household, firm or administration, as is currently the case for electric power and the cement and steel industries. Methane emissions from cattle breeding could be

[1] One can further make the case that because technologies build on the shoulders of previous generations and green energies have a longer horizon than fossil fuel ones, even if the latter are made cleaner through innovations such as carbon capture and storage, overall spillovers are larger for clean energy research, motivating higher subsidies than for alternative R&D tracks.

[2] Analyses of the impact of the Covid-19 vaccine procurement process are still awaited. Public procurement was also meant to preempt other countries on the supplies and not only for speeding up the advancement of technology (indeed the lack of international cooperation, except for the COVAX coalition, suggests that preemption was a major goal, even though no-one will ever say so). Also, we have little information about the counterfactual; the market for a vaccine was huge and we would expect a sizeable R&D effort even in the absence of public procurement.

taxed at the level of the slaughterhouse. Forestry contributions to global warming (admittedly less important in the EU, which has relatively less forest) or carbon storage from specific agricultural practices by contrast are harder to measure than a power plant's carbon emissions or the volume of gasoline produced by a refinery.

A third issue is that some infrastructures (say, for electric vehicles or applications of hydrogen) must be standardized so that competing producers can serve the market.[1] The polluter-payer principle ensures that economic actors are made accountable for their emissions, but no price guarantees that rival green companies will converge on a single standard, another market failure. The state may help with this standardization; it should be as neutral as possible as regards the choice of technologies, but it cannot be entirely neutral.

A fourth issue is that as a rule, incentives provided by carbon pricing work better for companies (power plants, cement, aluminum, or airline companies say) than for households. For the latter, a carbon price still works well to guide *current* consumption: applied to air travel, beef consumption,[2] gasoline and fossil-fuel-generated electricity, it leads consumers to substitute the train for the airplane, eat less beef, increase car-sharing and telecommuting, and use less air-conditioning. Carbon pricing may function less well when consumers invest for the long run. Three reasons for this:

- First, households are poorly informed about the future costs and benefits of their green actions. A case in point is energy retrofitting, especially in France where, unlike in Germany, consumers do not receive efficient advice[3] and subsidies are not based on realized energy savings. For carbon pricing to have the intended incentive effects, households must be properly advised regarding their private cost-benefit analysis.

- Second, those who decide are not always those who will pay the bill. Despite the energy performance certificates, tenants and landlords do not always agree on energy savings. In theory, landlords have the right incentives to invest in the energy renovation of their buildings and apartments if successive tenants are well informed about the quality of these investments (to which the energy performance certificate contributes), if they pay

[1] E.g., the recharging infrastructure for electric vehicles: charging connectors, vehicle charger vs. external charger and AC vs. DC connection, voltage…

[2] Their measurement is imperfect. An imperfect proxy for methane emissions might be the weight of the animal.

[3] And they should be wary of advice from the industry. Thermal insulation has had disappointing impact (see the next footnote). Households face both moral hazard (insulation suppliers can cut on the quality of material and work) and adverse selection (performance insulation benefits depend on many parameters; consumers further face a lemons market as they cannot evaluate the competence and honesty of professionals). See Ambec, S. and C. Crampes (2020), "Energy efficiency in buildings: From theory to practice," WP Toulouse School of Economics, February.

their electricity bills, and if the rent can be adjusted to reflect the lower energy consumption by the tenants. If these three conditions are not met, landlords will not make enough effort to improve energy performance. In practice, a few studies confirm that thermal renovation efforts are more sustained when landlords reside in the dwelling. Asymmetry of information problems can also slow down owners' eagerness to renovate if they are concerned about the impact of renovation investments on the value of their renovated property on the housing market in the event of a sale. Finally, there are coordination issues in condominium structures.

- Third, empirical evidence shows that households may underinvest in the quality of durable goods, either because of liquidity constraints or because of a present bias. This may well apply to energy efficiency choices, although a variety of government-sponsored zero-interest loans are often available to illiquid households.

These arguments call for complements to carbon pricing, such as bans and more generally standards. Examples of bans under consideration or already promulgated include the banning of single-use plastic bags and the prohibition on further sales or registration of new vehicles powered with specific fuels by a certain date or the definition of low-emissions zone not accessible by fossil-fuel cars. An international illustration of a standard in the environmental realm is the successful 1987 Montreal Protocol on Substances that Deplete the Ozone Layer, which set targets for countries and burden sharing.

Such policies are easier to put in place when combined with leg 2, innovation. A case in point is the change in lighting, which came from a combination of regulation (banning of the incandescent light bulbs in the late 2000’s and early 2010’s) and research and development on alternatives (LED, from the theory in the early twentieth century to the breakthrough on blue LED in the 1990s). Similarly, banning new sales or restricting the use of the combustion engine cars in “low-emissions zones” will be made simpler once the cost of electric cars has fallen and their range improved, which is in sight. Bans and standards may also trigger innovation and learning by doing by presenting the industry with a challenge.

Chapter One favors such complementary measures but warns against treading into such interventions without ballpark numbers about their efficacy. To take a foreign example, it is known that rooftop photovoltaic panels (PV) are much more costly than state-of-the-art large scale grid-based PV in Southern California, Arizona, Texas, etc. Why should the US government subsidize rooftop PV with direct subsidies and net metering subsidies? If we are trying to meet a decarbonization goal, it is better to subsidize grid-based PV, or take the money and put it into R&D for hydrogen or long-term storage. Retrofitting, a very

popular policy, is another case in point; the evidence shows that the price per ton of CO_2 removed can be very high except for the really poorly insulated buildings.[1]

Ideally, the impact of such policies should be assessed whenever possible.[2] This is needed to ensure that the implicit carbon price justifying the policy not be totally out of line with the carbon price levied elsewhere. Put less technically, a standard, a ban or a subsidy that leads to spending €1,000 of consumer or taxpayer money to economize one ton of CO_2 is not a green policy: under a carbon price of €50, say, the same amount of money would have removed 20 tons instead of a single one. Subject to this caveat that bans, standards and subsidies must be cost-reasonable and the overall policy coherent (they must be "tested" by calculating a ballpark estimate of the implicit cost per ton removed), we think that these instruments can indeed be part of an optimal package. And they are a bigger part of the package, the smaller the actual carbon price.

In this context, the Convention citoyenne pour le climat (CCC) makes a number of good recommendations, some of which are listed in Chapter One. They tend to be biased however toward subsidies and bans. As we argued, a subsidy is always a tax as it needs to be financed, and bans can be costly in an invisible way. The climate urgency motivates both a sacrifice, and picking our fights so as to make the most from this sacrifice. To keep the impact on the people's purchasing power reasonable, Chapter One recommends performing a cost-benefit analysis and applies such a preliminary analysis to some CCC recommendations. The same need for evaluation applies also to renewable portfolio standards, a frequent policy around the world mandating a minimum fraction of electricity generated through wind and solar.[3] We recommend that this process be systematized, so that the debate be informed by the relevant data (in the United States, the Office of Management and Budget (OMB) and the Environmental Protection Agency (EPA) test regulations like this using a schedule of estimates of the social cost of carbon). More on this shortly.

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[1] See, e.g., Fowlie, M., Greenstone, M. and C. Wolfram (2018), "Do energy efficiency investments deliver? Evidence from the Weatherization Assistance Program", *Quarterly Journal of Economics* 133, No. 3, pp. 1597-1644. They find on a US sample of low-income households that projected savings are roughly 2.5 times the actual savings. Blaise and Glachant (2019) on French data ("Quel est l'impact des travaux de rénovation énergétique des logements sur la consommation d'énergie ? Une évaluation *ex post* sur données de panel," *La Revue de l'Énergie*, 646, September-October, pp. 46-60) find an even worse ratio, at almost 8 times the actual savings.

[2] Also, one should not undertake such policies in sectors where a high-enough carbon price prevails already, as they would duplicate carbon pricing.

[3] The methodology for estimating properly the impact must be as state-of-the-art as possible. See e.g., Greenstone, M. and I. Nath (2020), "Do renewable portfolio standards deliver cost-effective carbon abatement?" *BFI Working Paper*, No. 2019-62, Becker Friedman Institute, November. They find that the US renewable portfolio standards have had a substantial impact on CO_2 emissions, and that the cost per ton of CO_2 abatement ranges from $58-$298 and is generally above $100.

25% of global greenhouse gas emissions come from agriculture and 16% of global emissions come from methane, a potent greenhouse gas. Incentives must be designed to halt deforestation and land degradation, and the promotion of land carbon sinks. To this purpose, we must improve remote sensing technologies so we can actually measure the actual impact of private efforts. Sustainable, diversified agriculture, precision cultivation and vertical farming are examples of policies that help reduce our emissions. Agriculture, which is a major source of pollution,[1] needs more focus by policymakers.

Ambitious city planning and public transportation schemes are also called for. Cities, land use and transportation systems (including park-and-ride facilities) must be designed or re-designed; the greening of cities strategy may also bring "co-benefits" such as better health and a reduced exposure to heat waves. These environmental policies will require complementary policies. They will raise further the land rent enjoyed by owners of city-center property, especially as localities vote against densification (which is unpopular with owners, who want to preserve and increase their rent). The increase in property prices brought about by green policies (ban of polluting cars, suppression of parking spaces…) must be captured by the community, possibly through some capital gain tax; in France such collective appropriation of the gains associated with public investment failed to take place for TGVs or urban renewal programs.

Housing policy, beyond the standard economic issues (actual incidence of housing subsidies, reallocation of social housing to those who need it most, liquidity of the rental market, etc.) has an obvious link with the fight against global warming. We have already mentioned energy renovation and the usefulness of supporting households (especially low-income ones) in their renovations through effective advice, subsidies conditional on verified energy performance, and an increase in the skills of craftsmen in the sector. These policies make it possible to reduce the energy consumption of buildings and to encourage the use of existing buildings rather than the construction of new ones. The densification of cities, despite the resistance of owners anxious to increase their land rents, is a necessary instrument, both to fight urban sprawl and its corollaries (heavy use of automobile commuting, artificialization of soils) and to reduce intergenerational inequality. Making the owners of brownfield sites accountable – forcing them to renovate the brownfields, to convert them to green spaces them or to sell them – can also contribute to the fight against global warming. Finally, the decrease in demand for office space due to Covid-19 and teleworking provides an opportunity to convert some offices into apartments, an opportunity that should be systematically exploited by empowering the market mechanism.

[1] Emissions of ammonia, a serious threat to health, from the agricultural sector continue to rise, posing a challenge for EU member states in meeting EU air pollution limits. More generally, a serious change in agriculture practices is necessary, but hard to impose for political reasons.

Learning by doing and public procurement

Taking as an illustration the sharp decrease in the costs of wind and solar power over the last 40 years, governments often use mandates – the requirement imposed on electricity companies to procure at least some percentage of their electricity from renewables – and other incentives for the adoption of existing green technologies in order to bring down the cost of alternative energy. The argument is that, independently of any R&D (which is promoted by R&D subsidies rather than incentives to adopt current technology), manufacturers learn by doing. They correct engineering mistakes over time, and the production cost decreases with experience. Mandates, which for example force public utilities to have a minimum fraction of renewables in their portfolios, do not focus on future generations of the technology, but rather try to unleash incremental improvements on existing technologies.

While there is no question about the existence of a virtuous circle of R&D, learning and economies of scale, researchers have found it difficult to put numbers on the relative influence of each in achieving cost reductions, even on existing technologies[1] and a fortiori looking ahead at new ones. Given this limited evidence, it is unsurprising that different assessments co-existed within the commission.

For some members of the commission, a strong push on mandates and other adoption incentives to bring the cost of existing technologies and nascent ones was imperative: "bans and standards are essential and would benefit from careful evaluation." There are two strong arguments in favor of this position. The first is the urgency, so many tools must be harnessed to make rapid progress. The second is that some of these technologies, in particular solar energy, will strongly benefit poor countries, where much of the increase in emissions, if uncontrolled, will take place.

Others members viewed "bans and standards as useful but only if evaluated carefully." They emphasized two hazards associated with mandates and other adoption incentives. The first is obvious from the previous discussion: Estimating future learning curves is difficult, and no-one wants to create an open bar that might divert public money from green actions with a much stronger impact on climate. The second issue is one of commitment: At some point the cost reductions level off, or more generally[2] mandates and subsidies are

[1] The reason for this is simple. The effects of R&D (public and private), scale economies, and learning by doing are simultaneous and inherently interdependent. For example, government R&D, subsidies, and mandates get wind turbines or photovoltaic (PV) modules into the market. Developers, equipment manufacturers, and construction companies learn how to deploy the technology, learn from their mistake, make some profit and use some of it to support their own internal R&D to make a bigger and better wind turbine or more efficient PV modules and trackers. At some point consolidated markets become more concentrated and demand increases, so remaining producers benefit from returns to scale.

[2] For instance, if wind and solar are competitive with fossil fuel technologies, it is time to stop the subsidies.

no longer needed; and yet the government often finds it hard to phase them out. It is therefore important to announce at the onset a list of criteria for the unwinding of support measures when costs come down and deployment increases. Members of the commission agreed on the nature of these arguments but differed on the weights which would be put on them.

Promoting a transparent and efficacious decision process

We conclude this discussion of complementary measures with two closely-related policy recommendations. In view of the extreme urgency to act, cost-benefit analysis should not add an excuse for procrastination – the need for a time-consuming, complex expert assessment prior to acting – to another – the pushback from lobbies.

- *Acceptance of ballpark estimates*. Cost-benefit analysis relies on assumptions concerning uncertain variables. Some of the estimates of the cost per ton of CO_2 removed are subject to considerable uncertainty. Assessing the cost of a ban on conventional internal combustion engine cars by some year requires information about the likely learning curve for batteries, the availability of rare earth elements, the efficiency of governments in imposing standards on charging stations, or the evolution of the composition of electricity generation. Much more difficult still is the evaluation of risky research alleys and uncertain learning curves. But the existence of substantial uncertainty should not be an excuse for doing nothing.

- *Proactivity of evaluations*. Cost-benefit analysis, to be useful, requires expertise and is time consuming (engineering and econometric studies, randomized control experiments…). The climate urgency makes it important, though, that the rigorous analysis required for cost-benefit analysis does not slow down public decision-making.

This suggests creating a monitoring unit that uses the best available tools to produce transparent and independent estimates – themselves updated over time as data accrue, knowledge evolves, and scientific debate provides feedback. These estimates would be used in decision-making without delaying action. Representatives and public decision-makers would have rapid access to data shedding light on the impact of their decisions, for the sake of both transparency and efficiency. Transparent calculations of the marginal cost of removing a ton of CO_2 from the atmosphere should be required for all government subsidy or mandate programs.

To be concrete, one can envisage, for example, the creation of a permanent commission, whose structure would be similar to that of the expert group on the minimum wage (SMIC) and would benefit from the technical support of an independent body; the alternative would consist in giving a much greater weight to socio-economic assessment in already existing

structures.[1] Economists, scientists and other high-level experts would regularly update their estimates of current and future carbon prices and costs per ton of CO_2 not emitted. The results obtained would guide public decision-making, from the design of calls for tenders (see below) to the evaluation of the impact of fiscal and tax policies ("green budgeting"). This commission would thus pave the way for the indispensable creation of a similar structure at the European level; in this respect, it will be necessary to ensure that the "European Climate Change Council", whose creation is planned in the European Parliament's draft European "climate law" and is intended to be composed of experienced scientists, has an important socio-economic evaluation component. In summary, while good estimates are difficult to produce, they would nevertheless make it possible to identify, for a given expenditure, promising leads in terms of environmental benefits.

2.4. Leg 4 – Compensation

Climate policies sometimes ignore the fact that they create losers. The carbon tax that inflamed the *Gilets jaunes* (Yellow Vests) was economically justified,[2] but it was initially not accompanied with measures that would have offset at least partly its impact on poorer households and rural and suburban drivers with few public transportation opportunities. For the sake of clarity:

- Not everyone can be compensated, since we argued that there must be a cost to climate change mitigation. In our intergenerational arbitrage between current costs and future damages to our planet, we must do the least harm; but the fight against climate change will not come for free. Besides, by "loser" we do not mean all economic agents who are hurt by the green transition. Workers should be compensated, not

[1] In France, there are already several bodies with jurisdiction over climate policy, including the High Council for the Climate (HCC, an independent authority), the General Council for the Environment and Sustainable Development (CGEDD), the Economic Council for Sustainable Development (CEDD), as well as several cross-functional bodies such as the General Secretariat for Investment (SGPI, responsible for implementing the Investment for the Future PIA Programs) and France Stratégie. We have no specific recommendations regarding the reorganization of these bodies. On the other hand, these structures, including the High Council for the Climate, generally do not have the means to carry out the economic assessments that would maximize the ecological impact for a given expenditure. It seems important to us, therefore, that the strong culture of socio-economic evaluation of the Criqui Commission, an existing structure under the aegis of France Stratégie, permeates the French state.

[2] It can be argued, though, that buying gas at a station already carries an implicit effective CO_2 taxation rate that is above the EU-ETS value. There is no question that including a carbon price in the price of gasoline is justified; the price should be the "shadow price" of carbon, which correspond to the time-contingent price that will allow us to meet the COP 21 emissions objective and far exceeds the EU-ETS price. In practice, the gasoline price includes not only the price of oil and the cost of refining and distributing it, but also a variety of levies, that reflect general-revenue-raising considerations (captured by the general VAT), congestion pricing, the emission of particles, and of course CO_2 emissions.

shareholders, especially those of corporations that had opportunities to change their technologies and end up with stranded assets; indeed, a policy of compensation for stranded assets would disincentivize firms to adopt green technologies.

- Neither will compensation ever be fair to the entirety of the targeted populations: some in those populations will enjoy windfall gains (e.g., they do not use a car and receive a "green cheque" to "compensate" for the imposition of a carbon tax on gasoline) while others will still feel some net cost. Every situation is idiosyncratic, and the state has neither the information nor the personnel to enter each and every special case; and so, we must accept less than perfect solutions and not use the imperfection as an excuse not to act (an analogy can be useful here: antismoking policies – which in many countries are regressive – would never have been enacted if one had insisted on perfect compensation).

Incentives require that compensation be backward, not forward looking; that is, it should compensate for a cost inflicted upon the losers, but not be a recurrent compensation. For example, a recurrent compensation to workers who live in a rural area very distant from their workplace would not induce them to find a nearer job or move closer to their workplace if they have an opportunity to do so (not everyone has). But solutions do exist. Even a single identical lump-sum transfer, the "green cheque", for every adult resulting from a carbon tax proceeds would benefit poorer households on average. And the redistribution can even be made more targeted and more progressive. Simply, the compensation should be as targeted as possible on actual losers – avoiding windfall effects – and keep a proper forward-looking incentive pattern.

This being said, there were disagreements within the commission: some members suggested that some of the proceeds of carbon taxation should go instead to green actions rather than redistribution. This has the benefit of showing that the state puts its money where its mouth is and that it is convinced that the carbon tax really serves to fight climate change, rather than just being another source of public funds or of redistribution. But using part of the proceeds to, say, fund green projects does not do as much to address the discontent of losers.

While all countries must spend money to reduce their carbon footprint, they differ in both how costly it will be and how they will be impacted by climate change. Therefore, compensation is also crucial at the international level. Stopping coal, which emits much more CO_2 than even rival fossil-fuel energies, is a low-hanging-fruit. Yet, it has happened on an insufficient scale, be it at the European level or elsewhere in the world. Poland and Germany for example are big coal producers. One understands the human cost generated by the closure of their coal plants; displaced workers deserve strong support; but delaying closure only delays those costs and in the meantime leads to very high emissions. There is no other way to proceed than compensating losers, as has always been done historically

in the form of free allowances: mid-western US states received "bribes" in the form of free emission allowances when a cap-and-trade system enabled US SO_2 and NOx emissions (which cause acid rains) to be reduced by half starting in the 1990's; eastern European countries received free allowances in exchange of their participation in the 1997 Kyoto protocol. This is the spirit of the EU "Just Transition Fund".

2.5. Leg 5 – International juicing

The EU-28 by itself is only a very small piece of the climate change puzzle. It represents 9% of global emissions, France less than 1%. Future emissions furthermore will come mainly from emerging countries, further reducing the European share. So, there is little that Europe can do on a stand-alone basis. Nonetheless, Europe has a part to play, as inducing a reduction of global emissions elsewhere will deliver benefits to Europe that can be sizeable:

- First, by "leading by example". To be certain, this strategy was not that effective during the implementation phase of the Kyoto protocol.[1] Nonetheless, a voluntarist policy can have a demonstration effect – things can be done – as well as a shaming effect on countries who do not get on board.
- Second, by using a stick, the Carbon Border Adjustment Mechanism (CBAM), to ensure a level carbon price playing field between domestic firms and importers (more on this shortly) and to encourage recalcitrant countries to jump on board. If done right, the border tax eliminates the competitive advantage enjoyed by firms located in countries with lax environmental regulations. Besides leveling the playing field, it also puts pressure on these lenient countries, as their competitive advantage on the export market vanishes (indeed, they are better off collecting the carbon tax on exports themselves). Chapter One also argues that border tax adjustments are more efficient than conditioning bilateral or multilateral trade agreements on compliance with COP 21 nationally determined contributions and commitments on climate action set by each country, neither of which are binding as a matter of international law.
- Third, by engaging in public green R&D and making the resulting technologies available to poor countries, and by helping the demonstration of viability of existing technologies. Furthermore, the European Union (EU) can work through the multilateral development banks, the International Monetary Fund (IMF) and the development finance institutions

[1] An unequal distribution of efforts between countries (offering countries like the United States a good excuse to deviate from the agreement) combined with the absence of a sanction tool (such as a carbon adjustment mechanism at the borders in case of non-compliance with the agreement) explains why Europe remained alone in carbon pricing (through the EU-ETS). Not surprisingly, its climate activism lost in intensity: The EU refused to stabilize the price of carbon when it fell below €10 per tonne due to the financial and sovereign crises and the development of renewable energies in Germany and elsewhere in Europe. That said, the EU-ETS recently introduced a market stability reserve system to prevent this experience from happening again.

to help emerging market and developing countries, which will represent a big share of the growth in output and emissions in the near future, to adopt low-carbon technologies. Finally, innovation is not only technological. The EU could, for example, offer 5% of carbon revenues to developing countries to set-up CO2 verification and markets. The benefits from an Indian cap-and-trade would be large and would represent a relatively low-cost contribution to climate mitigation for the EU. There is not enough policy innovation in the world, and this could produce emissions reductions that benefit Europe.

- Finally, Europe must play a leadership role in promoting credible and effective international agreements.

3. Further Thoughts and Leads for Future Reflections

3.1. Governmental actions

The strengthening of the ETS system and the no-exception rule

A carbon price should apply to all actors whenever possible, for six reasons.

- *Containing cost*. First, it is inefficient to tax some emissions and not others. A carbon price of €50 applied to some sector but not another, will lead some to spend €45 to abate, while others will not spend €5 to avoid emitting a ton of carbon because they are exempt from any payment if they pollute. This holds true at the international level as well. Drastically reducing emissions of the French production of electricity would be very costly as electricity generation is already mostly decarbonized in France (incidentally, that shows that an ambition of reducing emissions in the same proportion in each sector would be absurd); in contrast, low hanging fruits can be found in the 39% of world fossil-fuel emissions that still result from coal production, most of it in countries with no or very low carbon prices.

  A single carbon price also helps address the large variation in the cost of decarbonization across usages. The latter is relatively low for electricity and light duty vehicles, higher for (older) buildings, and currently very high for sectors like airplanes, ocean transport, etc. Some of the progress will occur through switching away from fossil fuels, and some will occur through R&D instead (itself incentivized by carbon pricing). We will need alternative fuels, perhaps carbon capture and storage, negative emissions (e.g. air capture of CO_2), which are much more expensive presently.

- *Respecting fairness*. Second, exemptions are unfair. *Yellow Vests* noted that, unlike them, truckers, fishermen, farmers, airlines, and taxis were not paying the full carbon

tax. We realize that the no-exemption policy will add to the number of groups who might resist carbon taxation (farmers, taxi drivers, lorry drivers, real estate managers, homeowners, etc.). But a no-exemption policy has much more legitimacy than a patchwork one. Furthermore, compensation combined with a pedagogy explaining why alternatives are opaque and that subsidies are in the end taxes, might further enhance the legitimacy.

Accordingly, we recommend the inclusion of industries such as housing and transportation into the EU-ETS. However, this inclusion should not lead to a loss of ambition. As we have noticed, the EU-ETS price is currently far too low (it was still at €25 in 2020, before rising to around €50 in early 2021, close to the level of the carbon tax in France). Two solutions under these conditions: the best approach is to negotiate a higher ambition for the EU-ETS, which would allow the closure of coal mines among other desirable effects. Until the political constraints at the European level are lifted, we advocate to still include these sectors in the EU-ETS and to add an additional national tax that fills the gap;[1] this surcharge would evolve according to the EU-ETS price. After all, this is what the British did in 2013 to eliminate coal (the EU-ETS price was around €10 at the time).

- *Making the process lobby-proof*. Third, like fiscal loopholes, exemptions expose the tax system to heavy lobbying. Once the state has opened the Pandora's box of exemptions, every lobby tries to have its name added to the list.

- *Curbing offshoring*. Fourth, and as already mentioned, the no-exemption principle[2] has another important corollary: Imports for whose emissions the producer is not held accountable should not have an undue competitive advantage over home production that is subject to carbon pricing; put differently, carbon pricing by itself should not lead to the offshoring of domestic production. The level playing field can be restored through a Carbon Border Adjustment Mechanism at the borders of Europe, that charges imports for the price corresponding to their carbon content, applying the same price for carbon emissions as for European firms. Straightforward in theory, but more complex in practice; for, estimating the actual carbon content of imports is not that easy, especially along a value chain located abroad. Indeed, if only intermediate goods such as cement and steel are subject to the border tax, the level playing field is not obtained for final goods such as cars. The border tax adjustment must be comprehensive, which requires information on the value chains. For that reason, economists are only mildly

[1] This inclusion in the EU-ETS combined with the tax adjustment will not solve the problem of under-taxation of carbon in other countries, nor will the status quo. Hence the importance of reaching an agreement at the European level.

[2] France consumes more CO_2 than it produces. Indeed, the CO_2 footprint of imports is twice as big as that of exports.

enthusiastic about the border tax. But we feel that it is necessary, if only to force free-riding countries to the bargaining table and generate reductions abroad that benefit France and the EU. Note also that it will be hard for Europe to justify abroad a border tax adjustment if it does not get its act together internally and allows for exemptions.

- *Phasing out fossil fuel subsidies*. Fifth, another implication of a single carbon price is the shutting down of fossil fuel subsidies that are so ubiquitous around the world. Such subsidies are equal to the difference between the total cost for society of the fuel (production and delivery cost + induced cost of local air pollution and global warming – the carbon shadow price – + general-revenue-raising considerations, measured by ordinary VAT) and the price paid by the fossil fuel user. It is estimated that fossil fuel subsidies amount to a staggering 6.5% of world GDP, with China, the US and Russia by far the largest subsidizers.[1] While straight underpricing of fossil fuel (of diesel in France and Germany) is a very common subsidy, there exist many other forms of less-obvious fossil fuel subsidies, from the absence of collateral pledging by US oil and gas companies (which leads them to not plug the shafts when they become unprofitable, generating high methane emissions), to subsidies to low-cost airlines or to subsidies linked to export finance (by the Banque publique d'investissement in the case of France) for oil and gas exploration, pipelines, or LNG terminals. Although much smaller than those of China, the US and Russia, European fossil fuel subsidies should be phased out and the European Energy Taxation Directive still lags behind in terms of its ambitions. *Fossil fuels subsidies often amount to a negative price on carbon*.[2]

- *Rewarding negative emissions*. Sixth, negative emissions will be necessary to achieve the net zero pledges (for example, there is currently a lot of interest in a wide range of natural and other carbon removal technologies). In theory, such negative emissions, when certified, should be rewarded by "credits"[3] whose value corresponds to the carbon price, again to ensure that the same incentive applies to alternative ways of mitigating

[1] See Coady, D., Parry, I., Nghia-Piotr Le, and B. Shang (2019), "Global fossil fuel subsidies remain large: An update based on country-level estimates," *IMF Working Papers* 2019/89, May. There is some uncertainty around the exact number, for methodological reasons explained in the paper, but there is no question that it is sizeable.

[2] This is so if the total cost of the fuel short of the impact on global warming (production and delivery cost + induced cost of local air pollution + general-revenue-raising considerations) exceeds the price paid by the fossil fuel user.

[3] Of course, only actors who also pay for carbon emissions would be eligible for those credits (otherwise, they might emit, recapture, and claim credits, as has happened with trifluoroethane or hfc 23 under the Kyoto Clean Development Mechanism).

climate change. Needless to say, details matter, and one must ensure that the policy achieves the stated goals.[1]

Electricity production

The production of electricity must be altered in level as in structure. Much more electricity will need to be produced to match the increased demand associated with electric vehicles, green buildings (heat pumps for example) or the production of green hydrogen (which uses CO_2-free energy to power electrolysis that splits water into hydrogen and oxygen) for mobility and higher-temperature industrial processes. This will create challenges for both electricity generation and distribution and transmission. In structure, most electricity will have to be produced from carbon-free sources. This is already largely the case in France, but not in the rest of Europe. The transition requires some thinking. We already mentioned the rapid phasing out of coal, which will not create a big surge in the price consumers pay for their electricity.

Renewables will need to be widely deployed, but they may still be expensive overall due to electrical system balance and transmission problems. First, these are intermittent sources of energy, and, in the absence of cheap battery or other sources of storage, they require being supplemented by other means of production; if the latter are carbon-intensive, renewables are less green than they appear. Second, in Europe the best wind resources are in the North, especially offshore, while the best solar resources are in the South. Bringing renewable electricity to where consumption takes place poses a challenge for high-voltage transmission grids, for both economic and "not in my backyard" reasons. This has for example been an issue in Germany, where wind farms are in the North and much consumption is in the South, with limited high-voltage transmission capacity in-between; the shortage of transmission capacity has occasionally led to the substitution of wind energy from the North by fossil-fuel electricity produced in the South, a problem that will become much more acute in the future as renewable energy expands substantially. As for solar, which like wind has witnessed a spectacular technological improvement in the last ten years, locating photovoltaic panels in Andalusia or North Africa makes much more sense than doing so in the North of France and a fortiori further north.

Besides the unpopularity of high-voltage transmission lines, there is a second obstacle to an efficient localization of renewables. Developing such lines across Europe requires cooperation among a number of grid owners and dispatchers with divergent interests (the same problem arises in the United States). A long-awaited solution would be to create a

[1] For example, one should not repeat the mistakes made when setting up the Clean Development Mechanism. The latter failed the verifiability criterion; it furthermore led the credits being earned solely in the European region, and the resulting increase in the number of allowances put downward pressure on carbon prices in the EU-ETS system.

single European transmission and dispatching system that would enable a single European electricity market and thus facilitate the deployment of renewables.[1] We support such an endeavor to achieve a truly pan-European power market. Finally, it should be noted that the capacity of the high-voltage grid can be increased without building new lines, for example by installing sensors that allow more power to pass through a line without fearing a break in the line.

Chapter One concludes that in the transition phase:

- Regardless of opinions about this mode of production, keeping in (safe) operation existing nuclear plants, which provide three-fourths of the electricity production in France, is a necessity if we want to bring our contribution to the fight against climate change; nuclear is carbon free, dispatchable, and has high availability. Large refurbishment operations can, at a reasonable cost, extend the life of these power plants up to 60 years (some even argue 80 years).

- The commission did take a stance neither on the desirability of (UK-style) construction of new power plants, nor on the specific nuclear technology if one decided in favor of such construction (third and fourth generations, including small modular reactors). Doing so would have required more expertise and time than the commission could devote to study issues related to cost and reliability, sequencing of the green transition, extension of life span of existing plants. In any case, the construction of new nuclear plants should not be excluded on a priori grounds given the huge increase in demand for decarbonized electricity in the years to come. When it comes to investment and R&D, and given the technological and societal uncertainties, it is important not to put all our eggs in the same basket.

- During the transition, the use of gas may be a lesser evil. Indeed, gas generates half as much CO_2 emissions as coal, although this difference is reduced in the event of methane leaks (methane leaks due to gas production and extraction must be closely monitored). In addition, its cost is relatively low, keeping the price of electricity at a reasonable level. It should be noted, however, that a more intensive use of existing gas-fired power plants should be preferred to the construction of new gas-fired power plants, as new investments with long lifetimes could have a lock-in effect on the energy mix; however, gas is still too polluting and the transition should be made as quickly as possible. A different way of expressing this is that the construction of new power plants

[1] Failing this, we should support the European Commission's Trans-European Networks for Energy (TEN-E) regulation, which tries to identify projects of common interest.

can only be considered if there are very significant technological advances in carbon capture and storage.[1]

Boosting innovation

Innovation comes primarily from the private sector. But the impetus is often given by the state. First, through R&D subsidies and various policies encouraging innovative start-ups and subsidizing the demonstration of some key technologies. Second, by conducting smart industrial policy; not an industrial policy that is created to promote certain industries or to prop up losing industries, but one that tries to unlock technological challenges. While governments too often attempt to pick winners without having the required information, favor lobbies or just follow their favorite whim, they can alternatively attempt to unlock technologies through a well-thought governance design. A case in point is the US defense initiative DARPA, which played a key role in the development of now widely used key technologies, such as the GPS or the Internet. DARPA distributed money to the private sector, universities, and government labs with much discretion (due to insulation from politics and lobbying), an eye on outcomes and a strict oversight of the projects. Similarly, the US National Institute of Health has had a large impact on advanced medical and pharmaceutical research, but they have considerable financial resources (more than $30 billion per year).

A green R&D agency could be set up, preferably at the level of Europe, which offers a larger scale and a wider array of competences than a single member state. European Alliances for batteries (since 2017) and for clean hydrogen (since 2020) have already started to foster cross-European public-private collaboration. A European version, E-ARPA-E, of the Advanced Research Projects Agency–Energy (“ARPA-E”, as this spin-off of DARPA is known in the United States) would fund high-risk, high-reward research, “way out there” (“early stage”) projects. To avoid wasting public funds and to ensure a real impact, this independent agency would adopt a proper governance. Examples of desirable features include:

- A true high-level manager would be appointed, with substantial operational flexibility to oversee the allocation of funds and insulation from interest group politics. ARPA-E started in 2009 with tight supervision from Nobel laureate and US Secretary of Energy

[1] We do not see here any argument for policy intervention if the carbon price is high enough: the recommended carbon pricing mechanism should solve the problem efficiently provided it is put in place. A ban on coal (which will meet the same resistance as a carbon price) will be necessary if the carbon price remains too low. But this again raises the issue of predictability of the carbon price. New investment in gas is risky given that it will have to be phased out relatively rapidly; with the knowledge of future carbon prices, the private sector can evaluate this risk; in the absence of such knowledge, investment choices are complex.

Steven Chu and the first two directors were very distinguished science professors at UC Berkeley and University of Maryland.

- Grants would be subject to a rigorous peer-review process, in which independent, highly-qualified experts would assess the technological feasibility and the even-distant market prospects of the project, and would compare not only the projects, but also the scientific standings of the teams (a very important feature for the project delivering).
- E-ARPA-E would bet on highly promising teams and promising but high risk projects. It would be agnostic as whether the private sector or universities are best placed for solving a particular problem.
- The agency would not pick the solution in advance; it would set goals (e.g. battery capacity and longevity) rather than the way to achieve the goals. Again, the recent vaccine experience is useful: it was not clear a year ago what was the best scientific and cost-effective route.
- The agency would evaluate interventions after they have taken place, and publish the results; it would include a "sunset clause" which ensures support can be withdrawn if the project is not working or is no longer needed (a feature that is often missing when the public sector undertakes industrial policy: whether under the pressure of recipients who want to keep receiving funds or because they want to prove they were right in the first place, officials too often keep throwing money at projects that show little chance of succeeding). Relatedly, because a good R&D portfolio has some failures, failures need to be tolerated and recognized, but lessons must be learned.
- A requirement of co-funding by the private sector might be of further help (as is the case for the US ARPA-E), both at the project screening stage and to help facilitation the termination of non-performing projects.

Is this feasible? It may be useful to compare EU-ARPA-E with existing French and European institutions with similar objectives.

A European role-model for this, albeit in the academic-research sector and with too small a scale,[1] is the European Research Council (ERC), itself modelled after the very successful National Science Foundation and National Institute of Health in the US. It selects a small number of high risk-high promise projects, is protected from political intervention, and conducts a clean, peer-reviewed allocation of grants. The two key researchers, Ugur Sahin and Adrian Hill, behind two of the three current Covid vaccines, that of BioNTech-Pfizer and that of Oxford-AstraZeneca, are both ERC laureates whose grants were for then-exotic

[1] The ERC's budget is in the €2 billion ballpark for the associated 27 member states, while the EU-28 GDP is about €15,000 billion.

forms of vaccination that they were able to transform quickly when Covid-19 appeared.[1] Needless to say, the European agency in charge of green projects would face a different environment and have different goals and processes, but the ERC example shows that European cooperation and a clean governance can be achieved in the R&D domain.

Another European undertaking, the European Space Agency (ESA), has been successful during quite a long time despite two features that have made the agency difficult to run.[2] First, it has always applied an unwritten "fair-return" rule that contributing countries must receive a volume of orders for projects supported by the agency in proportion to their contributions. This fair-return rule adds a significant factor of complexity and slowdown in the decision-making process, as well as the occasional suboptimality in the selection process. Second, ESA defines the technical specifications to be met for the projects it finances, while DARPA and other American agencies have moved to a logic that defines performance objectives and leaves it to the contractor to find solutions. The European system has been less conducive to breakthrough innovations such as reusable launch systems, or the industrialization of the production of certain equipment.

As we already noted, European member states have embarked in joint research support. A newcomer to this landscape is the European Innovation Council (EIC), which will distribute €10 billion over 7 years; at the pilot stage in the framework program ending in 2020, the EIC is inspired by the way the European Research Council (ERC) operates: a fraction of its budget will even be used to take over where the ERC's "proof-of-concept" program ends, to bring innovations closer to industrial or societal use. The EIC also has thematic priorities in the tradition of DARPA. Unfortunately, unlike the ERC's, the EIC's strategic council is only advisory. The European Commission has kept the upper hand on the concrete decisions. Because of this "detail", Europe cannot claim to have created its own "DARPA" (in fact, DARPA has a lot of independence).

A final comparison: in France, the General Secretariat for Investment is piloting the "Programme d'investissements d'avenir (PIA)". The PIA finances innovative investments[3] over the entire innovation life cycle, often with co-financing from the private sector. Its independence and its approach (on the whole rather bottom-up) also make it tick several boxes listed above. On the other hand, EU-ARPA-E would perhaps put more emphasis on defining a target than the path to reach it. Governance would also be more oriented towards

[1] In the case of Covid-19, the promise of government procurement played a role – the companies knew that they would have massive demand for their innovations from governments. There was little uncertainty about demand.

[2] France Stratégie (2020c), *Les politiques industrielles en France. Évolutions et comparaisons internationales*, report for Assemblée nationale, November.

[3] PIA programs have evolved from cross-cutting approaches (innovation competitions) to a more sector-based approach (batteries, artificial intelligence, etc.).

scientists, who are very present in the consultations in the PIA but much less in the decision-making bodies.

While the role of scientists in decision making and target setting could be strengthened in the management of the PIA, it should be noted that these differences are particularly important when it comes to selecting a very small number of disruptive projects and putting large sums of money on them, as the US agencies in the high-tech, environmental and medical fields have been able to do, unlike us. Committing such sums with a high risk of failure is not in the European administrative culture for understandable reasons, but it is indispensable to make such risky bets to achieve world leadership in at least a few areas. There are of course two corollaries: it is imperative to attract very high level scientists as managers, and to do so, it is necessary to know how to put the necessary means in place if necessary. Moreover, both for budgetary reasons and for having access to a broader talent pool, it is desirable to situate the agency at the European level (without imposing "fair return" constraints, or sprinkling posts according to nationality quotas).

Diplomatic channel

We already mentioned the need for a border tax adjustment. Many are concerned with the risk that, under the cloak of green policymaking, lobbies obtain protection against foreign competition. Aligning the import duties with the current price of carbon in effect in Europe limits the scope for such manipulation; but the tax base – the estimated emissions induced by the imports – is more discretionary. This border tax adjustment should be as rule-based as feasible, possibly as part of an accepted World Trade Organization (WTO) process.

In view of the constraints inherent in the United Nations process (obtaining the signatures of 196 countries gives each a veto right and necessarily leads to "least common denominator" decisions), a number of economists proposed in the past a joint action by a small number of high emitters (such as the United States, China, Europe, Russia, India, Brazil and Japan). These countries would agree on a core of common actions, and put diplomatic pressure (and economic pressure through the border tax) on other countries to join the club. With the 2016 American election and more broadly the rise of populist governments often unwilling to tackle climate change, the idea lost momentum. The election of Joe Biden might create an opportunity for Europe to rethink such an approach, together with China, the largest emitter, and one that has become over the years more and more climate conscious. The commission did not reach an agreement as to the appropriate forum:

- Some argued in favor of a "coalition of the willing"; the voluntary nature of such a "climate club" would facilitate progress on an agreement. The club's variable geometry would make it flexible.

- For others, creating a new institution does not come without cost. We already have the G7 and the G20 (which covers 80% of world emissions), of which the European Union is a major player, and the climate club might introduce more bureaucracy and disconnect between the various institutions. Climate change discussions will shortly take place within the G7 (plus say China) or a spinoff of the Group of 7, which might be a better forum than the G20, which includes a number of countries that may oppose policies that diminish the reliance on fossil fuels.

Our commission however had little expertise in diplomatic issues, and left the debate there. The contribution of political scientists would shed important light on this issue.

Environmental covenants in public contracts

It is often suggested that the award of public contracts include green criteria as important factors of choice among contenders. For example, following a CCC recommendation, a French bill would alter the Public Procurement Code to make the integration of environmental clauses in all public procurement contracts mandatory, rather than optional. A priori, this idea is compatible with the concept of "economically most advantageous bid" inscribed in the European public procurement directives: this concept could be understood as including an evaluation of the environmental damage caused by production processes; the relevant data in this case are emissions and their implicit subsidy (the difference between the social cost of carbon emissions and the actual price of carbon).

But the (well-meaning) calls for environmental covenants in public procurement most often are not related to high-risk, high-return R&D. Indeed, following a CCC recommendation, a French bill aims to move from the possibility to the obligation to insert environmental clauses in all public procurement (Code des marchés publics). The devil is in the details and we would advise to exercise caution here, as it would be preferable to tackle incentives directly. Not because the concept of "economically most advantageous offer" is enshrined in the directives on European public procurement: this concept could conceivably be understood as including an assessment of environmental damages generated by the production process; the relevant data here are the emissions and the underpricing of these emissions (the difference between the shadow and the actual price of carbon).

Consider the well-taken concern about the greenhouse gas emissions created by the transportation of non-local production of inputs or food. A paradox arises when a government refuses to subject the airplanes' emissions to the ETS system or the truckers' gasoline to the carbon tax, and at the same time allows or even asks procurement officers to include environmental concerns in the tender of public contracts. Environmental criteria in procurement are (imperfect) substitutes for the taxation of emissions by the government. This passing-the-buck implies a switch from a well-defined and consistent carbon price to a series of discretionary and likely incoherent policies.

We here reiterate a warning made in Chapter One: green policies will be expensive, there is no need to inflate this cost by selecting ineffective policies. Without careful assessment, the specification of the weight on environmental actions might involve an implicit amount of public funds of €5 or of €1,000 per avoided ton of CO_2. The public accounting offices (regional and national *Cours des comptes* in France) are currently not equipped to compute these implicit costs and to verify the claims of bidders made in public tenders. Furthermore, the ability to tilt procurement exposes officials to lobbying and electioneering. A local official eager to be re-elected may over-emphasize the benefits of local production or voluntarily ignore some relevant dimensions (say, the heating of local greenhouses to grow vegetables) while including others (say, transportation), so as to protect local producers against competition, at a high cost for public finances or the consumers and a low or even negative impact on the environment.[1]

3.2. Non-governmental actions

Regulations are never perfect for a variety of reasons, and we all should do our bit to help. First, we should try to alter ongoing social norms. This is no easy task, but norms-based interventions can be effective, especially when coupled with material incentives. Tobacco smoking in public spaces is a case in point: attitudes changed drastically in France when fines and legal enforcement suggested that such individualistic behavior was not widely accepted in the population and constituted antisocial behaviour. For instance, combining maluses on high-emission cars with a ban on advertising their “glamorous” features or outright awareness campaigns would mimic what was done for tobacco.

Second, citizen and corporate initiatives (socially responsible investment and consumption for example) can contribute to a better outcome. Whether on their own initiative or under stakeholder pressure, firms like Walmart or the FANGS contract some of their electricity from wind and solar producers. Whether such initiatives have a real impact has to be looked at with care, though; for example, it has been noted in the US that purchasing renewable generation in states where there is a mandate dictating the share of renewable generation in electricity companies’ production portfolio often leaves total renewable generation (and CO_2 emissions) unchanged: it does not generate more investment in renewables. Impact is what matters, not posture.

There cannot be too strong a divergence between the material interests of consumers, investors, suppliers and what is socially expected from them. Many of us are willing to pay a bit more for fair trade products or receive a smaller return on our savings if these

[1] In this respect, article 15 on public procurement (*commande publique*) of the proposed law following the CCC is of concern. It would mandate that public contracts take into account considerations related to the environmental aspects of the works, services or supplies subject to the contract.

contribute to a greener economy. There is no evidence however that allows us to count on massive *voluntary* sacrifices of purchasing power by a significant fraction of the population (which is confirmed by the perceptions reported above). Relatedly, private initiatives should not absolve governments from acting and governments should not ask the private sector to do their job. It should be borne in mind that 30 years of injunctions have not radically changed our carbon emission behavior, and that, although awareness has grown in the population, there is only so much that we can expect from non-incentivized private-sector behavior.

What to expect from the private sector?

So far, many of the encouraging private-sector news on the technological and managerial fronts have owed more to an increasing awareness of the enormous economic shock that the end of the waiting game will provoke than to effective governmental action. Corporations realize that global warming is an existential threat for their business as well as for the world. With mankind's having its back to the wall, the regulatory response will impose a large shock to their balance sheet if they are fossil-fuel dependent. Firms accordingly engage more and more in an assessment to their vulnerability to the climate risk (stress tests).

Shareholder insistence on knowing the carbon footprint and the exposure to regulatory risk makes good business sense, independently of any environmental consciousness. As shown for example by the behavior of some financial institutions prior to the 2008 financial crisis, corporate managers may adopt short-termist attitudes; they may cut corners to offer a flattering image of their performance at the helm of the firm, either to keep their job if the latter is imperiled, or to cash generous bonuses and exercise stock options if their compensation is not subject to clawbacks. Climate-related procrastination increases firms' short-term profits, but exposes them to a large but delayed macroeconomic shock. It is therefore in the interest of shareholders to curb a possible short-termism of their management and to make sure that the firm is not too exposed to climate risk, that it will not be left tomorrow with too many stranded assets.

What to expect from the Central Banks?

There is currently much discussion about "green central banks". Let us start with the uncontroversial part, which already lies within the mandate of central banks: Climate change should be embodied in the central banks' economic forecasts, banking stress tests, and assessments of the quality of the collateral they accept from banks. Climate change will create macroeconomic shocks (damages, properties under water, energy transition, high carbon prices and stranded industrial assets), whose likely size grows every day as we procrastinate. Various scenarios must be drawn so as to predict banking and insurance liabilities as the fight against global warming unfolds. Climate stress tests are about

financial stability and capital buffers that reduce the occurrence of banking bailouts. Several other policies have been proposed, that in contrast consume public funds and that we now discuss.

- *Risk taking and public finances*. Today, the current problem with green projects is not the availability of financing, but the lack of associated income prospects. The central bank can potentially boost the profitability of green projects in several ways. Two of them, well-meaning, have been recently suggested. To the extent that central bank profits go to the Treasury, both involve the use of public money. They are in our view misguided.

  First, the central bank could promote green projects by relaxing prudential standards: It has been proposed that capital requirements be loosened for banks' climate-friendly lending. Green projects are subject to substantial macro (political and technological) risk. One cannot help being concerned about such a policy increasing the risk of a banking crisis. Green finance should not be the new subprime, if at the end of the day greener corporations do not reap the expected revenues (for example, because governments fail to impose the relevant carbon price) or specialize in a technology that does not deliver.

  Second, the central bank can reduce spreads on bonds in a discretionary manner; it does so for example to shore up countries that face a speculative attack on their currency. It has been proposed that the central bank purchase green bonds to reduce their spreads if any. In contrast with the relaxation of prudential standards, such a policy would induce direct risk taking by the central bank, rather than an indirect one associated with the specter of new bailouts of the financial sector. Leaving aside the fact that a proper, impact-related definition of green bonds is still in the making, green spread reductions would open an environmental and political Pandora's box. For example, could the European Central Bank (ECB) refuse to buy German bunds on the ground that per capita emissions of CO_2 from the burning of fossil fuels for energy and cement production are 75% higher than those of France or that Germany is delaying the closure of its coal plants until 2038? Why not purchase bonds of firms or institutions which do good for the world, reduce inequality, give large sums to charity? This should be left to governments, not the central bank.

- *Legitimacy*. The European political institutions have the instruments and the mandate to fight climate change. A transfer of competences to the European Central Bank should at the very least be explicit. It would, however, provide governments with an excuse to make the ECB responsible for their environmental policies. Since these climate actions have a cost, the state spends public money, even if the operation is done through the ECB. It is the states that must take responsibility for this, in a

completely transparent manner and without jeopardizing the finances, credibility and independence of the ECB.

What to expect from the financial sector?

Public policy procrastination as we noted provides citizens, firms, and investors with incentives to do their own bit. Needless to say, we strongly favor such actions. But to be effective they require carbon accounting. Carbon accounting for a reporting company correctly emphasizes its direct and indirect emissions: direct emissions from owned or controlled sources; indirect emissions from the generation of purchased electricity, steam, heating and cooling; all other indirect emissions that occur in the company's value chain. The challenge here is to make sure that the proper information be available for these actors to direct their actions in the right direction. Current disclosures lack consistency, comparability and reliability. We should require that companies report their emissions in a verified and standardized way, with the same penalties that apply for inaccurate financial reporting.

We recommend, building on the implementation of the European taxonomy,[1] to extend the reflections carried out at the European level by bringing together rating agencies in environmental, social and governance matters, central banks, financial market regulators, accounting standards specialists, financial institutions, scientists and economists in order to develop a uniform method for assessing the environmental impact of companies.[2] Unfortunately, the task is far from simple. Indeed, our intuitions can be misleading and the adoption of "green behaviour" is much more complex than it seems: Investing in an installed base of hydroelectric plants or in a renewable energy that would have occurred anyway thanks to high-enough subsidies, does nothing for the planet, however green these energy sources may be. The plants already exist and better funding conditions (lower interest rates) amount to a mere windfall gain to the corresponding energy producers.

- To have an impact, green projects must not have taken place in the absence of lower interest rates paid to environmentally conscious investors. Such "additionality" is difficult to assess as we do not observe the counterfactual. Typically, the project developer puts an argument as to what would have occurred, absent the actions that

[1] As the first step in the "Financing Sustainable Growth" action plan launched in March 2018 by the European Commission, the taxonomy project, on which the European regulations on sustainable investment are based, has resulted in the publication of the report "Taxonomy: Final report of the Technical Expert Group on Sustainable Finance" in March 2020 et au "règlement (UE) 2020/852 du Parlement européen et du Conseil du 18 juin 2020 sur l'établissement d'un cadre visant à favoriser les investissements durables et modifiant le règlement (UE) 2019/2088."

[2] At the national level, there are platforms such as the one created by France Stratégie.

have been taken; the regulator, lacking precise information about the counterfactual, may certify additionality if politically or administratively expedient.

Similarly, well-meaning private policies such as carbon offsets and public ones such as the Kyoto Clean Development Mechanism (CDM), despite its emphasis on additionality, may fail to reduce carbon emissions and rather create a windfall gain for projects that would have taken place anyway or whose direct impact is nullified by carbon leakage. The Kyoto CDM rewarded carbon-saving projects in developing countries. It allowed industrialized countries to obtain carbon credits tradable in ETS systems by investing in emission reductions where it is cheapest globally. The CDM generated high transaction costs, as there were endless debates as to whether projects were additional or not.[1] Another issue is that the conservation of a forest in Indonesia would raise slightly the price of soy or timber, leading to substitute deforestation elsewhere – the leakage problem once again.

- Another case in point is the "exclusion vs. best in class" debate. For example, should environmentally responsible investors invest in a technology that still emits CO_2 but replaces another technology that pollutes more? Should we encourage firms in industries that pollute but cannot be phased out in the short run to reduce their pollution (for example, if oil is still going to be used in the short term for, say, driving, incentivizing oil companies to reduce their emissions at the extraction, transportation and refining stage has environmental benefits; the question is clearly more complex than one would think)?

- Finally, there is much discussion about divestment of carbon-intensive assets from portfolios, starting with immediate divestment from coal-related assets, in response to political authorities' failure to strongly act in this matter. But, while they have strong symbolic content, there is only so much we can expect from such exclusionary policies. Their efficacy is limited by yet another leakage problem: they have little impact if other investors jump at the opportunity of buying undervalued fossil fuel stocks and bonds (this was expressed – albeit in too extreme a form – by Bill Gates, who argued that campaigns to ditch fossil fuel stocks are a "total waste of time"). Quoting from the chapter, "it is not the divestment movement that weakened the tobacco industry, but the high taxes that were imposed on cigarettes in the western world." Once again, social responsibility is about impact, not posturing.

[1] See World Bank (2010), *World Development Report 2010: Development and Climate Change*, p. 265 and the reference therein. These debates of course subsided when the "currency" of the payment (allowances in the EU-ETS system) collapsed. A related issue is that of "carve-outs". A firm that otherwise has high carbon emissions, either directly or indirectly through its supply chain, can select a subset of assets that are clean and issue green bonds against them. Similarly, Poland, a high CO_2 emitter, was the first issuer of sovereign green bonds.

4. Summing up

Four observations shape our views on the first challenge. First, the climate urgency calls for swift and large-scale action. There is rapid change, but nowhere near fast enough. Second, we must adopt a holistic approach to tackling the challenge. Third, green policies will be expensive, but our planet is worth more than enough that we should have the courage to admit this fact; the more we procrastinate, the more costly it will be. Fourth, there is no need to inflate this cost by selecting low-impact policies.

Carbon pricing has many virtues. Unpopular for good as well as bad reasons (see the analysis of perceptions), it is nonetheless an essential piece of the puzzle. It has been poorly implemented in the past: it has been too unambitious to have the desired impact, admitted many exemptions, given way to numerous fossil fuel subsidies, raised concerns about offshoring to countries practicing environmental dumping, and offered low visibility as to future levels of the carbon price. The insufficient compensation of low-income suburban and rural dwellers has also contributed to its unpopularity. So, our first recommendation is an unambiguous endorsement of “carbon pricing done right”.

But much more is needed beyond carbon pricing. First, through a rapid intensification of the green R&D effort. Second, through standards, bans and targeted adoption incentives where carbon pricing is less adequate. These interventions are more discretionary than carbon pricing and therefore more prone to lobbying, regulatory capture and red tape. We highlighted how such concerns can be assuaged through a proper governance of the processes and the creation of independent agencies. On the R&D front, we proposed the creation of a European agency that would use peer reviews to fund high risk/high reward projects. On the standards, bans and adoption incentives, we proposed the creation of an independent commission made of high-level scientists and economists, who would help rationalize public choices without slowing down public decision-making. In both cases, sunset policies would phase out subsidies when projects do not perform and when subsidies are no longer needed. In sum, we view the state as a strategist that will take its responsibilities seriously (and not try to pass the buck to other actors, such as the central bank or corporations), unleash the private sector’s adoption and innovation, and reconcile urgency to act and cost containment.

Finally, France by itself will have a minor direct impact on climate mitigation. But, especially if designed at the European level, its indirect impact can be substantial: leading by example and showing that “things can be done”, putting pressure on free-riding countries through border tax adjustments, promoting technological and policy innovation that will benefit poor countries, and playing an intellectual leadership role in the building of international agreements.

SECTION 2

ECONOMIC INEQUALITY AND INSECURITY

Underlying Chapter Two written by Dani Rodrik and Stefanie Stantcheva

1. Facts and Perceptions

How bad is inequality in France? If one looks at standard quantitative measures, one is tempted to conclude that the answer is: not so bad. In most dimensions, France does as well or better than the European Union or the OECD averages:

Start with the standard measures: Pre-tax income inequality, as measured by the Gini coefficient[1] is a bit lower in France than the OECD average, 0.37 compared to 0.38. The same holds for post-tax inequality, 0.28 versus 0.29, the lower post-tax coefficients reflecting the redistribution coming from taxes and transfers.

At the top of the income distribution, the pre-tax income share of the top 10% is 32% in France, lower than in Germany, 37%, the United Kingdom, 35%, or the United States, 45%. At the bottom, the pre-tax poverty rate in France is higher than the OECD average, 26% versus 20%,[2] but the post-tax (and transfer) poverty rate is substantially below the average, 8.5% versus 10.8%, reflecting strong redistribution toward the bottom. Wealth inequality

[1] The Gini coefficient is a standard measure of inequality, which looks at how much the actual distribution of income differs from complete income equality; a Gini coefficient of 0 means complete equality, a Gini coefficient of 1 means full inequality, with one person receiving all the income.

[2] The proportion of people at or below the poverty rate pre-tax, constructed by the OECD, is slightly misleading as the OECD treats retirement benefits from the public retirement system as transfers. As a result, the pre-tax pre-transfer measure reflects the fact that, absent the public retirement system, many French people would indeed be at or below the poverty level. Other countries, in which private retirement systems play a more important role, are less subject to this problem. A way to avoid the issue is to look at the poverty rate excluding retirees. If this is done, France looks more similar to the average.

is, as elsewhere, larger than income inequality, with, for example, a wealth share of the top 10% in France equal to 55%, but in this respect, France appears to be roughly at the OECD average.

Furthermore, contrary to widespread perceptions and contrary to the experience of many other countries, income inequality, again measured by the Gini coefficient, has not increased: while the OECD average was increasing substantially, the Gini coefficients for both pre-tax and post-tax income inequality have remained roughly constant during the last two decades in France. And, again in contrast to many other countries, the bottom 50% has seen faster income growth than the top 10% in France since 2007.

Spatial inequality, which clearly has played a role in triggering the *Gilets jaunes* (Yellow Vests) revolt, is actually lower than in most other European countries: The coefficient of variation (a measure of variation, equal to the ratio of the standard deviation of the distribution to the mean) of disposable income across regions, is 0.05 for France, compared with 0.07 for Germany and 0.20 for Italy.

These statistics do not look so bad. They are however in sharp contrast with perceptions. In one of the surveys run by the commission, we found that 73% of people in our survey indeed see income inequality in France as a serious or very serious problem. 62% see wealth inequality as a serious or very serious problem. These are substantially higher numbers than the corresponding numbers for the United States, 50% and 46% respectively, where nearly all these measures of inequality are much higher, and trends have been much worse.

How does one reconcile the disconnect between facts and perceptions?

- The first answer is that there is no reason to take the average of other countries, be it the OECD or the European Union as the right reference point: this may still be too much inequality. The French may particularly dislike inequality, even if it is not as bad as in other countries.
- The second answer is that it may well be that these statistics do not capture relevant, more dynamic, dimensions of inequality, such as the ability or not to acquire a good education, to hold a good job.

This led the authors of Chapter Two on inequality to look more closely at perceptions and what people cared about, by reviewing existing surveys and carrying out two more on their own. These surveys give a good sense of what people think about when they talk about inequality:

People care about having “good jobs.” One of the surveys asked them what they thought a good job entailed. People saw a good job as one that provides them with a reasonably long tenure within the firm, pay progression and good benefits, responsibilities,

opportunities for promotion and a decent working environment. A good working life is one in which, in addition, if a good job is terminated, one can get another good job.

People do not think that everybody has a fair shot at a good education, and in turn a fair shot at a good job. When asked to rank from 0 to 10 the answer to "I achieve the education I seek", France has the second lowest score out of seven European countries for which data were collected, 6.6, with only Italy below at 5.9, and Germany for example at 8.1. When asked to rank the answer to "I get the job I seek", France again has the second lowest score, 5.5, with Italy at 4.5 and Germany at 7.0.

People worry about social mobility, how their children will fare. They believe that access to good education is highly unequal. From one of the surveys done for this commission, 70% of people believe that education is much better for children of high socio-economic status. When asked whether students have the same chances to attend the university, only 44% agree, the lowest percentage of the seven countries; the numbers for Italy and Germany are 49% and 70%, respectively. And the actual numbers support their views. According to the OECD, the social stratum is the most important factor explaining educational attainment in France. For instance, while average PISA (Programme for International Student Assessment) scores for 15-year-olds in France are slightly above the average of the OECD, five times more students from low socio-economic backgrounds do not meet the minimal level for reading. In terms of educational mobility from one generation to the next, France is second to last out of 27 countries. 87% of students in vocational training programs have parents without college degrees, as compared to 51% for students in general academic tracks. Going beyond education and looking at intergenerational mobility with respect to jobs: Only 14.9% of sons (that study looked at sons only…) with parents in the bottom quartile make it into the top quartile, a low percentage, and one lower than the OECD average of 16.9%.

People worry that good jobs will disappear. They see free trade, globalization, technological change as threatening their jobs. They see the decline in manufacturing, which now accounts for only 10.4% of employment and 13.4% of GDP in France – compared to 25.5% of GDP in Germany, 19.7% of GDP in Italy.

In this context, there has been much talk of the "hollowing of the middle class," of the polarization of employment, with the middle-skill jobs disappearing and being replaced by low-skill jobs. A recent study by France Stratégie shows that the picture is a more complex one.[1] It finds that the share of middle-skill jobs has indeed decreased by 6% from 1996

[1] See Reshef A. and Toubal F. (2019), *La polarisation de l'emploi en France. Ce qui s'est aggravé depuis la crise de 2008*, Cepremap n°50. The study by France Stratégie challenging some of their conclusions is : "Polarisation du marché du travail : y a-t-il davantage d'emplois peu qualifiés ?" by Jolly C. and

to 2007. It finds however that this has come with a nearly equal increase in the share of high-skill jobs, while the share of low-skill jobs has remained roughly constant. This must be seen as good news, but it comes with four large caveats:

- The first is that, looking at more granular decompositions, some categories of workers, such as small farmers or low-skill craft workers, have indeed seen their jobs disappear and their employment share substantially decrease.
- The second is that the spatial dimension is again very relevant. Once the flagship factory that provided the good jobs in a small town has closed, there is little hope anything similar will be created. Even if public subsidies succeed in bringing in a new flagship factory, the same mishap may happen again years later. And moving is not always an attractive option. On top of the loss of social links, which are particularly strong in small town and rural communities, comes an economic stumbling block: workers are stuck because the value of their house (their only wealth) has declined, so that the rational economic choice may be to keep on living there and earn less.
- The third is that, even if these evolutions continue and many middle-skill jobs are replaced by high-skill jobs, the decrease in those middle-skill jobs, the hole in the job distribution, makes it harder to move up the job ladder. Some of the middle rungs of the ladder are missing. When one more year of high school might have allowed a worker to move up, it may now take a full college degree, a much larger jump.
- The fourth is that future evolutions may be different, and the threats to good jobs may become stronger. Indeed, one of the conclusions of the study is that, even within this 20-year interval, trends have been quite different between the first and the second decades.[1]

Finally, the survey comes with a warning to policy makers. People expect the government to intervene. But they have limited confidence in the government to change things. Only 36% of them, when asked about the welfare state, have a positive opinion, the same percentage as when asked about globalization.

2. Conceptual Frame

The survey answers give a good sense of what people care about, and thus what policies aimed at decreasing inequality should try to achieve. Namely, to prioritize social mobility

C. Dherbécourt, *La Note d'analyse*, No. 98, December 2020. With a response by Reshef and Toubal in March 2021 on the CEPREMAP site.

[1] See for instance in the aforementioned study by France Stratégie the figure on the evolution by sector over the two decades. It is reproduced in Chapter Two of the present report (Figure C of Box 2).

and give as much of a fair shot at good jobs to all, while still protecting those who end up being worse off.

To do so, policy can intervene at three stages:

- At the pre-production stage, policy can make human capital and financial wealth less unequal, so that people start their life with more equal opportunities.
- At the production stage, policy can work on refreshing and improving skills; it may also try to shape technology and the organization of firms, so they create more good jobs.
- At the post-production stage, given the fact that not everybody came out equal at the production stage, policy can take measures to protect and redistribute.

The traditional focus of policies has been on the pre- and post-production stages, with more limited intervention in the production process itself. Clearly, better can be done on traditional pre- and post- production policies, e.g. on education, on inheritances, and more broadly on redistribution. The traditional redistributive tools may not suffice, however. Technological progress and globalization will continue to impact jobs and incomes, likely increasing polarization and pre-tax inequality. And there are limits to how much pre- and post-production redistribution can do, given the already high tax-transfer rates in France.

This implies looking into the production process itself. Some measures are no-brainers in their justification, although not in the details of their implementation: Professional training throughout life is essential and can be done better. But should one go further? Can firms be induced to reorganize to create more good jobs, give more responsibilities to low-skill workers, offer more ways to go up the job ladder? Can technology and technology adoption be made more good-jobs-friendly? Should trade be restricted if it eliminates (good) jobs domestically? These are difficult issues, and the commission spent a lot of time discussing them. They raise both conceptual and implementation issues. We thought it was important to put them on the table. They should be explored but, because some are new and they all raise serious issues of implementation, they must first go through further research and proof of concept stages.

Before we start however, a similar caveat to those made in the other two chapters. As the discussion we just had suggests, there are many aspects of inequality, and many policies, institutions, regulations which affect the outcome. We just could not discuss all of them. Thus, you will find only passing references to some policies, for example a universal basic income, or the optimal structure of wealth taxation (*impôt de solidarité sur la fortune*, ISF), in what follows. Our only excuse is that we just did not have the time to discuss it all.

3. Pre-production Stage Measures: Levelling the Playing Field

3.1. Education

The strengths and weaknesses of the French education system are well documented, the scope for reforms long discussed, and indeed some reforms are happening. But more must be done. The French educational system, from kindergarten to higher education, has at least two shortcomings.

First, except for a small and successful elite, the quality of education is only average – even though spending on education, 5.5% of GDP is higher than the EU average. For example, PISA scores for 15-year-olds are only slightly above the OECD average. This bodes poorly for the future as good jobs require the accumulation of soft and hard skills. Particularly worrisome for good jobs prospects is the mediocre ranking in science and mathematics. For example, the recent Trends in International Mathematics and Science Study (Timss) puts France in 4th and 8th grades mathematics performance last with Rumania and Chile among developed countries. France has dropped down not only relative to the best, East Asian nations (China, Japan, South-Korea, Singapore, and Taiwan) or Finland, but also compared with the average advanced country.

Second, as we saw earlier, education is highly unequal. Potential remedies have been repeatedly identified, and recent reforms have moved in the right direction. But the list of what remains to be done is both well-known and long: School segregation should be reduced. Still more must be spent on disadvantaged students; in line with the discussion of immigration in Chapter Three on demography, school integration and spending more on schools with disadvantaged students need to go together.[1]

The large apprenticeship shortfall must be filled (recent reforms making it more attractive for employers to take apprentices and for students to enter apprenticeship have gone some way). More effort should be exerted to link vocational training to jobs. Young people, especially those from disadvantaged backgrounds, need to be much better informed about the importance of qualifications, jobs and available careers (a theme taken up in Chapter Three on demographic challenges and the labour market participation of people

[1] More money may allow disadvantaged schools to offer special programs and attract better students. But evidence of the benefits of throwing money at disadvantaged schools without a better mixing of privileged and disadvantaged kids is limited. Because segregation is higher in schools than in the surrounding neighborhoods (Oberti-Savina 2019), desegregation is less of a problem that in the US, where neighborhood segregation is very high. Desegregation can be achieved through vouchers, quotas for disadvantaged students and other means. Oberti, M. and Y. Savina (2019), "Urban and school segregation in Paris: The complexity of contextual effects on school achievement: The case of middle schools in the Paris metropolitan area", *Urban Studies* 56, No. 15, February, pp. 3117-42.

with an immigrant background). They should have the means to navigate the maze of secondary and higher education tracks and be informed about the differences between tracks that are apparently similar but offer very different employment and career prospects. The choice of fields of study should reflect current and future employment opportunities.

The attractiveness of teaching careers needs to be enhanced. As in Finland, more autonomy (accompanied by accountability) must be granted to institutions and teachers to enable them to develop innovative approaches based on both experimentation and benchmarking. Finland also shows that career attractiveness is not just a budgetary issue. This country, which ranks among the world leaders in mathematics, science and reading and comprehension, has one of the most efficient and egalitarian education systems, despite a limited budget (of course, Finland has specificities compared to France, including a lower level of inequality due to family background and language). Autonomy and freedom of pedagogical methods can contribute to making the job more attractive, as well as solid continuous training for teachers.

That said, teachers' salaries are too low in France, so too few qualified candidates apply for teaching positions, especially in the scientific disciplines that are so essential for good jobs. Salaries should be more reflective of skills and bonuses should be high enough to encourage the most experienced teachers to work in disadvantaged areas. Raising the salaries of new recruits and enhancing their skills should not present any particular difficulties. On the other hand, applying the new salary conditions to existing teachers, while having a beneficial effect on their morale, would have a very high budgetary cost. Our commission did not have time to explore the ways of reform in this area; it will probably be necessary to think about new approaches, without prejudice, and also to look at what has been done abroad (for example, in Finland, South Korea or the Czech Republic).[1]

3.2. Inheritance

The logic of the inheritance tax (as opposed to a wealth tax, say) is to level the financial playing field for new generations. The survey evidence presented in Chapter Two shows that the French dislike inheritance taxes but are ethically conflicted in their assessment: A large

[1] In Finland, teachers are municipal civil servants. Employment protection is legally very similar to that of permanent employees, but in practice it may be higher. Dismissed teachers can appeal on the same grounds as employees, but disputes are handled by administrative courts rather than the ordinary courts. But other approaches can be contemplated. For example, the recruitment of new staff on indefinite contracts under private law rather than under civil servant status, as was done for La Poste and France Télécom, should be explored. Those on the new permanent contracts would receive a higher salary and existing teachers, whose civil servant status would be preserved, would be able to opt for the new status. They would then be subject to the new contractual terms and conditions, and retraining could possibly be offered to them if necessary. It may also make sense to pay more for math and science teachers, who are more difficult to recruit.

majority feels that parents are entitled to bequest their hard-earned wealth to their children without incurring a tax for the transfer; at the same time, however, most people feel that allowing inequality at birth through different endowments is unfair. While these beliefs exhibit an obvious tension, they reflect a demand for equal opportunity. This suggests a direction for reform. This logic of equal opportunity implies focusing not on people who give, but on people who receive, the tax base should be how much the beneficiary receives in total, "hard earned wealth" should be largely protected, through a relatively high exemption threshold, and tax revenues could be explicitly allocated towards redistribution.

This is not the case today. First, the inheritance tax is donor-based rather than beneficiary-based. For example, the tax rate is lower if the beneficiary inherits from two persons (say, the two parents) than if he/she inherits the same sum from only one (say, a single parent). Yet, consistent with popular preferences, it is not how much is given, but how much is received that counts for equal opportunity. The second violation is that the tax code allows for exemptions every 15 years, and so benefits donors and beneficiaries who are knowledgeable and can plan long in advance relative to those who do not; the logic here is to take into account the sum of donations over lifetime in the computation of the tax.

Chapter Two's recommendation that beneficiaries be taxed on the lifetime income they receive from donors is appealing; we endorse it subject to the same caveat that is added by the authors: we have little evidence on the actual implementation hurdles (the only European country having adopted this approach is Ireland, where the total of all the gifts or inheritances received throughout lifetime – over €335,000 for parent-child transfers – is the tax base).

This intergenerational transmission of wealth is far from negligible. The ratio of yearly transmissions (gifts and inheritances) to yearly disposable income is estimated to be 19% and is forecast to increase to 25% to 32% by 2050. It is, not surprisingly, higher for higher income groups. Despite high tax rates[1] however, the inheritance tax represents only 1.2% of overall tax revenues: In reaction to the unpopularity of the inheritance tax, the French legislator reacted not by changing rates or the progressivity of the inheritance tax system, but by creating loopholes and exemptions, a familiar French disease. We do not see how fairness is improved by encouraging savvy households to engage in tax optimization. The chapter points for example at the treatment of life insurance policies (with an exemption capped at €150,000 per beneficiary and given preferential rates above that threshold).

Despite the commission's push for better rather than higher taxes, we suspect that even "better" inheritance taxes will remain unpopular. Two policies may help reduce the disconnect between perceptions and the commission's recommendation:

[1] France has the 3rd highest top rate on inheritance to children in the OECD (45%), behind Japan (50%) and South Korea (55%).

Regardless of one's ethical views on taxing inheritance, we should all agree on the need to make it fair, that is based on what is received by the beneficiary. Making it focused on the beneficiary is also the only way to make it truly progressive. This requires moving away from donor-based taxation and eliminating the loopholes. The emphasis on equal opportunity that is implicit in a beneficiary-based, no-loophole system may help make the tax more legitimate. One can argue about tax rates, but not about features that make the tax random or subject to gaming. To reflect the legitimate concern about being able to pass on "hard earned" wealth, the threshold for taxation should be high. Consultations with citizens and public discussions of the matter might contribute to lowering the unpopularity of the tax.

To further emphasize its redistributive role, it may make sense to violate the principles of public finance and to allocate the inheritance tax revenues explicitly to financial redistribution that fosters equal opportunity. Without pushing any action specifically, this earmarking could go to the creation of individual accounts that the disadvantaged young could spend to avoid having to work while studying or training, or to financial accounts that disadvantaged kids could access when becoming adults; alternatively, it might finance early childhood programs.

This being said, the issue of tax avoidance is a serious one. Taxpayers can patiently give money to their children (for smaller amounts); and they can move abroad (for larger amounts). There needs to be more work as evidence is extremely scarce on these issues; and there is barely data on core descriptive statistics on inheritances and wealth for France.

4. Post-production Stage Interventions

(Because some of the production stage policy proposals are the most controversial, we have put a discussion of these policies last.)

All taxes and transfers have redistributive aspects and thus affect inequality. A discussion of the overall French tax/transfer system, considering its implications for inequality, would have gone far beyond what the commission could do. What makes the issue complex is the potential tension between efficiency and distribution. Efficiency suggests taxing factors which are less mobile, leading to fewer distortions; the quintessential example is the taxing of pure rents. But taxes, and transfers even more so, have distributional implications. The example of a tax on real estate is revealing in this respect. The value of real estate reflects mostly the value of the land, an immobile factor. From an efficiency viewpoint, the tax creates few distortions. But the tax also falls largely on the middle class, households for whom real estate is the main source of wealth. What the right tax rate should reflect the

trade-off between efficiency and inequality, and in turn reflect society's preferences.[1] Economists can point to the trade-offs, but policy makers must decide where to put the needle.

What we could do however was focus on parts of the tax/transfer system where taxation could be done better. For that reason, the authors of Chapter Two decided to focus for the most part on the treatment of capital income, where there is room for improvement.

Capital is mobile, labor much less so. Governments have found that, when they tried to tax capital, capital fled, and high tax rates often led to low tax revenues. This is why recent reforms in France have narrowed the capital-taxation gap with abroad. But the result of tax competition between countries has been a combination of low tax rates on mobile capital and a race to the bottom. Countries have tried to attract mobile capital, kept high tax rates on the less mobile parts, allowed for many loopholes and exemptions, and faced high both legal and illegal tax avoidance.

The challenge is thus to have better capital taxation, i.e. lower tax rates but higher tax revenues and fewer distortions. Progress has been made in France in the recent past. For example, some of the extremely high tax rates on capital, which sometimes exceeded 100%, have been eliminated. The introduction of the *Prélèvement forfaitaire unique* (PFU), also called "flat tax", has put a ceiling on marginal tax rates on capital income, reducing distortions.

However, more can be done thanks to technological progress, information sharing, and emerging international agreements.

Technology. Two strategies that may foster increased compliance include data analytics and third-party reporting (third-party reporting already exists for salaried work or for the VAT). An example of progress in this direction is the proportion of controls targeted by artificial intelligence and data-mining algorithms, which is expected to reach 30% in 2020 and is targeted to reach 50% in 2023. Such compliance-increasing schemes not only raise tax collection, but also promote fairness (rather than a society in which the scrupulous pay more taxes than the opportunistic) and finally redistribution: To quote from the authors: "While regular workers are mostly the recipients of wages and employee income that is third-party reported, higher income individuals receive much more of their income in the form of capital gains, dividends, rental income, and proprietorship or business income. These forms of income have much higher rates of non-compliance."

[1] Although we realize that it is prominent in the French political debate, we do not provide a detailed discussion of the wealth tax (*impôt de solidarité sur la fortune*, ISF) for several reasons. First, its magnitude (the cost of the switch to the *impôt sur la fortune immobilière*/IFI is estimated around €2 or €3 billion per year) is minuscule relative to the sums involved in any of our three challenges. Second, the evidence on the effects of a wealth tax – in terms of the trade-off between efficiency and redistribution just mentioned – is limited. Third, the consistency of a wealth tax with the points on capital taxation and the inheritance tax developed in Chapter Two requires further study.

Information. One key here is automatic exchanges of information among countries. France should keep playing a major role in promoting such exchange and stress the need for a broader exchange including all classes of assets, including real estate and private business assets (the current EU regulations have a broader scope than the OECD's and already include some non-financial assets such as immovable property).

International agreements. The commission is highly supportive of the Base Erosion and Profit Shifting (BEPS) initiative by the G-20 and the OECD.[1] Many multinationals choose to declare profits in low-tax countries, no matter where they actually set their products. The first pillar of BEPS attempts to redistribute in part taxing rights among countries away from residence and physical presence (ownership, production facilities and employees) to include the demand-side (sales, revenues and customers) dimension. The second pillar is aimed at reducing tax competition by giving countries the right to "tax back" in cases where other jurisdictions have not ("sufficiently") exercised their primary taxing rights; if not agreed to, an alternative could be an agreement on a minimal tax rate to avoid a race to the bottom. Finally, and importantly, the taxation of multinationals should include all industries, and not only digital firms.

International coordination would also be desirable on the household income front. To quote from the authors: "Preferential tax regimes for foreigners are widespread. As a result, in many countries, the top tax rate for foreign high-income earners is below that for domestic high-income domestic earners." Of course, different countries may legitimately have different preferences with regards to tax rates; but reducing, sometimes considerably, income taxes on mobile high talent does not work towards more equality and is hardly justifiable by efficiency considerations at the global level. An example close to us is the extremely generous tax treatment for Italian professors abroad if they come back to Italy. A discussion of this matter should be undertaken, at least at the European level if not more broadly. An alternative, in use by the United States, is to make French citizens living abroad subject to French taxation (in excess of what they have to pay in the country hey are living in), at least for a number of years.

These changes will not by themselves eliminate all the loopholes that limit the tax system's efficacy and fairness. The difficulty here lies beyond the temptation for policy makers to condemn tax loopholes in general but introduce new ones to please constituents. Some loopholes actually have efficiency rationales, such as the regressive exemptions on services to individuals, meant to prevent moonlighting; or the Plan d'épargne en actions (PEA) which provides tax relief for returns on financial market investments up to €150,000

[1] This was written before President Biden's endorsement of a minimum capital tax of 15% worldwide, thus reinforcing the OECD approach. While the fairness of the breakdown of its proceeds among countries and the presence of exemptions will have to be monitored, the willingness to limit tax competition among countries is excellent news.

(and somewhat offsets the strong French preference for investing in safe life insurance *fonds en euros* over investments in the productive assets that will contribute to growth). But many loopholes have neither redistributive nor efficiency rationales. For instance, empirical work has repeatedly shown that real estate subsidies – such as the *loi Pinel*, tax exemptions on the principal residence, rental subsidies – benefit mainly property owners by raising real-estate prices and rentals in city centers and do little for their intended beneficiaries. Put differently, the redistributive impact could be much higher if the public funds were used differently.

Accordingly, a process should be put in place that assesses and reconsiders various tax exemptions. For example, by setting up an economics commission that would define and track loopholes and issue public recommendations to the government and the Parliament. The challenging part is to make sure that its recommendations do not go unheeded.

5. Production-stage Policies: Fitting Skills to Technology and Technology to Skills

Both technological progress and trade have profound and complex effects on the structure of production, and by implication, on the job distribution. Sometimes, technological progress substitutes capital for labor, leading to the elimination of low-skill jobs or even middle-skill jobs with a large repetitive component. Sometimes, it acts as complement to labor, allowing low-skill workers to achieve more complex tasks, or allowing middle-skill workers to do what previously were high-skill jobs. For example, nurses and emergency medical technicians may perform tasks that are today the prerogative of physicians, increasing the demand for middle skills and reducing that for high skills. Although we can assess which types of jobs have been transformed or eliminated so far, it is harder to foresee the longer-run impact from technological change on the job distribution.

Trade creates jobs in export industries, but it also leads to the closing of firms in sectors exposed to imports, and the disappearance of some low-skill and middle-skill jobs. Perhaps because job losses (which have a face) are more salient than job creations (which do not), but also because new job creation does not necessarily occur where jobs have been destroyed under the pressure of foreign imports, polls show that trade is perceived by workers as the main culprit in the loss of middle-skill jobs. In our survey, 57% of respondents thought of outsourcing and globalization as the main cause, and only 28% blamed technology. Most economists by contrast have concluded that skill-biased and routine-biased technological progress is the more important factor.

The traditional policy approach has been to take these technological and trade evolutions as given, to try to train workers for the existing jobs, and help the unlucky workers adjust to the disappearance of their jobs through unemployment benefits and retraining.

The question the commission debated is whether policy should be more ambitious in two ways: First, by trying to affect the job distribution itself by giving incentives to firms to make more jobs good jobs, and to adopt technologies that complement rather than substitute for labor; and second, by putting restrictions on trade to prevent good jobs from migrating to countries which do not have labor protections comparable to those of France or other developed countries.

5.1. Training workers

There is no question that preparing workers for the best jobs they can get and helping them to fill those jobs are essential. The set of programs that do so goes under the name of active labor market policies (ALMPs), ranging from skill training, to employment subsidies, to public sector work, and to assistance with job search and matching.

The evidence on the impact of these programs is mixed. Sectoral training programs, when well designed, have proven the most useful. The evidence is that the most successful programs have been those which were most employer-focused. The experiences of Germany, Sweden, Luxembourg, and Switzerland described in Chapter Two, all show how closer interactions with firms, in the design of jobs by the firms and the design of training by the programs, can lead to more successful outcomes. A much-studied program is the QUEST program in Texas, focused on jobs rather than just good jobs and with exceptional outcomes (estimated increases in annual wages of $3,000-6,000 at a one-time cost of $5,000-10,000). Based on that evidence, we believe that Pôle emploi would benefit from closer contact and interactions with private-sector employers and use the information to better serve both employers and jobseekers.

France has just embarked on a major reform of professional training. First, by creating a personal training account (*Compte personnel de formation*, CPF); second, by creating a new structure to coordinate, fund and certify vocational training (France Compétences). This is potentially an important progress, although the jury is still out. In particular, compared with the current situation, key challenges for France Compétences will be: to reduce the excessively large number of training providers; to provide training seekers objective information on the value of available courses; to carefully certify training programs; and to direct training seekers towards actual jobs and those more in need of training. Singapore, which has a list of certified providers that citizens can finance with their personal training account, and Germany are good examples to study.

We believe that there are three ways in which the workings of Pôle emploi and France Compétences might be further improved. First, by having the two institutions work together more closely to identify the needs of firms. Second, by being more proactive in assisting workers at risk because of anticipated company reorganizations. Third, by exploring with

firms how to design jobs and job career paths to make them more attractive to workers. Again, much is to be learned from what other countries have done.

We have focused so far on improving the training of workers. Another lever is to give workers and firms additional incentives to respectively get and give such training. Here, France faces a problem due to its generous tax-transfer structure. The combination of a negative income tax, direct subsidies to employers for low-wage workers, and large reductions in employer social security contributions (SSCs) at the bottom have both decreased the cost of low-skill workers for firms and increased the income of low-skill workers. This explains in part why post-tax poverty rates are low in France and it is clearly good news. But these various reductions, as well as the disappearance of housing allowances, exemption from income taxation and workfare (*prime d'activité*) are phased out as income increases and disappear for wages around 1.6 times the minimum wage. The result is very high effective marginal tax rates for workers earning close to the minimum wage, giving them few incentives to get better jobs and, symmetrically, making it expensive for firms to give workers additional skills and move them up the job ladder. This suggests areas for reform.

One obvious possibility is to make the phase-out happen over a wider wage range, but this can rapidly become expensive for the state. Another is to provide specific incentives for firms to offer training, and for workers to acquire training.

On the firm side, a possibility to counter the insufficient incentive for training is to condition receipt of the SSC reduction on the provision of qualification training. The firm could top up the worker's personal training account. This top-up would thus be integrated within the overall reform to training of low-skill workers and should satisfy the requirement for some nationally accredited vocational education. Qualifications would have to be fully certified and tailored to local sectoral needs. Conditioning receipt on the provision of such training would raise the cost of employment, part of which may have to be offset, suggesting some sharing of the top-up between the firm and the state. To the extent that, more recently, it is also older lower-skilled workers that have been supported by reduced SSCs and other subsidies, it could also align with the policy suggestions in Chapter Three on demography for improving training and job opportunities for older workers.

On the worker side, similar incentives could be given to acquire training, for example in the form of grants, or loans partially forgiven if the funds are used for training. Here, the experience of other countries is again useful. In Norway for example, each student receives a loan of €1,150 a month, with reimbursements conditional on future income, but with the debt obligation being reduced with student performance and the timely obtention of diplomas. It would be worth thinking about how to design a similar policy for young workers. Finally, if our suggestion to dedicate inheritance taxes to training or education accounts for the young was followed, the two could indeed be combined.

Well-designed labor market policies also have the potential to promote good jobs. In particular, experience rating ("bonus-malus" in France) makes employers accountable for the consequences of their layoffs while providing them with flexibility to adjust their labor force to economic shocks. They thereby mitigate the harmful duality between precarious jobs ("CDD"), which are short-lasting, and overprotected jobs ("CDI"), that are longer lasted but in short supply as firms are concerned that they will not enjoy enough flexibility if they face demand or cost shocks. In France, workers on short-term contracts have limited prospects in the firm (their contract cannot be renewed repeatedly without being transformed into a long-term contract) and receive no training because they are "disposable workers". For such workers, experience rating, to the extent that it increases tenure, contributes to good lives, if not better jobs; and it also gives firms incentives to invest more in their workers, and thus to improve jobs. Interestingly, French workers on long-term contracts report often suffering from anxiety and are sometimes bored in their job: because it is hard to find such jobs, such workers often cling to their job, hoping that it will not be suppressed, and they cannot take on some new challenges elsewhere. There have been recent efforts (2019) to create experience rating in France. Typically for France, many exemptions have been created (it applies to only 7 industries), and, where it applies, the incentives thus created are still too small. But this is a useful start and the reform should be driven home.

5.2. Improving the number and quality of jobs

There are two related issues concerning the supply and the nature of jobs.

- The first is that, with artificial intelligence and robots, some jobs considered as good jobs risk being destroyed at an unprecedented pace in the years to come. Any transition is costly, and this one may be particularly so due to its scale and speed.
- The second is that workers who hold those jobs are exposed to downward social mobility. Although we cannot predict well the consequences of the forthcoming technological upheaval, there is a substantial probability of further increase in polarization (the gradual disappearance of the middle class, the barbell tilting in favor of high skills and against low skills). The disappearance of good jobs has, as detailed in this Chapter Two, led distressed communities to experience serious health and crime problems, generating despair and a rise of populism.

As stressed by the authors of Chapter Two, the current policy framework presumes adjustment by workers and their skills to new technologies and leaves aside an adaptation of technologies to the labor force. Technological progress and especially adoption are not, however, exogenous processes that a country must take as given and adjust passively to. Firms have a choice as to how they organize internally, how they set up job ladders, what technological choices they make, what machines they choose. The issue is whether and how policies can be used to bend those decisions and lead to more good jobs.

To be certain, such bending may increase production costs and lower the consumers' purchasing power. As in the case of climate change, though, one may conclude that it is worth incurring a cost in our standards of living to foster a better "environment", in this case a more equal society. Put another way, one may argue that the prioritization of consumer needs over worker welfare has gone too far and should be corrected. The choice must be left to society and to its representatives rather than to the experts. But experts can explore the nature of the trade-off, and this is what the authors of Chapter Two tried to do, and what led to an intense but useful discussion within the commission.

One can think of two approaches. The first is to decrease the cost of labor across the board relative to the cost of capital, either through changes in taxation or changes in labor market regulations, leading firms to adopt more labor-friendly technologies. This raises however larger issues about the relative taxation of capital and labor and about labor market regulations, with their many other desirable or less desirable effects. The second is to do more targeted interventions, and this is what Chapter Two focused on, and what we now turn to.

R&D, technological adoption, and (good) jobs

The authors suggest several ways in which progress could be made. They propose a specific structure to lead firms to supply more good jobs: "Regional Business Bureaus" (RBBs). The RBBs would engage in a dialogue with local firms to provide a portfolio of services or prospective investors to assist them to offer more good jobs, by redesigning work, offering a higher probability to move up within the firm. They would add to the usual list of criteria for investment subsidies a criterion based on the firm's expected job quality performance; and they would monitor the outcome. The authors emphasize the need for not adding another big institution to the existing ones, that would increase the already high bureaucratic burden on firms; they accordingly stress the obligation to investigate the best reorganization of work among financiers (BPI, localities, regions), employment services (Pôle emploi), and training institutions (France Compétences) to achieve maximal efficiency for the RBBs.[1]

Similarly, the authors of Chapter Two propose that innovations that are compatible with (good) jobs be incentivized. Accordingly, the authors recommend that a "prospective employment test" be applied to determine public spending priorities for innovation. Currently, R&D subsidies and programs are often targeted toward specific sectors (for example, batteries, or more generally green technologies under the EU green deal), but do not reflect the impact of these technologies on jobs. This impact, when it can be assessed, could be taken into account. Conversely, equipment and innovations that destroy jobs would be taxed

[1] It is worth noting that Pôle emploi has moved in that direction already. More than 5,000 counsellors have as their primary charge to build relations with firms, helping them define jobs and find applicants.

or deprived of access to R&D subsidies. The difficulties here should not be underestimated. Take for example the proposal to "tax robots". Are robots physical machines or also software? Both can eliminate jobs. If robots destroy jobs in one firm but increase its productivity and thus decrease costs in other firms, they may lead overall to an increase rather than a decrease in jobs. Empirical evidence on both the direct and indirect effects of automatization on employment is just starting to be collected. Initial results are mixed.[1]

Chapter Two recommends a series of softer interventions, meant to persuade firms and researchers to be more aware of the implications of their investment and research on worker welfare. This includes raising awareness and consulting workers when firms contemplate organizational design, and making for example AI researchers more sensitive to the implications of their work (as was the case for researchers involved in controversial defense projects). The overall strategy is to combine a norms-based intervention with material incentives to implement the required change.

Trade and (good) jobs

When technology is incentivized toward a (good) jobs approach, then, by definition, policy makes a difference whenever the firm would otherwise have reduced its costs at the detriment of jobs. At the aggregate level, a good-jobs policy will likely increase domestic production costs even if consists in subsidies, as these subsidies must be financed through taxes on production either on beneficiaries or elsewhere. One risk then is leakage, just as in our discussion of the imposition of carbon taxes in Chapter One on climate change, namely that cheaper, non-labor-intensive products be imported from other countries. Should there be restrictions on trade (at the European border, as the single market prevents raising barriers to trade within Europe)?

As politically popular as they may be, general trade restrictions whenever good jobs may be lost would be counterproductive, even if the goal is to save good jobs: Such restrictions would lead to retaliation, and the loss of jobs, possibly good jobs, elsewhere in the economy. But what the survey evidence shows that part of what is behind anti-trade sentiments is a sense of unfairness, that competition and trade are not fair if the other country's competitive advantage is built on weak regulations to protect labor.

With this is in mind, the authors propose a two-fold solution. First, at the national, or preferably at the EU level, discussions would be organized among stakeholders, producers, and consumers: Is there a case strong enough to bring to the WTO? While it is

[1] See the different conclusions reached by Aghion, P., Antonin, C. Bunel, S., and X. Jaravel (2020), "What are the labor and product market effects of automation? New evidence from France" (*CEPR Discussion Paper*, No. 14443, March), versus Acemoglu, D. Lelarge, C. and P. Restrepo (2020), "Competing with robots: Firm-level evidence from France" (*AEA Papers and Proceedings* 110, May, pp. 383-388).

difficult to aggregate the votes of those who gain (say, workers and investors in import-competing industries) and those who lose (say, workers and investors in export industries, consumers) from trade restrictions and some groups might be more vocal than others, such a consultation might develop better societal understanding of the relevant trade-offs. If the case is deemed worthwhile, it is then sent to the WTO, which decides whether to accept the charge of "social dumping" as a rationale for the imposition of anti-dumping duties on the country charged with the violation.

The obvious and difficult question is where to draw the line in deciding what unfair trade based on social dumping is. The authors suggest that child labor, forced labor, dangerous and unhealthy working conditions, or the violent repression of labor rights, be included in the definition of social dumping, but not low wages, which would open a Pandora's box on how many jobs in poor countries are worth a job in a rich one.

Can it be done?

The commission agreed on the devastating effects of job and status losses on distressed communities, and the need to think about good jobs in general. The debate was about whether the theoretical recommendations could be made operational.

While the (good) jobs approach is theoretically sound, its implementation clearly requires addressing difficult challenges.

Direct approaches, such as reduced taxation of labor and better ALMP, are non-targeted policies, as are a variety of other public policies (R&D tax credits, experience rating, carbon tax, most Covid-19 related policies such as furlough schemes or credit guarantees…). The benefit of such policies is that they do not require fine information about technological and financial idiosyncrasies of firms; relatedly, they create no scope for favoritism, quid-pro-quos, and similar abuses of public policies. Their cost is that their lack of targeting creates windfall gains for those firms which would have done the job (keeping workers, reducing pollution, etc.) even in the absence of incentives.

Industrial policies in contrast try to use fine information to favor the worthiest beneficiaries (firms, industries, technologies). An "additionality criterion" (already discussed in the context of climate change) is often introduced to avoid windfall profits: It is then required that the beneficiary would not have adopted the proposed policy in the absence of incentive.

The limits to industrial policy, i.e. more targeted intervention, are the need for fine information and the design of a governance ensuring integrity in the awarding process. Focusing on bending innovation and technology adoption, informational requirements include: (i) whether the technology is a complement or substitute for jobs (in some cases, the answer is simple: thermal retrofitting is more labor intensive than the installation of wind farms); (ii) whether, even if the technology is a substitute for labor and destroys good jobs

in the firm where it is introduced, the increase in productivity may decrease the costs of other firms, leading them to expand and create good jobs elsewhere (iii) whether projects are additional (which require contemplating a counterfactual and is complex as shown for example by the experience on Kyoto's Clean Development Mechanism).

In the special case of good jobs, one must further specify an operational definition of a "good job". What we learned from the commission's survey is what workers think constitute a good job. The notion of "responsibilities", "promotions", "decent working environment", "good benefits" are not easy to evaluate and quantify; some are manipulable by employers through job relabeling. "Pay progression" is easier to measure but, if it conditioned subsidies, would lead to more backloading of compensation, with adverse consequences for the young (low wages, job immobility). A "reasonably long tenure" is subject to relative (job and sectoral) interpretation. Hopefully, future research will refine these notions and their measurement. It will also have to attribute weights on the various characteristics: as most jobs do not offer all attributes, trade-offs will have to be contemplated. Jobs at MacDonald's certainly do not tick all boxes, but they offer more opportunities for promotion than many other jobs.

Expertise and integrity go hand in hand with the choice of governance for agencies in charge of industrial policy. Here again the practice of the French administration must be benchmarked against the best practices in the world (DARPA in the US for instance; see our discussion of climate change). These agencies must be led by managers who are accountable for their performance, enjoy much discretion and are protected from political interference. They must be agile, define goals instead of selecting specific means of achieving these goals, refrain from sprinkling the money, and able to interrupt non-performing projects (not always the characteristics of such agencies in France). They must also involve the private sector. They must hold the beneficiaries of public funds accountable in case they do not deliver what they promised on the job front. Transparency, although desirable, is a very insufficient rampart against arbitrariness, given that the citizens have no information regarding the choices and especially no personal interest in delving in the details of such decisions.

Some commission members made the point that, even if these measures are taken and are successful, many jobs cannot easily be turned into "good jobs", raising the question of what can be done for these "bad jobs". For those jobs, other avenues, higher financial compensation (as in the case of care to the elderly), must be explored. In this context, an issue which was not taken up in Chapter Two but has figured in many popular discussions is the potential introduction of a universal basic income (UBI). We (the two rapporteurs) do not favor the creation of a universal basic income. Our reasoning is straightforward. We believe that there are enough potential jobs for all workers, skilled, or unskilled. It may however be that some of these jobs have low productivity and thus will be offered by firms only if wages they must pay are sufficiently low. Indeed, it may be that these wages may

be below what is considered living wages. We believe that the solution in this case is a combination of a low minimum wage and a negative income tax *prime d'activité*, in France). The low minimum wage allows these jobs to exist; the negative income tax can ensure that workers still earn a living wage. This may however be expensive for the state to provide, thus providing an additional incentive to transform as many jobs as possible into good, or at least better, jobs.

Finally, the multilateral approach to defining, and dealing with social dumping raises more broadly the possibility of agreements on labor standards. The contours of such standards require further thought. While we favor a multilateral approach, there are also weaknesses. While many countries share concerns about the effects of trade on good jobs, they may not be able to agree on enforceable labor standards in trade agreements for good (difficulty in specifying what is social dumping) and bad (beggar-thy-neighbor) reasons. And in the developed world, the reluctance to go in this direction may not stem from the United States and China only; a case in point is ILO's various labor regulations, that France has shown more eagerness to ratify than all but one country. A related issue is that the single market requires an agreement among European nations; imposing constraints on French firms might jeopardize jobs if some other member states objected to the trade policy.

To end this part: We should be clear. There was wide agreement among the commission that pre- and post-production redistribution, with an emphasis in particular on education and professional training are essential. But there was also wide agreement that there are limits to pre- and post-production redistribution, and that one should explore whether production and trade can be organized differently. There is a high probability that technological change and globalization will continue to exacerbate inequality and hollow out middle-skill and middle-income jobs. We think it is important to open the discussion, and to put several ideas on the table. We realize that they are not ready for use but hope that they will lead to more exploration and the adoption of new policy tools.

SECTION 3

DEMOGRAPHIC CHANGE: AGING, HEALTH AND IMMIGRATION

Underlying Chapter Three written by Axel Börsch-Supan, Claudia Diehl and Carol Propper

Just as with inequality challenges, demographic challenges are multidimensional. Again, we had to pick and choose among them. We decided to focus the work of the commission on two of them. The first and main one is the implications of aging and its connection to health. The second is immigration, or more precisely, immigrant integration in the labor market. We realize there are many others, such as whether demographic evolutions are an important factor in explaining low interest rates, and therefore what the future may hold, or gender differences between men and women in the labor market, and so on.[1] The only excuse for not treating them was the need to narrow our scope.

That France is aging is too often perceived as bad news. It should not, for it reflects for the most part a major societal achievement, namely a steady increase in life expectancy together with an increase in the quality of life in old age. It is thus fundamentally good news. It requires however adjustments in the way life is organized, the main one being maintaining the right balance between work and retirement. For countries such as France which rely on pay-as-you-go social security, longer life expectancy implies either a

[1] We did not in particular consider the wider theme, dating at least back to Alfred Sauvy, that aging societies are less dynamic in many dimensions, economic, sociological, political. While economic research on this issue is limited, macro-economic research has not found much relation between productivity growth and demographics (for example, Acemoglu, D. and P. Restrepo [2017], "Secular stagnation? The effects of aging on economic growth in an age of automation," *American Economic Review* 107, No. 5 [May]: 174-179, and the conclusions of micro research, discussed in the text, are that productivity does not seem to decrease with age until at least 65).

decrease in benefits, an increase in contributions, or a higher retirement age.[1] This choice cannot be avoided.

Because overall social security contributions are already very high in France, we believe that the adjustment should come through a combination of an increase in the effective retirement age and a relative decrease in benefits, with the priorities depending on current circumstances. This involves rethinking the pension system.

Pension reform should satisfy four goals.

- The pension system should be unified, to become more transparent and fairer.
- It should allow for individual flexibility in the choice of retirement age versus the level of retirement benefits.
- It should recognize the large differences in life history and life expectancy across workers.
- Finally, it should be flexible enough to maintain financial balance, now and in the future, by balancing adjustments between retirement age and retirement benefits, so as to reflect societal preferences in response to macroeconomic and demographic evolutions.

What should be done must not however be reduced to a series of technical changes in the rules of the retirement system. Like the inequality and climate challenges discussed in Chapter One and Chapter Two, and to the extent that demographic evolutions require a longer working life, this requires a holistic approach (an expression we use in all three chapters), i.e. a larger set of measures making it more attractive for firms to keep older workers and for older workers to be willing to work longer. This implies, among other things, changes in the organization of firms and how they treat older workers, more professional training for middle-age and older workers, and a focus on the prevention and the treatment of chronic illnesses.

To anticipate our conclusions:

- We agree with the Delevoye report and the subsequent proposed law that a prerequisite is a rationalization of the existing system. Once this is done, there are various ways to introduce flexibility, to account for differences in work histories and life expectancies, and to achieve the goals above.

[1] With a few exceptions, we use “retirement age” for “claiming age”. This is standard usage. But the two actually differ in France, where, because of various pre-retirement programs, the average retirement age is roughly one year less than the claiming age.

- For the sake of concreteness, we propose a specific set of reform measures, which builds on and enhances the existing retirement reform project. It is based on an easy to understand point accumulation system; a retirement window with an earliest retirement age; benefits that increase roughly actuarially neutrally if workers prefer to retire after the earliest retirement age; a system of point adjustments for low-income workers that gives them a decent pension even if they stop working at the earliest retirement age. We believe that such a pension reform, plus measures to increase both the demand for workers by firms and the willingness and the ability of older workers to work longer can allow for a smooth and fair adjustment to demographic changes.

- We could have extended our focus to look at not just the participation rate of older workers, but the participation rate of workers of all ages. A general increase in the employment rate would increase the tax base of contributions and facilitate the adjustment. Lowering the average unemployment rate, which is high in France, would go some way. We decided not to discuss the issue of what lies behind the high average unemployment rate in France and what policy measures should be taken, as this would require another report. We decided however to focus on one striking characteristic of the labor market, namely the low labor force participation of immigrants. Better integration is obviously essential for many reasons, but it is also of relevance for retirement reform. We see this as a major issue, which should be given higher priority by the government. We propose several measures, none of them particularly new, but all of them probably needed to lead to better integration.

1. Facts and Perceptions

France is aging. The demographic dependency ratio, defined as the ratio of those over 65 to those between 15 and 64 years, which is equal to 33% in 2020, is expected to increase steadily, to reach 45% in 2040. The good news is that it is primarily due to an increase in life expectancy, together with a temporary bulge reflecting the aging of the large baby boom generation, rather than to a decrease in fertility. Fertility in France, at 1.9, is close to the replacement level.[1]

Public pension expenditures are high, equal to 15% of GDP according to the European Union definition, 50% higher than in Germany. Italy, the only EU country with a higher ratio, at 15.6% of GDP, has a much older population. The French pension system is more generous than that of comparable countries such as Spain, Italy, or Germany. Due to high

[1] The fertility rate has decreased since 2014. It is too early to say whether this is a permanent or a temporary decline.

benefits and early retirements compared with other countries, the average contribution rate (the levy on employees and employers) dedicated to pensions is high, 27.5% of earnings, and can be much higher for those with high earnings. The system is nearly balanced, with a small deficit in 2019 (the deficit is expected to be larger in 2020 and 2021 because of Covid-19).

One issue we would have had to discuss in the past is whether the system should build a substantial trust fund and move from a pay-as-you-go system to a partially funded one. The argument used to be that such a fund would increase national saving, and thus increase capital accumulation and output. This discussion made sense when saving was perceived to be too low. It does not make sense in the current environment in which the current interest rate is very low, reflecting an incipient excess of saving over investment. Additional saving would lead to an even lower rate, and if monetary policy were constrained by the zero lower bound and could not implement such a low rate, would lead to a deficiency of aggregate demand and higher unemployment. Furthermore, moving toward a funded pension system would impose a “double whammy” on current French workers, who would have to pay the pensions of their elders, in this case the unusually large generation of baby boomers, as well as part of their own pension, a costly transition for a generation facing more job insecurity than in the past (the aftermath of Covid-19 crisis in the short term and AI and robot revolution in the medium term).

The issue we must discuss however is whether the system will remain in balance in the future, or whether structural adjustments are needed to achieve it. There is no question that past reforms have improved the financial outlook substantially. The latest report from the Conseil d’orientation des retraites (COR) concludes that the share of pension expenditures in GDP will actually decrease slowly over time. Using their methodology (which gives a slightly lower ratio of pension expenditures to GDP than the EU number cited above), and their most pessimistic assumption about productivity growth, i.e. 1%, the ratio of expenditures will decrease slightly, from 13.6% in 2019 down to 13.4% in 2070, this despite an increase in the demographic dependency ratio (defined here as the ratio of people 60 and over to those between of 20-59) of 37%.

There are however two reasons to believe that this forecast is too optimistic.

The first is that even the COR most pessimistic assumption about productivity growth, 1% per year, may still be too optimistic. Over the last 15 years, productivity growth has been only 0.7%.[1] The reason productivity growth matters is that, in the current system, revenues

[1] Projecting productivity growth is very hard. It is worth remembering that the cross-decade correlation in productivity growth rates is around 0.1 to 0.3. See Easterly, W., Kremer, M., Pritchett, L. and L. Summers (1993), “Good policy or good luck? Country growth performance and temporary shocks,” *NBER Working Paper Series*, No. 4474, National Bureau of Economic Research.

grow at the rate of wage inflation, while expenditures grow at the rate of price inflation. The higher the rate of productivity growth, the larger the difference between wage and price inflation, the more favorable the system's financial balance. Symmetrically, the lower the productivity growth, the worse the system's financial balance. (This dependence of the financial balance on difficult-to-forecast productivity growth in the near and distant future is undesirable. One element of our proposal is indeed to eliminate that dependence and the associated uncertainty by letting benefits be indexed by wage inflation. Details on this later.)

The second reason is related to the first. The way balance is maintained under the COR simulations is through the role of price indexing in both the determination of initial retirement benefits and also benefits in payment, resulting in a decrease in average benefits relative to wages. What happens in the simulations is that the large increase in the dependency ratio (moderated only by a slight increase in the average retirement age) is offset by a large decrease in the ratio of benefits to wages. The COR simulations imply a decrease in the ratio of retirement benefits to wages of 20% by 2070. Even if one may want to reduce slightly the average income of retirees relative to the average income of workers (a ratio which is high in France), this strikes us as too mechanical and too extreme an adjustment, and more relevant perhaps, politically unfeasible since it brings very old retirees to an average very near to the poverty line.

Numbers on labor force participation of older workers in France are striking. The labor force participation rate for those between the ages of 55 and 64 is 56.2%, compared to a European average of 66.6%, with most of the difference coming from the participation rate of workers between the ages of 60 to 64. Most workers claim benefits at the age of full replacement rate, which is now 62. But many retire earlier, relying on various pre-retirement mechanisms, so that the average retirement age is 60.8 for both men and women. This compares to 65.2 for men and 63.7 for women for the OECD average.

Contrary to common perceptions, there is no evidence that decreases in productivity should motivate early retirement. Indeed, studies of the automotive and the insurance industries suggest that there is no evidence that productivity decreases with age until at least 65. On average, disability-free life expectancy at 65 is 10 years. Chronic illnesses are however an issue: 20% of those age 60-64 have at least two chronic conditions, with large disparities across income or education groups. Chronic conditions have a major impact on labor force participation: For the 50-64-year group, having a chronic illness multiplies the probability of being out of work by 3, the probability of being retired by 2, the probability of being unemployed by 1.5.

These large disparities extend to life expectancy in general. Life expectancies vary with gender, education, current income, wealth, health behavior, and genetics. A striking statistic of our report is the difference in life expectancies across income levels for example (income

not being necessarily causal but being largely an observable proxy for some of the underlying factors, type of job, etc.). At age 62, men in the lowest income decile have a life expectancy of 19.5 years, compared to 26 years for those in the highest income decile. Put another way, if these two workers retire at the same age, one of them can expect to live 6.5 years less than the other. Differences across income levels for women are slightly less dramatic, but still substantial, 5 years between the highest and the lowest income deciles.

2. A Holistic Approach

Start with pension reform. The detailed architecture of any pension scheme is complex, and the reader is referred to the underlying chapter for more details, more discussion of alternatives, and more discussion of the relation to the law presented by the government in January 2020. What we do below is give a sense of the main choices we recommend and their motivation.

2.1. Shifting from price to wage indexation, with a demographic adjustment

Any pension system has to weather various shocks: transient (such as the financial or Covid-19 crises, the consequences of the end of the baby boom), or long lasting (the increase in life expectancy, the advent of AI and robots and their implications for the labor market). Faced with such shocks, no system will be automatically watertight for many decades; but repeated pension reforms is not the way to go either. Some automatic adjustments are required to provide the system with some sustainability.

Another important point is that macroeconomic and demographic risks have to be borne by someone, either the pensioners through an adjustment in their benefits, or the workers through higher contributions or a longer working time, or both; there is no way out.[1]

In particular, faced with the increase in life expectancy, there are three ways of adjusting: higher contributions, lower benefits, or an increase in the retirement age. As we saw, the way it is forecast to happen under current law is mostly through a decrease in benefits relative to average wage, engineered through price indexation which automatically decreases the replacement rate over time by the difference between the rate of wage

[1] There is yet another possibility, which is that the system runs a deficit, and the burden is absorbed in the general budget, and thus eventually by current or future taxpayers. While the low interest rates raise issues about the scope for debt finance, we assume in this chapter that the retirement system remains balanced, and that the issue of debt finance applies to the rest of the budget.

inflation and the rate of price inflation, a difference which depends in turn largely on the rate of labor productivity.

There is a better way. We believe that the contribution rate, which is already very high, cannot be increased, and that the adjustment must involve nearly exclusively both replacement rates and retirement ages. We do not believe however that price indexation of benefits is the right tool to do it. It was useful in slowing down the growth of benefits, but it has three shortcomings:

- The first, which we discussed, is that because wage inflation is very likely to be higher than price inflation, reflecting the increase in productivity over time, it implies a steady decrease in benefits relative to wages, which, at some stage, becomes socially unacceptable.
- The second is that it makes the social security fund balance too dependent on the highly uncertain rate of productivity growth in the future, with a strange welfare implication: The higher the rate of productivity growth, the more the adjustment falls on the retirees through a decreased ratio of benefits to contributions.
- The third is that it makes benefits sensitive to the path of individual earnings. Compared to wage indexing, it penalizes early earnings relative to later earnings. There is no reason for that to be desirable.

Thus, we argue for the reintroduction of wage indexation – adjusted by the dependency ratio in a way described below – for both contributions and benefits, to achieve financial balance through more transparent, more predictable, and more fair adjustments.

To describe the architecture of the system we propose, we start by showing how the system looks to an individual worker, and then return to how best to balance the system as a whole.

2.2. A point system proposal

Transparency is important. We propose a point system which (leaving aside important adjustments for special circumstances discussed later) is straightforward:

- During their working life, workers receive points in proportion to their wage, for example 100 points if the worker's wage today is equal to the current average wage, 200 if it is twice the average wage, etc. Under some conditions, they also receive points when they are not working (as is already the case in the current system for maternity and other care, or unemployment). Determining the number of points as a percentage of the average wage ensures that early gains have the same value as later ones: for

example, receiving the average wage today or receiving the average wage 10 years from now gives rise to the same pension rights.

- Points are accumulated on an individual account over the entire work life until claiming a pension.
- At the time of claiming, the accumulated points are converted into an initial pension benefit, in proportion to the average pension benefit for that year. (As described below, low earnings may receive additional "bonus points" at that time.) A point gives a right to a certain number of euros (the "service value") annually. Each year, this service value is adjusted for all pensioners equally to take account of wage inflation and demographic changes, as described below. This implies that, if a pensioner has 1.2 times the average number of points of pensioners that year, then (s)he receives 1.2 times the average pension benefit; and that, each year, all pensioners have the same service value per point, whether they are 62 or 83 years old.
- Complementing pension income with work income is allowed past claiming the pension: someone in good health and still enjoying work contributes to society by continuing work. One can think of two fair arrangements here, one in which this additional work does not lead to more contributions or more benefits, or another in which additional work comes leads more contributions and thus more benefits.

2.3. Allowing for flexibility of individual choices

To allow for flexibility of individual choice, Chapter Three suggests that rather than set a retirement age, the system sets a retirement window, with an earliest claiming age, and possibly a latest claiming age.

- The earliest retirement age or earliest eligibility age (EEA) is the earliest date at which the worker can claim retirement benefits. It is the same for all workers.
- Workers who keep working beyond the EEA and do not claim benefits until later, keep receiving points for additional years worked and get the value of their points adjusted in a roughly actuarially neutral way, reflecting both their not-drawing on the pension fund in the meantime and the decrease in their remaining life expectancy at retirement. By "roughly actuarially neutral", we mean that the delay in claiming the pension makes the pension system roughly even.

Chapter Three does not take a position on whether there should be a latest claiming age. Conditional on the employer and employee both agreeing to continue the work relation, there seems to be little reason to impose a latest claiming age. But this may require

adjustments in the nature of employment protection legislation and employment contracts past the EEA.

2.4. Recognizing individual differences

A fair retirement system must recognize the fact that workers differ in many ways. Some have checkered work histories. Some have had painful jobs. Some have had low income and may have accumulated fewer points, and, as a result, may face old age poverty. Some have low remaining life expectancies. The question is how to deal with those differences in a way which is transparent, fair, and avoids abuses.

The easy part is checkered work histories and low lifetime income in general (and thus fewer points in the system we propose). Like the current system, the system can take into account periods of unemployment or maternity by providing additional points. To the extent that society wants the retirement system to be progressive, workers with low lifetime incomes more generally can get additional points.

The current system has a “contributive minimum” (this minimum pension should not be mixed up with the so-called “old-age solidarity allowance”, the latter being a means-tested social benefit, taking into account the overall income defined at the household level). Chapter Three suggests doing pretty much the same, but in a smarter way to keep some incentive for workers to accumulate points when the number of accumulated points is low. In the current system, workers in the bottom two income deciles receive a minimum pension (with the result that France has one of the lowest old-age poverty ratios). The existence of the threshold below which the pension is independent of income introduces an undesirable kink. Chapter Three argues that a better approach (or at least a complementary approach) might be to give additional points to the four bottom deciles of the income distribution, in a way that makes benefits grow with accumulated contributions even for low incomes (as is the case in some other countries).

This leaves the issue of different life expectancies. Those differ from many reasons, income, gender, education, penibility, genetics, health habits. As we saw, some of the differences are striking: Life expectancy at 62 for male workers in the highest decile of the income distribution is 6.5 years higher than for those in the lowest decile. Some correlates, such as income or gender, are observable. Some are not. Some, such as genetics, are given; some, such as the effects of smoking, depend on behavior. The question is how best to take these factors into account, and on this, there was no agreement within the commission.

The authors of Chapter Three did not want to offer adjustments beyond those described above. They pointed out that, given the large set of factors, observable or unobservable, there is no way to do a fair adjustment, and that, given the correlation between income

and life expectancy, the additional points already given to low-income workers or workers with checkered work histories went a long way towards allowing workers with lower income, and thus likely lower life expectancy, to claim and retire earlier. They also pointed out that workers with low income typically start work earlier and thus reach the earliest claiming age, the EEA, with more points, and therefore a higher replacement rate, than people who enter the labor force after acquiring further education and presumably have higher income. Finally, they insisted on keeping the same EEA for all. They argued that the EEA plays an essential role as a social norm and allowing for different EEAs would undo that role (this is clearly a potential issue in a country like France, where, as we saw, the age of exit from the labor force is lower than the minimum claiming age).

Some members of the commission wanted to go further. While income is indeed not the only cause of life expectancy and may indeed be mostly a proxy for other factors, the correlation is sufficiently strong that workers with low income could be given additional points beyond those given above so as to have a higher replacement rate at the EEA. They thought that some workers might want to retire and claim earlier than the EEA even if this meant a lower replacement rate. This could be done either by explicitly linking the EEA to the income decile, for example, allowing workers in the bottom four deciles to retire earlier, with an actuarially neutral discount; or instead keeping the EEA (which would probably have to be given another name) but allowing low-income workers to claim earlier, albeit at a larger discount. They also thought that, if the average effective retirement age had to be increased over time, and the increase in life expectancy was, for example, more pronounced for high income, allowing for different EEA adjustments and, for example, increasing the EEA for high-income workers but not for low-income workers, might give an additional degree of freedom in adjusting to changes in life expectancy. This might not only be more fair, but also facilitate politically the increase in the average retirement age. The issue must be resolved but there was no resolution within the commission.

2.5. Arduous work

How to take into account hardship, painful working conditions, is a harder issue. Hardship is real, but it is much harder to assess and measure than, say, past periods of unemployment, thus raising the risk of abuse. One insight is that social partners in each industry have decentralized knowledge about working conditions. It is then natural to let them jointly reach an agreement as to how to account for the "*pénibilité*" of specific jobs. To avoid the risk that each industry tries to get it financed by the rest of the pension system, the commission proposes that each sector fully bear the cost overrun that its decisions impose on the system.

To give an example, suppose that a worker would normally retire at the age of 62. The sector can decide to let the worker de facto retire at 55 because of painful working conditions and then pay the worker's benefit and social security contributions between the ages of 55 and 62; the worker would then enter the general retirement system at the age of 62. The details of this proposal require further elaboration; this early retirement must be guaranteed through a fully funded reserve fund that will prevent the liabilities from being transferred to the general regime if the firm is in default or the sector shrinks to the point of a couple of firms bearing an unacceptably high burden. Similarly, one must as usual allow firms to opt out of the sectoral agreement.

Overall, making firms and sectors accountable for what they impose on the rest of society is good public management. As noted in Chapter Three, the Dutch experience consisting in strengthening incentives on the employers' side proves interesting: putting more of the costs of disability insurance on them led to a large reduction in the disability rolls while increasing employment of older workers.

2.6. The determination of the service value

Turning to the financial balance aspects, the first point to be repeated is there is no possible way to insure citizens against permanent macroeconomic and demographic shocks. Stabilization in the face of a transient shock (Covid-19) can however be achieved.

At some level, system balance is simple accounting. For a given contribution rate, and starting with a balanced system, keeping the system balanced requires that the percentage increase in the average pension benefit be equal to the difference between the rate of growth of the average wage and the rate of change of the system dependency ratio (the ratio of retired over active workers).[1]

The system dependency ratio depends on the average effective age of retirement. Chapter Three argues that the retirement window should shift as life expectancy increases. The question is by how much? A useful benchmark is a rule such that the increase in life expectancy goes for two-thirds to an increase in work life, and for one-third to an increase in retirement duration. This rule can be motivated as follows. If longevity increase were the

[1] At retirement, points are converted into some date-t benefit. The aggregate balancing formula, written at date t, is $c_t w_t a_t = b_t r_t$, where c_t is the contribution rate (to simplify, let us take it the same for everybody; if not, this is the weighted-average contribution rate), w_t the average wage, a_t is the number of active workers, b_t is the average pension benefit, r_t the number of retired workers. It implies that if we keep the contribution rate constant over time, $c_t = c$, then the average benefit should grow at the rate of growth of the average wage, minus the rate of growth of the dependency ratio: $\frac{\dot{b}_t}{b_t} = \frac{\dot{w}_t}{w_t} - (\frac{\dot{r}_t}{r_t} - \frac{\dot{a}_t}{a_t})$.

only demographic change, then keeping the ratio between average career length and average duration in retirement constant would balance the pension system. Since a career is about 43 years and duration of retirement about 21 years, hence roughly 2:1, every 3 years of additional life expectancy should be divided 2:1 between a shift of the retirement window by two years and an extension of the retirement duration by one year.[1] If such a rule were used, the system dependency ratio would remain roughly constant, and the replacement rate could then remain roughly the same. The service value of a point would then increase for all pensioners at the rate of average wage inflation.

In general, however, people may want adjustments that involve both an increase in the retirement age and a decrease in the replacement rate. Chapter Three thus recommends the use a more flexible rule, reflecting societal preferences, and discusses what form such a rule could take.

2.7. A reserve fund, and an independent board

Whatever rule is chosen, in the case of transient shocks, be it macroeconomic fluctuations, or the bulge created by the retirement of the baby boomers, it makes sense to allow for temporary deviations from the rule. To do so, the natural solution is the creation and monitoring of a reserve fund. This fund could be drawn upon temporarily in a difficult year and would not be meant to partly fund the retirement system on a permanent basis, in contrast with some proposals of the past. To avoid temptations to unduly snatch from the fund for political expediency, the management of the fund should be entrusted to an independent body, whose mission can also include the monitoring of demographic and other macroeconomic evolutions, and the adjustment of the retirement window (see below). The discretion granted to this independent body must of course come with some control. Were the reserve fund to fall below some threshold level, generating a signal that the fund is structurally unbalanced, the body would be instructed to rebuild the fund through a combination of adjustments in the replacement rate and the retirement window to make the system sustainable. One difficult and important issue here (an issue recurrent in Chapter Three) is how to make the board both politically independent but reflective of societal preferences and the opinions of citizens.

[1] If such a rule is used is to adjust the earliest claiming age, the effective claiming age may not change one for one, as workers may, for example, decide to retire at the same age as before. If the adjustment for the claiming date is actuarially neutral, as we have argued it should, the decrease in the accumulated points implies that the decision of workers as to when to retire given the new EEA does not affect the decrease in total benefits which come from the increase in the EEA.

2.8. Dealing with the transition

Our report agrees with the Delevoye proposal that the transition from the 38 current regimes to 1 should be gradual but probably faster than complete grandfathering of current workers, which would take a generation. We believe that a transition over 15 years is reasonable. We also agree that current retirees and those who will retire soon should not see their situation changed. (While the commission realized that the transition may have to happen in different ways in the public and in private sector, it did not feel competent to discuss how the transition should be engineered in the public sector versus the private sector.)

3. Accompanying Labor Market Policies

Just as important as the retirement rules of the pension system is the quality of jobs available to older workers, a theme that parallels the discussion of "good jobs" in Chapter Two on inequality.

The evidence suggests that what motivates workers to remain employed is not only income but also staying in contact with the world of work and having a sense of purpose. At the same time, older workers often want more flexibility in the balance between leisure and work. This suggests focusing on improving part-time arrangements for older workers. This clearly must be a multi-dimensional effort:

One dimension of improvement is, in the pension reform, to make the adjustment associated with working longer actuarially neutral, which is not the case at this stage, but we suggested earlier should be. This would make it more attractive for workers to work longer.

Another is to focus on professional training for workers throughout their work life, again a theme that parallels our discussion in Chapter Two on inequality. The evidence is that skill levels are substantially lower for older than for younger workers: This however appears not to reflect age per se, but the recency of education and the lack of updating. Based on a 2011 survey, only 51% of French workers had further education after their formal education, compared for example to 72% in Sweden.

Yet another is to deal better with chronic illnesses. Perhaps most important is the need for a change in attitude towards those with chronic illness in the workforce. The goal must be to allow workers with disabilities to remain in work, rather than to want to drop out. (For several chronic illnesses, not working makes the chronic illness more debilitating.) Reviews of best practice based on international evidence indicate that strategy to improve the health capacity of older workers needs to combine three different types of policy and interventions.

- The first are workplace-based health and wellness interventions to promote health and increase the work capacity of older workers.
- The second are employer accommodation practices to help older workers with health problems to stay in work.
- The third are to address features of the disability insurance system to ensure that older workers who experience functional problems do not leave the labor force.

The experience of Sweden shows that these reforms can make a large difference. Not only that, but it also shows that social norms and attitudes can shift as a result.

Focusing on the chronic illnesses when the workers are old is too late. Chronic illnesses start earlier. The general proposition here is that preventative care can be improved: the current system focuses too much on cure. The report goes into detail about foreign experiences, and a number of potential technical reforms of the health system, from greater use of pay for performance and payment for bundles of treatments rather than pay for act, to a pre-defined basket of fully insured preventative care treatments. Telemedicine, whose usefulness has been evident in the Covid-19 crisis, can also play a role. It can help establish better services for many chronic illnesses, for example mental illnesses or depression. And it can seriously alleviate the medical desert problem.

4. Immigration and Labor Participation

Immigration, both its nature and its size, raises many economic, social, and political issues, most of them going much beyond what our commission had the expertise to study. We decided to focus on the labor participation of immigrants, which is obviously of intrinsic relevance, but is also relevant in thinking about the financial balance of the pension system.

The employment rate of immigrants in France is 58.5%, compared to 66.4% for native-born workers. The unemployment rate of immigrants is 14.6% relative to 8.3% for natives. In these two respects, France does about the same as Germany, and does better than Sweden.

Some of the difference reflects the initial adaptation. The employment rate for the first five years after immigration is 41% but increases to 60% after five years. As always, the averages hide substantial heterogeneity across gender and origin. For example, after 6 to 10 years, non-European women immigrants still have a participation rate that is 15% lower than for native women. Interestingly, much of the difference disappears for those belonging to the second-generation (i.e. the sons and daughters of immigrants). It however remains lower for second-generation women of non-European origin.

This situation reflects a list of factors:

– For first-generation immigrants, language skills play a large role, and so does the lack of social capital. An interesting finding is that language courses increase labor force participation but do so not so much through the acquisition of language skills themselves than through access to better information about the labor market.

– Immigrants face a tough labor market. While true qualification is difficult to assess, a study has found that 55% of North African immigrants appear overqualified for the jobs they have, compared to 39% for all immigrants, and 20% for native born.

– Discrimination plays a role. Studies indicate that candidacies from people with ethnic-sounding names get less call backs than others. And so does culture. Only 25% of Turkish women are employed and a large share of those who are not employed is not even active on the labor market.

– Turning to the second-and-third generations, school segregation plays an important role and contributes to the intergenerational transmission of low levels of education. The proportion of students from migrant background in disadvantaged schools is high, and so is the proportion of students from migrant background in the low performing reading proficiency group.

Given this list, it is obvious that there is no single magic bullet. There are however three directions to explore.

- **More coherent policies to support recognition of existing credentials and acquisition of new skills**

  Lack of (partial) recognition of foreign degrees is sometimes due to information problems on the part of immigrants. This can be improved. Increasing the number of language lesson hours (which has already been increased to 400 hours) would be another important starting point since language skills have a strong impact on labor force participation. Providing more focused occupation-specific language training and enabling women with children to take part in such classes has proven successful in Germany.

  In that respect, Chapter Three provides an interesting computation. Closing the gap between overall labor force participation between France and the European Union could be achieved (arithmetically) with a 10-percentage point increase in the participation rate of the 55 to 64-year-olds. Taking the proportion of immigrants who would benefit from additional language training, together with the estimated effect of language training on labor force participation (an estimate which must be taken with a grain of salt), language training could by itself fill 60% of the gap. In short, it would make a substantial difference.

- **Counteracting intergenerational transmission of low levels of education**

  It is well documented that school segregation is much worse than residential segregation. This has been recognized and addressed by many programs in the past, the most recent one being the *réseaux d'éducation prioritaire* (REP). We believe that more should be done, in particular by providing incentives for a better mixing of children from privileged and disadvantaged family backgrounds in private and public schools. Children from immigrant parents would disproportionally benefit from this.

- **Detecting and reducing discrimination**

  The hesitancy to collect data on employees' immigrant background have led to limited information about the effects of immigrant origin on labor force outcomes. There are however ways of improving our knowledge without compromising anonymity or putting those reporting such information at unease.

CHAPTER ONE
CLIMATE CHANGE

Christian Gollier and Mar Reguant

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EXECUTIVE SUMMARY

An urgent need for aggressive policies

Climate change poses an immense challenge and threat, already leading to the loss of life and ecosystems, increased conflict, and economical losses. We have finally reached a moment of quite unanimous recognition of the great threat that climate change represents. Several high-emitting countries, such as the United States, have recently stated their willingness to also be part of the solution. Steady actions with clear and credible milestones are therefore highly valuable at this point. Europe is the right level to shape most climate policies for EU member states. There is an urgent need for aggressive policies to lead the change and engage other countries, which can be achieved by a combination of policy tools: improved carbon pricing, subsidies to R&D, standards, bans, better management of forests and land, etc. They are all part of a big suite of decarbonization policies.

Carbon pricing is an essential signal

Carbon pricing is an essential signal to convey our collective climate ambition to all citizens, consumers and producers. There is a strong consensus among economists that a uniform carbon price is necessary to induce an efficient and fair ecological transition. The EU Emissions Trading Scheme (ETS) should be strengthened to make carbon pricing more effective and transparent, replacing national pricing schemes (such as the carbon tax in France). The ETS should include all fossil-fuels by regulating emissions embedded in refined products, thereby including the transportation and housing sectors without any exemption. It should cover imported emissions by imposing the same effective carbon price to imported goods and services, with the aim of imposing a level playing field and incentivizing trade partners, barring any protectionist temptation. The credibility of the universal ETS carbon price should be reinforced for the long run by imposing price floors and ceilings growing at 4-5% per year. The carbon dividend, which could rapidly amount to €200 billion per year, should be fully redistributed to the EU citizens, in a transparent

way, potentially to favor the lower deciles and the workers most affected by the transition. Carbon pricing should be fiscally neutral.

A battery of other policies are needed

A battery of other policies are needed to ensure adequate progress towards mitigation goals, and to ensure international action. These policies should include subsidies to renewable technologies or building retrofits, phase-out targets for fossil-fuel based technologies such as combustion engines and heating systems, a ban on coal use, environmental conditionality of the Common Agricultural Policy, and R&D subsidies for negative emissions technologies and for electricity storage. Nuclear electricity is a valuable asset to maintain low emissions in France. Consumers, investors, corporations and banks should be empowered by establishing a transparent carbon accounting system, but climate finance is a poor substitute for state-controlled climate policies. Prioritization over alternative climate actions should be based on a sound cost-benefit analysis accounting for costs and co-benefits, with climate benefits being measured using a carbon value compatible with our collective climate ambition. This guarantees that the transition will be obtained by minimizing the disruptions to households and by maximizing the opportunities, e.g., in the form of job creation and co-benefits. Although bans have implicit costs and subsidies for some are necessarily taxes for others, many, but not all, recommendations of the Convention citoyenne pour le climat are likely to pass this test. To attain our new climate ambition, more will be necessary in terms of public infrastructures, R&D, and carbon pricing.

Priority to international policy tools

Internationally, France and the European Union account for a relatively small share of emissions. Policy efforts should prioritize actions that can have positive spillovers to other parts of the world. The EU and France should seize the current momentum of climate action, both in the private and in the public sector, and ensure that commitments to decarbonize the economy are taken seriously. Among policy tools, efforts should be devoted to innovation towards substitute technologies that do not require the use of fossil fuels, in addition to negative emissions technologies, such as direct air capture, rock weatherization, or agricultural engineering. The EU should also seek explicit agreements surrounding carbon pricing and explore international policy tools to encourage other countries to participate in such mechanisms.

In summary, European governments need to come together and increase the ambition of both carbon pricing and other climate change policies to coordinate a rapid transformation of our economies and societies. A portfolio of ambitious policies has the potential to kickstart the required change and encourage other countries in the global scene to also ramp up efforts. It is both a moral duty and the efficient path of action. The time is now.

INTRODUCTION

Over the last four decades the accumulation of scientific knowledge on climate change has left no doubt about the unbearable social and environmental costs associated with our emissions of greenhouse gases (GHG). There is a growing consensus that our economies must be greened, the sooner the better. Europeans have democratically decided to build an economic system entailing a 55% reduction of emissions by 2030 (compared to 1990) and zero net emissions by 2050. The complex question is how to reorganize our society to do this without being paralyzed by the difficult compromises that need to be made. In this report, we offer a coherent answer to this question. It is supported by a large consensus among academic economists around the world.

Over the last two decades, Europeans have been able to fulfill their international climate promises, with an emission reduction of almost 25% between 1990 and 2019. In fact, the energy transition has already begun. In recent years, progress on low-carbon solutions and markets has been faster than ever. Solar electricity costs have fallen 80% in 10 years. Wind costs are down around 60%, and batteries are 85% cheaper. Today, a stealth green revolution is propelling us. The environmental awareness of a growing share of the people has also radically transformed the social landscape of climate politics, from consumer and citizen activism to climate finance, responsible investment and carbon accounting. We are all part of the solution.

For the next three decades, we believe that it is possible to combine economic growth with the EU climate ambition. Net cost estimates of the 2050 net zero emissions target represent a reduction in GDP (Gross Domestic Product) of less than 1% over the period, far below the climate damage estimates of inaction. Thus, we must fully decarbonize our economy within a short period of time on a scale and intensity unprecedented in peace time. The recent policy against Covid-19 shows us that it is possible as soon as the political will is there. Consumption behavior should change dramatically to reduce carbon-intensive products and services and to favor short circuits. Coal, and then natural gas, must be

replaced by solar and wind sources in our electricity mix, and electricity storage technologies must be developed. The transport sector should exclude gasoline and diesel engines within the next decade or so. Cities and their suburbs should be reshaped to ease collective and individual mobilities. Several industrial sectors are doomed to disappear together with their jobs, whereas new economic activities will emerge. Labour and social interactions should be adapted, in particular to favor telecommuting. Houses and buildings should be retrofitted at a much faster speed and in a more efficient way than currently observed. Large scale carbon capture and sequestration will likely be necessary within the middle of this century. Efforts in R&D will be key to bypass the current technological locks for the development of carbon-free solutions.

Over the last few months, huge national and European plans have been decided in which hundreds of billions of euros will be spent to green our economies. This will not be enough, as too many consumers and corporations continue to invest in carbon-intensive assets and projects. In line with the vast consensus of the economics profession, we support an ambitious carbon pricing policy to force all polluters to internalize the consequences of their actions. A universal carbon price high enough to attain our global climate goals should be imposed to all consumers and producers in Europe, with no exemption. Carbon pricing is aimed at making it privately profitable to implement many of the necessary green actions described above by realigning the myriad of private interests in our society with the common good, thereby contributing to attaining the global climate goal at minimum cost. By raising the price of carbon products and services, this system allows us to green our growth at the lowest cost for the citizens. History shows that the evolution of relative prices plays a major role in our lives, and that it is a central element of any societal transition. The carbon pricing policy should also fight social inequalities. This should be done by redistributing a fraction of the carbon dividend to the lower deciles of the population and to the specific losers of the transition (coal miners, specific rural areas) in a transparent way. Since the emergence of the *Gilets jaunes* (Yellow Vests) movement, cost-efficiency and redistribution issues have become key for the social and political acceptability of any climate policy.

Europe is the right level to define and implement a carbon pricing mechanism. Our proposal relies on the existing EU-ETS system of emissions allowances. This system should urgently be reformed to enlarge its scope and intensity. The objective should be for EU-ETS to cover all measurable emissions under EU jurisdiction, which implies a border carbon adjustment. Beyond the scope enlargement, a menu of other reforms should also be examined. One possible reform would be to obtain a European treaty establishing a multi-decade carbon price floor, growing at 4-5% per year from a scaled-up 2021 level around €60-€80/tCO_2. The long-term visibility of the carbon price over the next three decades is key to trigger the energy transition based on private, irreversible investment projects whose emission reductions are dispersed over a long period of time. To solve the

credibility issue of increasing carbon prices in the future, one could consider a strategy that has already been successfully implemented for the European monetary policy: creating an independent Carbon Central Bank (CCB). The CCB would receive a mandate from the EU political institutions to govern the carbon price in a manner compatible with the democratically-determined climate goal of the Union.

Whatever the policy used to reshuffle carbon pricing in Europe, special attention should be given to the use of its revenue. The EU should redistribute this revenue to each country in proportion to its emissions. A fraction of it could also be allocated to the Just Transition Fund created at the occasion of the EU recovery plan of July 2020 ("Next Generation EU") to facilitate acceptability by countries with lower marginal abatement costs (MACs). In the absence of a European solution, France should rely on a reshuffled carbon taxing mechanism, enlarging its scope, and redistributing its revenues.

Carbon border adjustment mechanisms (CBAMs) are useful not only to control for environmental dumping and for leveling the playing field, but also to incentivize EU consumers and producers outside this continent. It is a WTO-compatible tool to align all market players for the common good. Economists of both sides of the Atlantic agree that CBAMs should be used to incentivize the creation of "climate clubs". Under the Biden administration, the European Union and the United States, potentially with China, could form the core of such a club, yielding a critical mass to attract many other countries within this club. This suggests launching a climate diplomacy round that clearly departs from the "lowest common denominator" principle in force in the COP negotiations carried by the UNFCCC.

Carbon pricing is a necessary policy, but it is far from sufficient. Climate change is indeed far from the only market failure that justifies public intervention. Together with the urgent need for action, this justifies a wide spectrum of interventions, from subsidies for firms, consumers and investors to industrial/agricultural norms and consumption bans. There are several reasons to attack the climate challenge with a variety of tools. First, from a management of uncertainty point of view, it can be useful to ensure improvements in strategic sectors at a faster pace than possibly signaled by carbon pricing. Second, these policies often tend to be more popular than carbon pricing, potentially enabling a more ambitious policy portfolio. These public interventions are also justified by other market failures due to non-climate externalities, asymmetric information, limited rationality, or biased beliefs. Third, these policies can be targeted to areas in which other co-benefits exist and are currently unpriced, such as the transportation sector, which is responsible for significant local pollution; investments targeted at re-stimulating depressed areas; or increasing the efficiency of building envelopes, which could also be beneficial in terms of resilience in the face of growing extreme events.

Innovation is an area of public intervention that deserves further attention. The intense informational externalities of research activities imply that carbon pricing is not enough to

solve the market failures of green research. Europe should finance a large and sustained scientific and R&D program to remove critical technological locks, such as electricity storage, batteries, green agriculture and the like. Priority should be given to R&D projects that are more likely to succeed, yielding large impacts over a wide set of sectors. Such policies have the additional benefit to reduce the cost of the transition outside Europe, thereby making it very effective to incentivize other countries and regions to reduce their dependence on fossil fuels. We should not put all our efforts on the basket of breakthrough innovation, which might not materialize, but we should be aware of its spillover benefits when addressing the global tragedy of the commons.

The cost efficiency, effectiveness, feasibility, and credibility of each of these policy options should be evaluated to prioritize their implementation. In particular, their cost-benefit evaluation should be based on the true social cost of carbon and should also take in account their non-climate impacts. Not everything that is green is necessarily desirable. Even some actions that have no impact on the public budget, such as banning certain goods and anti-pollution standards, have hidden costs for citizens that must be understood. The existence of unpriced co-benefits is often critical, for example, when life-threatening pollutants in cities can be reduced. The redistributive impacts of climate change policies should also be measured and given a proper social value. Jobs creation could be another key policy consideration. Using this cost-benefit approach justifies, for example, phasing out coal as soon as possible from the EU electricity mix.

In sum, an ambitious policy portfolio should be rolled out in France and the EU to face the raising threats of climate change. An ambitious policy portfolio would send a strong signal to consumers, investors, and other countries, and contribute to the necessary change ahead.

SECTION 1

THE CLIMATE PROBLEM

The last half century has accumulated an overwhelming stock of empirical facts and scientific knowledge that basically eliminate any doubt that the emission of CO_2 and of other GHG gases changes the climate of our planet for the worse. Humanity is now confronted by the risk of a dramatic deterioration of its environment, and of the collapse of its economic welfare. France and the European Union have committed to take responsibility and confront the challenge, at least on paper. On November 8, 2019, the French Parliament promulgated the law "*Énergie et Climat*" that commits France to reduce the consumption of fossil fuels by 40% in 2030 (compared to 2012) and to attain zero net emissions by the year 2050. In December 2020, the EU decided to reduce its emissions by 55% in 2030 (compared to 1990), on top of the net zero emissions goal by the year 2050. For the classical political accountability problem of long-term promises, it is good to commit to a clear target for 2030. Zero net emissions by 2050 is a very ambitious target, which will require a radical transformation of the global economy and the way we live. The nature and the costs of this necessary transition are still imperfectly known. The waiting game that has been played by most countries over the last three decades puts us in the uncomfortable position of urgently adopting irreversible climate actions, while simultaneously exhibiting enough flexibility to adapt to many uncertainties, both climatic and technological.

In its 2018 report entitled *Global Warming of 1.5°C*, the Intergovernmental Panel on Climate Change (IPCC) stated that if all countries around the world do the same proportional reduction of emissions pathway in the next 30 years as promised by EU, the increased average temperature of the atmosphere could be limited to 1.5°C compared to the pre-industrial age. In the absence of radical scientific and technological breakthroughs, this outcome is not plausible, but this should not inhibit the EU's willingness to perform its fair contribution to the global efforts.

We take the democratically-determined EU commitments as a common goal, and explore the strategies to attain this ambitious climate objective in an efficient way.

Economists have long debated about which climate ambition should be socially desirable, weighing the short-term cost with the long-term benefits of the ecological transition. Current estimates of these costs are around 1% of GDP in 2030, whereas its benefits in terms of reduced climate damages are at least one order of magnitude larger. Deep uncertainties surround the costs associated with the last 20% of emission suppression, for example, in the aviation industry. The optimality of this suppression remains an open question.[1] This issue is related to the level of carbon value, which is discussed in Section 3 (point 1).

A key question is whether Europe should stick to its climate ambition if it remains isolated from the world on this issue. It is clear that Europe has a historical responsibility, particularly due to its accumulated emissions over the last two centuries, to lead the world outside the problem that we collectively created. A strong ethical and economic case can be made for Europe being ahead of the pack. At the current social cost of carbon, many green technologies are unilaterally cost effective even if no other countries participate, which is an important development that has contributed to the easing of international discussions. That said, if no other sets of countries participate, the temperature targets will become unreachable and there will be a growing need for adaptation, R&D, negative emissions technologies, and geoengineering. Our position is that such a failed outcome, which reflects in part the history of climate negotiations to date, should be avoided at all costs. This report is based on the assumption that the EU is not isolated on the climate issue, and that at least the United States, China and India are strongly on board by the year 2030. We make proposals to increase the probability that this will happen.

1. An Existential Threat

The Integrated Assessment Models used for the fifth report of the IPCC vividly document the unbearable damages incurred in the future if we collectively fail to reduce our carbon footprint. Our responsibility towards future generations is at stake. If we do nothing, the average temperature could increase by more than 3°C by the end of this century, and much more thereafter. Extreme climate events such as droughts and hurricanes will be more frequent, leading vulnerable populations to starvation, reducing agricultural and labor productivity, raising ocean levels, forcing migration, and stressing food security and water supply. Natural assets and their flow of ecosystem services will be deteriorated or

[1] This question is associated to the issue of implementing a ceiling price in the EU-ETS system (Section 3, 1.1). It is also related to the size of the carbon sinks.

destroyed, through forest fires, the acidification of the oceans, and changes in the ecological habitats. Biodiversity will incur irreversible transformations.

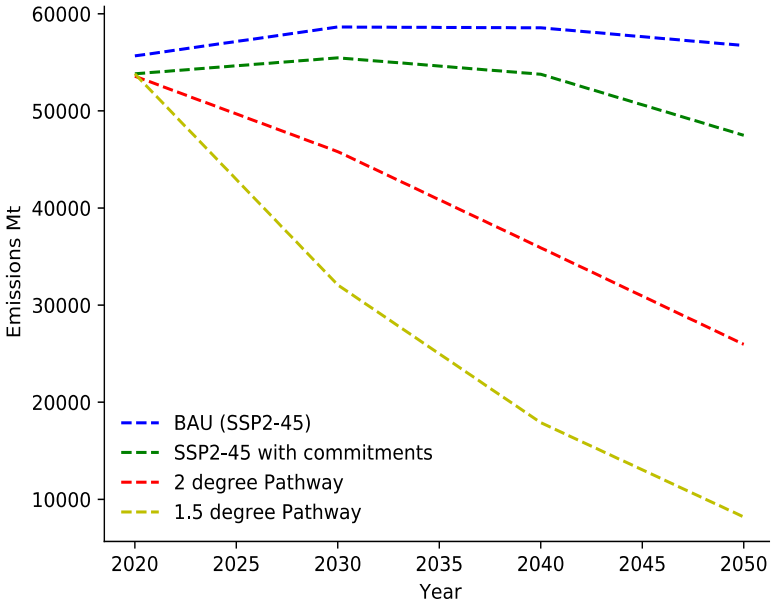
Deep uncertainties surround the climate dynamics of our biosphere under these human-induced shocks never seen before. A simple measure of these impacts is given by a key climate parameter called the climate sensitivity. It measures the increased average temperature of the atmosphere when doubling the concentration of CO_2. In its 2013 fifth report, the IPCC believed that it was likely to be somewhere between 1.5°C and 4.5°C. This wide range illustrates the uncertainties affecting various aspects of the climate dynamics far away from its pre-industrial equilibrium. For example, climatologists have identified feedback loops, such as the release of methane from the permafrost in Siberia generated by the increased temperature there, but the quantification of this phenomenon remains a challenge. Other feedback loops are uncertain, such as the ones involving the change in the albedo (reflecting power of the planet) due to changing clouds and ice surfaces, or the effect of global climate change on the absorption of CO_2 by plants. These uncertainties will take too much time to resolve, and immediate, decisive actions are urgent; waiting to get the information is not an option anymore. In the absence of action, Alestra et al. (2020) estimated a permanent loss of world GDP of around 13% by the year 2100 due to climate change. Stern (2007) estimated that the inaction would have an impact on intergenerational welfare equivalent to a permanent loss of consumption somewhere between 5% and 20%, i.e., something like a permanent Covid-19 crisis.

The degree of confidence about these estimates is limited. The climate system and the damage function linking the temperature change to its environmental, health and social impacts are highly non-linear. For example, the human body works optimally at a body temperature around 37°C. Increasing it by 0.2°C reduces our ability to perform multiple tasks. At 38°C, our ability to think deteriorates rapidly. At 42°C, we die. Human labour productivity deteriorates when local temperature goes beyond 22°C (Heal and Park, 2016). Because poor households can less easily protect themselves from external weather conditions, they are more vulnerable, with important consequences to their health and wealth. The optimal temperature for maize productivity is 18°C. Its agricultural productivity goes to zero below 10°C, or above 30°C. Biodiversity is highly sensitive to changes in humidity and temperature. Different environmental assets on which human beings rely for their subsistence will be destroyed. Entire regions will become inhabitable by most species, in particular human beings. Thousands of reports have been published over the last three decades on the expected catastrophic climate damages from our inaction, and it is not our objective here to write a new one. Rather, our responsibility as social scientists is to describe possible strategies to help humanity confront the climate challenge.

Some basic carbon arithmetic is useful to understand the intensity of the climate challenge. The atmospheric concentration of CO_2 was around 280 parts per million (ppm) in the pre-industrial age. It crossed the 400 ppm bar in 2016, growing at a rate of 2.2 ppm per year

(except in 2020 due to the Covid-19 pandemic). The ambition of limiting warming to 1.5°C leads to a global carbon budget for Humanity. The IPCC report (2018) states that we should not emit more than 2,800 $GtCO_2e$ since the preindustrial period for a 50% probability of limiting warming to 1.5°C. We already emitted approximately 2,200 $GtCO_2e$. The associated remaining budget is being depleted by current emissions of approximately 42 $GtCO_2e$ per year (a historically high level – in the 1970's, global emissions were around 15 $GtCO_2e$/year). This means that, at the end of 2020, our remaining global carbon budget is down to 480 $GtCO_2e$. At this speed, our global carbon budget would be zero at the end of 2031.

Figure 1 – Emission pathways compatible with 2˚C goals



Source: Own elaboration

Climatologists have alerted governments and public opinions for at least three decades now, but global GHG emissions have continued to grow at a rate of 1.5% over the last decade, stabilizing only briefly between 2014 and 2016 but this fall will certainly be followed by a post-pandemic rebound. In the worst days of the Covid-19 lockdown, daily emissions only receded to their 2006 level. Nations made promises (called Nationally Determined Contributions, or "NDCs") in the framework of the Paris Agreement of December 2015, but they are largely insufficient. The UN Environmental Program (2018) claimed that,

> "if NDC ambitions are not increased before 2030, exceeding the 1.5°C goal can no longer be avoided. Climate damages already prevail, with an increase of average temperature already observed of 1.1°C since 1880, with important regional variations. In Antarctica, the average temperature has already increased by 4°C since 1980. Pathways reflecting

current NDCs imply global warming about 3°C by 2100, with warming continuing afterwards."

Despite renewed and elevated NCDs made throughout 2020, the world's projected emissions are well above not just the 1.5°C warming pathway, but the 2°C warming pathway. This is illustrated in Figure 1. Any additional delay in implementing radical reforms to fight climate change dramatically increases the global cost of the transition.

To decisively fight the threats of climate change, radical and immediate coordinated policy action is needed.

We have seen that the cost of inaction will be prohibitive. What do we know about the cost of action?

Given the existing capital stock that relies on fossil fuels and their ample availability at relatively low prices, switching to alternative sources of energy will be costly in the short run, due to the need for new investments and their higher costs (e.g., hydrogen, fuel cells, etc.). However, the necessary effort to decarbonize the economy does not mean that one should give up economic growth, in particular if we succeed in performing a least-cost mitigation strategy. After all, between 1990 and 2019, EU emissions of CO_2 were reduced by 23%, but the EU GDP increased by 50%. Most costs take the form of capital investments (power plants, electric vehicles, house retrofits, etc.). Although that could have a negative impact on consumption, these necessary investments can act as a positive stimulus in the next few years in a post-Covid-19 world with underemployment.

Many studies have examined the necessary additional investments that are necessary to green our capital. For example, in the transportation sector, the additional investment cost measures the cost differential of using an electric vehicle rather than a fossil fuel vehicle. Quinet (2019) and France Stratégie provided a recent synthesis. The OECD estimates at $6,900 billion per year the necessary green investments in the world for the next 15 years, which corresponds to a 10% increase in the current flow of investments in infrastructure. In IPCC (2018), this flow is estimated at 2.5% of world GDP every year.

The European Commission (EC, 2018) estimated the flow of necessary additional investments in Europe from 2030-2050 to be between €175 and €290 billion per year to achieve net-zero emissions in 2050. In France, the recent report of the *Stratégie nationale bas-carbone* (SNBC, 2020) from the Ministry of Ecological Transition has estimated the flow of sectoral investments that supports its strategy toward carbon neutrality in 2050 (see Table 1). A simple number to keep in mind is the 2.5% share of GDP necessary to fund the transition in the next few years, but this share will increase over time. Only half of it should be counted as extra costs (SNBC, 2018). Quinet (2019) also estimated the investment overcosts per sector. These estimates are described in Figure 2. This transition is thus feasible in terms of capital allocation. Most of this additional effort will have to be

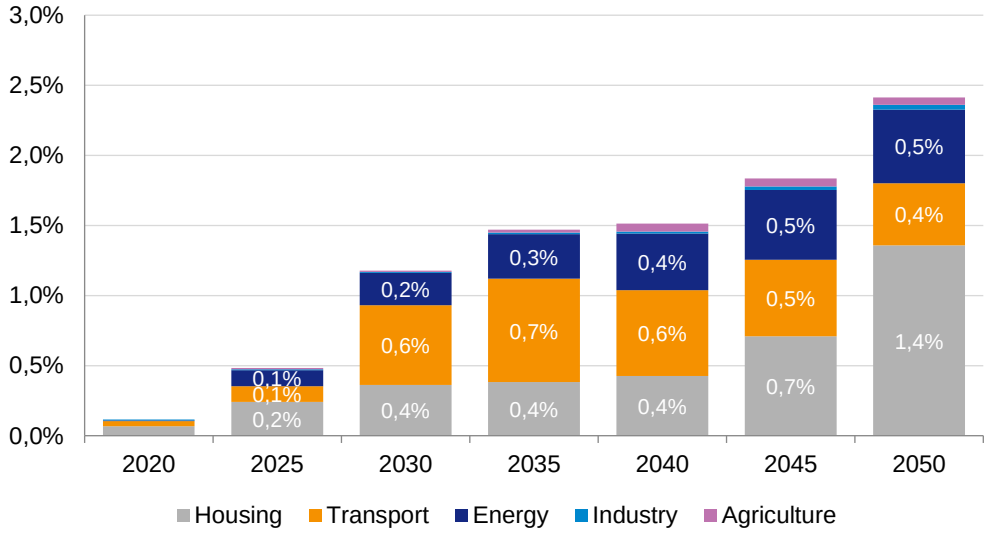
borne by the private sector, and it will be necessary to make these investments attractive for the stakeholders.

Table 1 – Flow of gross investments to attain net-zero emission in the *Stratégie nationale bas-carbone* (in € billion per year)

	2019-2023	2024-2028	2029-2033	2034-2050
Housing	14	18	22	28
Transport	21	36	52	85
Energy and networks	11	10	11	13
TOTAL	**46**	**64**	**85**	**126**

Source: SNBC (2020)

Figure 2 – Estimation of investment overcosts per sector in France, expressed in percents of GDP



Source: Quinet (2019)

Investment costs are only one element in the various costs associated to the ecological transition. Some of these costs will be compensated by a flow of economic benefits, as in the case of the thermal insulation of dwellings, which will reduce household energy bills. Other costs are not capitalistic. The net cost for France to achieve its climate ambition could be estimated as follows. France should reduce its emissions (currently at 0.31 $GtCO_2$/year) by around 35% in the next 10 years. Assuming an abatement cost

around €250/tCO_2, as estimated by the Quinet Commission for 2030 (Quinet, 2019), this yields a total cost of €27 billion that year, or approximately 1.1% of GDP_{2030}, assuming a 1% growth rate. It is an upper bound since this estimation assumes a flat marginal abatement cost curve.

2. Perceptions and Willingness to Act

With such overwhelming scientific evidence, what is the willingness to act and the perceptions of the public? How can they impact, accelerate, or delay the needed transformation of our economies? The good news: there is consensus in the need for action. Among the public, there is ample consensus on the nature and magnitude (to an extent) of the problem. French people are particularly aware of the human origin of climate change. According to a recent survey by Douenne and Fabre (2020a) to 3,002 French residents, over 90% of respondents agree that climate change is present whereas only 3% believe it is not occurring. Furthermore, 80% of respondents agree that climate change is at least of serious gravity. Among such households, 35% of them chose the gravity to be disastrous and over 40% to have cataclysmic consequences.

Even with such a strong acknowledgment of the perceived gravity of climate change, there is a gap between acknowledging the need for action and actively supporting ambitious climate change policies. Households understand this is a serious matter, but are unaware of the degree of deep transformation necessary to address the problem (Douenne and Fabre, 2020a). Furthermore, there are additional challenges associated with finding agreement on how to allocate the burden, both inter-temporally and across households, along with a mismatch between the needed investment in, and costs of, varying policy tools, and the expectations on how much the transition will cost. There is also a general issue of building trust around the particular climate change policies that are eventually chosen. We highlight several challenges below.

Challenge 1 – Social acceptability and beliefs around the cost of the transition

There is substantial disagreement on how the burden of the transition should be allocated among the public, as well as often a misperception on the costs of climate change policies, either over- or under-estimating its monetary costs. Such perceptions affect the policies that can be approved, as some of them end up being more popular than others due to these misperceived costs.

In a recent survey sponsored by the Haut Conseil pour le climat (HCC, 2020), 91% of the respondents consider that it is urgent/very urgent to act against climate change. But only 72% of the respondents support the idea to apply the polluter-pay principle to tax carbon emissions, which would affect their purchasing power. Earlier in 2020, the Convention

citoyenne pour le climat (CCC, 2020) flatly rejected any debate on the carbon tax defended by Katheline Schubert, Professor at Paris School of Economics, at the occasion of one of their early plenary sessions. Moreover, the report of the CCC, which provides many important recommendations, ignores this policy option. The HCC examined the reasons for the relative distaste of the carbon tax in France. Almost nine out of ten respondents believe that the climate policy should not affect the financial situation of the middle class, thereby suggesting that they believe that the ecological transition could be performed at no cost. An alternative interpretation would be that a majority of the French citizens believe that the rich should pay. The policies of the last three decades bear a responsibility for this biased perception among the French population of a happy energy transition, creating millions of jobs and reducing the electricity bill. It has created the conditions for the emergence of the *Gilets jaunes* movement (Yellow Vests).

While support for other policies is larger, their costs are often hidden. It is also unclear that this support will be enough to facilitate the needed investment without substantial efforts in communicating the urgency of action, or to give power to political parties that are more ambitious in the fight against climate change.

Challenge 2 – Social acceptability around equity and fairness concerns

Replacing cheap fossil fuels by renewable sources of energy will be costly for society, at least in the short term given the existing technologies. Some people will bear larger costs than others. This raises a critical concern about the redistributive impacts of the climate policies, in particular because the income-elasticity of energy demand is smaller than unity in Europe. In other words, poorer households spend more of their income on heating and transportation. To find a good compromise that can have enough support, it is important to be quantitative about these impacts and create compensation mechanisms within the proposed policies. It is thus essential to convey the difference between incidence (who bears the impact of the costs of the policy) and overall cost effectiveness (e.g., overall costs per reduction of ton of carbon) to ease such debate. To induce the acceptability of a measure that creates positive net social value, we support any measure that transfers part of the gain of its winners to compensate its losers.

Even though carbon taxes clearly enumerate the costs and incidences, there is still strong opposition to this policy. Much of the resistance stems from tax aversion, which influences beliefs about tax properties such as effectiveness or fairness (Douenne and Fabre, 2020b). Adding explicit, redistributive goals as a foundational aspect of climate change policies has been suggested as a possible means to address this problem. However, opposition may persist even in the presence of explicitly redistributive taxes, thus the need to carefully address this challenge. Indeed, in a recent survey performed during the *Gilets jaunes* movement in France, Douenne and Fabre (2020b) found that the respondents tend to overestimate their loss, to wrongly think that the combined policy (carbon tax cum lump

sum redistribution) is regressive, and to not perceive the effectiveness of the carbon tax at reducing emissions.[1]

Challenge 3 – Social acceptability around the tragedy of the horizons

The belief of relatively costless transition may limit the political support to any policy that would impose sacrifices to the citizens. As it induces procrastination, it raises the issue of the intergenerational sharing of the cost of the transition. Even if many of the climate damages are no longer perceived as distant in the future, the costs of action are immediate. Inertia is inherent to the carbon cycle. Current anthropogenic GHG emissions will persist in the atmosphere and in the oceans for centuries and millennia. They will impose damages for many generations to come. The US Interagency Working Group on the Social Cost of Greenhouse Gases (IAWG, 2013) gives us a simple way to estimate the duration of the flow of damages, which is around one century. Reducing emissions today contributes to reducing damages in the short term, but most of the benefits will be felt in the distant future, on average in 100 years.

This so-called "tragedy of horizons" is an additional source of complexity to fight climate change. The Covid-19 experience can be a useful contrast to understand this challenge. In the case of the Covid-19 crisis, citizens perceived almost immediate collective benefits to their individual efforts, which made the strict lockdown more socially acceptable. In the case of the climate crisis, the collective benefit of our individual efforts will be much stronger than those of the Covid-19, but they will materialize in a more distant future, which limits the desire for short-term sacrifice.

Challenge 4 – Social acceptability around the tragedy of the commons and international competition

Additionally, the international dimension of the problem can create conflicting views on who should bear the costs of this transition at a global level, what is known as the "tragedy of the commons." The European Union needs to set the expectation that the efforts to combat climate change will be maintained even if other countries fail to comply, at least for a while. It is not obvious that public opinion will follow.

That said, it is important to pay attention to the potential losers from asymmetric regulation. The lack of international harmonization can particularly impact workers in emissions-intensive sectors, leading to some regions or household groups being most affected by these competition issues. These sectors have often already suffered from loss of

[1] The lack of transparency about the objectives of the carbon tax since its introduction in 2015, the limited political attention to the redistributive issue, and the dramatic softness to tax exemptions for powerful pressure groups (truckers, farmers, taxis…) have also contributed to this fiasco.

employment opportunities due to the process of globalization of the supply chain and the energy-bias in trade (Shapiro, 2020).

As we will highlight in the next sections, finding a balanced policy approach that confronts and addresses these challenges is essential. Wide acceptability of climate policies is needed to ensure their success and continuity. Even if there is substantial agreement on the scientific evidence regarding the existential threat that climate change poses, successful climate change policies need to be feasible and implementable as rapidly as possible.

Despite the difficulties (tragedy of horizons and commons, belief bias), finding wide and decisive consensus in practical policy implementation is of utmost importance to effectively fight climate change.

3. The International Challenge

In addition to the challenges in perceptions and willingness to act at the national level, solving the climate crisis requires considering the global nature of the problem. French CO_2 emissions represent less than 1% of the global emissions of this GHG. Even if France were to fully decarbonize its economy, that would only marginally affect the climate dynamics. Even at the European Union level, EU-28 is currently responsible for approximately 9% of global CO_2 emissions. There is thus no point to think about our climate policy in a vacuum. But it creates an internal coordination problem that is easier to solve under the EU constitution than under the much weaker rules of international law.

There is a risk that such immense challenge, and the limited impacts of greenhouse gas reductions by the European Union to the global problem, can lead to nihilistic positions that prevent progress. While this has been true for many decades, the impacts of climate change today are sufficiently acute that governments are starting to take more serious action. In some ways, the increased perceived costs of the problem reduce the coordination challenge. In this scenario, there is high value in leading an effort to tackle the problem. Being united reduces the international free-rider problem in the global negotiation and makes compliance by other trade partners, now more willing to act on their own, more attractive.

Recent encouraging developments can make the value of these commitment and policies even larger. Several high-emitting countries have recently announced their intention to commit to net-zero carbon emissions by 2050 or 2060, including China, Japan, South Korea, and the likely addition of the United States under a Biden administration. Whereas announcements set a useful guiding post, the European Union can lead by example by sticking to intermediate goals, such as the recently announced plans of 55% reductions

by 2030 that ensure progress at an adequate pace. Europe can play a major dragging and exemplary role at the international level.

Europe is the right level to shape an efficient climate policy. The EU should set an example with ambitious goals and materialized action to contribute to solving the international challenge.

To make more clear the need for the EU to markedly pave the road for ambitious international climate policy, it is useful to understand the magnitude of the challenge. Even if Europe enhances its climate change mitigation efforts in line with its carbon targets, this will be insufficient if other countries do not match the effort.[1] In fact, the Paris Agreement nationally determined contributions (NDCs) are insufficient to achieve the IPCC Fifth Assessment Report mitigation scenarios to limit warming given current pledges.

The IPCC Sixth Assessment Report predicts several country-level shared socio-economic pathways (SSP) for CO_2 emissions extended as far as 2100. SSP1-1.9 represents a pathway for global emissions in which average global temperature rises are limited to 1.5°C, and SSP2-2.6 represents a pathway for global emissions in which average global temperature rises are limited to 2°C.[2] These two pathways in particular should be seen as targets relative to pathways such as SSP2-4.5, which is regarded as the high-emissions baseline, or business-as-usual scenario.

In the following analysis, this report attempts to calculate the gap between the world's current climate pledges and the target emissions scenarios. The two sources of climate pledges are Paris Agreement NCDs, collected from the Climate Action Tracker website,[3] and the recent net-neutrality commitments made by several nations. These pledges are combined with historical OECD emissions from the Greenhouse Gas Emissions database[4] to create reasonable country-level emissions pathways through 2050. For any nations without NCDs or net-neutrality commitments, the SSP2-4.5 mitigation scenario[5] was inserted to create a global forecast for emissions based on our current pledges.

[1] See Deutch (2020) for a piece discussing similar limitations to any US efforts that focus narrowly on net zero emissions by 2050.

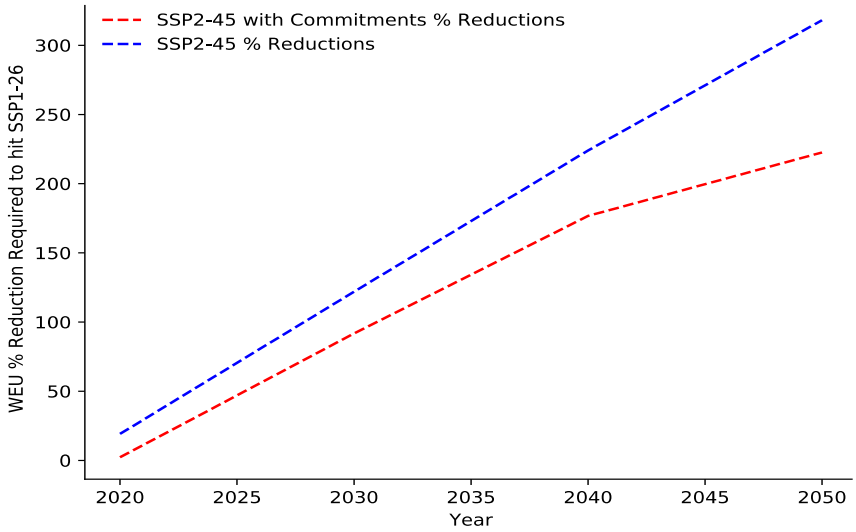
[2] Meinshausen, M. (2019), "The implications of the developed scenarios for climate change," In: Teske, S. (ed.), *Achieving the Paris Climate Agreement Goals*, Springer.

[3] https://climateactiontracker.org/.

[4] OECD Stats, Greenhouse Gas Emissions.

[5] As a test of robustness, and to demonstrate the differences between SSP2-4.5 relative to the Paris Agreement NDC forecasts, the business-as-usual mitigation scenario alone is used as a secondary reference to compare to the SSP1-2.6 mitigation scenario.

Figure 3 – Required percentage reductions to 2015 emissions (%)



Source: Own elaboration

Figure 1 compares the global emissions trajectories, in $GtCO_2e$, for the SSP1-1.9 mitigation scenario, the SSP1-2.6 mitigation scenario, the SSP2-4.5 mitigation scenario alone, and the SSP2-4.5 forecast combined with country-level pledges. While the SSP1-2.6 2°C warming track requires global emissions to be halved by 2050 relative to present day, the business-as-usual model indicates relatively stagnant emissions trends. The SSP2-4.5 track combined with mitigation pledges by key actors helps reduce emissions some but falls substantially short at delivering sufficient reductions by 2050. With clear evidence that the current stated commitments are not sufficient to meet the 2°C warming target, we then compute by what percentage, relative to 2015, the Western European Union must reduce their CO_2 emissions to reconcile the gap. Figure 3 shows the annual percent reductions.

Perhaps the most noteworthy aspect of Figure 3 is the stark nature of the results. The percent reductions are daunting at 50% in 2025 and net-zero by 2030, and become unrealistic under both scenarios shortly thereafter. There are four main lessons to take away from this analysis. First, the Paris Agreement NDCs and net zero commitments will not be sufficient to limit the rising global average temperature. Stronger mitigation policies are required for any hope of attaining the 2°C warming goal. Second, the burdens of these mitigation policies cannot be undertaken by only a handful of countries and regions. The efforts must span the globe if they are to have meaningful impacts. Third, it makes very clear the need to invest in negative emissions technologies that can help compensate for emissions in other regions. Finally, this analysis highlights that the scenario in which Europe takes “too much action” in mitigating climate change is highly unlikely under the stated goal of staying within target regarding the global carbon budget and warming.

Decisive action needs to be taken to fight climate change given the limitations in international enforcement. The need for negative emissions technologies and other policy solutions that engage a larger share of countries is self-evident.

Policies that reduce the compliance costs of non-complying countries (e.g., technological change either through explicit R&D policies or subsidies that trigger innovation) could be prioritized based on this principle as well. One option is to emphasize technologies that make alternatives to fossil fuels cheaper, such as scalable battery technologies for the electricity sector. This could help displace the burning fossil fuels even in countries that cannot afford, or do not desire, to participate in the effort to fight climate change. We discuss these aspects in detail in our recommendations regarding innovation policy (Section 3, point 4).

Carbon pricing implemented at the regional level is subject to substantial limitations when solving the international challenge, as it typically only prices domestic production. To ameliorate these issues, one should prefer policies that do not generate leakage, i.e., consumption taxes as opposed to production taxes or carbon border adjustment mechanisms. The desirable properties of these mechanisms need to be traded-off against the other aspects of the policies (e.g., feasibility). We discuss these issues more directly in the section about how to strengthen the EU-ETS (Section 3, point 1).

On moral grounds, there is an argument to envision a broader global cap-and-trade system with emission allowances based on an equal per capita basis. The mean emission of greenhouse gas in the world (as in France) is around 6 tCO_2e per capita and per year. But each of the 331 million people living in the U.S. emit 16 tCO_2e per year on average, whereas the 90 million people leaving in D.R. of Congo emit basically none. If one considers a carbon value of €60per tCO_2e, this means that U.S. excess emissions have an annual value of €200 billion, whereas the carbon credit of D.R.C. should be valued at €32 billion per year. The North should seriously recognize its responsibility in future climate damages and should consider the possibility of paying the South for implementing the necessary investments to green its economy. This could be performed by requesting the South to enter in a ETS mechanism and by offering them free permits proportional to their population, which would at the same time increase the incentives for mitigation in developing countries.

Climate change policies that alleviate the tragedy of the commons should be prioritized over otherwise similar alternatives. Policy innovations that incentivize developing countries to join carbon pricing schemes should be considered, even if they lead to substantial transfers between countries.

Summary – Facts, Perceptions and Challenges

- Scientific evidence indicates a tight window to mitigate the already irreversible impacts of climate change.
- France's public opinion understands the need for action but might not be aware of the scale and costs of the necessary action.
- Perceptions disfavor taxes and policies that do not directly address the impacts of regulations on the middle class.
- France can and should play a relevant leading role within the EU and the world to continue leading with ambitious decarbonization targets.
- Climate policies should be designed to actively help reduce the international coordination problem.

SECTION 2

MAKING CLIMATE POLICY PROGRESS

For many years now, France and Europe have been attempting to achieve their ambitious objectives of emissions reduction with a wide set of policy instruments and micro-actions. There is a myriad of opportunities, small or large, transitory or permanent, individual or collective, cheap or expensive, to decarbonize our economy. Two key questions need to be addressed in this context:

1. Which actions should be prioritized to attain our climate objectives?

2. How should we reorganize our economic system to make sure that these necessary actions will be implemented?

The first question is about which climate actions to implement, such as retrofitting houses or buying an electric car. The second question is deeper as it addresses the role of capitalism, market regulations, individual freedom, democratic values and economic growth to fight climate change. These two questions are intertwined, because the structural transformations of the economy should be aimed at making sure that the prioritized climate actions will be implemented everywhere and by everyone at the right intensity, today and in the future.

Determining the optimal climate policy would require knowing the marginal abatement cost of every possible climate action by every economic agents in every sector of the economy. Such a goal is herculean, as experienced by the IPCC, or by the Commission Criqui currently working under the auspice of France Stratégie to estimate the cost per tCO_2 saved by different climate actions. In this section, we explore various methodological questions. What is the right framework to evaluate different policy options? What are the relevant trade-offs? How to quantitatively and qualitatively assess the merits of each policy? In Section 3, we make some specific policy recommendations based on the principles described here.

1. Guiding Principles and Policy Tools

The EU has democratically determined its climate goals through an emission reduction pathway that goes through a 55% reduction (with respect to 1990) by the year 2030, and zero net emission by 2050.[1] This emission reduction target should be attained at minimal cost for the citizens. This means searching for the set of climate actions that have the least cost per ton of CO_2-equivalent saved. This requires the implementation of all actions that have a cost per ton of CO_2 avoided below a certain limit value. This threshold is named the "carbon value", or the shadow value of the climate goal (Quinet 2019). The higher the cost per ton, the larger the emissions reductions. This shadow value provides information on the marginal costs of complying with the emission target. The more stringent the climate goal, the larger the carbon value. The carbon value also depends upon the cost of the available green technologies. This concept exists independent of whether one wants to decentralize the climate action through a carbon price, i.e., a carbon tax or a market for emission permits. It exists as soon as one recognizes the need to minimize the social cost of the transition.

The scientific evidence informs the policy design and in particular this carbon value. First, it provides a measurable objective on the necessary reductions of emissions (high certainty). Second, it provides a measurable cost to reducing such emissions. This effort to estimate the schedule of carbon values that is compatible with the French climate ambition has been performed three times under the auspice of France Stratégie, with three commissions chaired successively by Marcel Boiteux in 2001, Alain Quinet in 2009, and again Alain Quinet in 2019 ("Quinet 2"). The recommendations contained in their report are summarized in Table 2. The estimation of the shadow price of carbon for long time horizons should be taken with caution. For a net-zero emission in 2050, the estimations of this shadow price of carbon of the six models used in Quinet 2 are between €511 and €3,513/tCO_2. In IPCC (2018), the range of this shadow value for 2050 is between $45 and $1,050/$tCO_2$ for the 2°C target, and between $245 and $14,300/$tCO_2$ for the 1.5°C target. This reminds us the deep uncertainty surrounding in particular the marginal abatement cost for full decarbonization of our economies.

[1] The 2050 horizon is too distant to make current politicians accountable for such a distant commitment. Intermediate commitments can thus add important value.

Table 2 – Shadow carbon price (in 2018 euros per metric ton of CO_2) in France implied by three different commissions

	Boiteux (2001)	Quinet 1 (2009)	Quinet 2 (2019)
2010	32	32	
2020	43	56	69
2030	58	100	250
2050	104	250	775

Source: France Stratégie

The prices presented in Table 2 are useful to highlight the dramatic changes that need to be accomplished over the next few years and decades. The carbon values estimated for 2030 and 2050 correspond to the shadow price of the corresponding emission targets committed at the time of the publication of the report. For the Quinet 2 report, this is a 40% reduction in 2030 and net zero emissions in 2050. The shadow price of the carbon budget in 2030, almost four times as large as in 2020, highlights the need to steeply increase our efforts to fight climate change. The 8% annual growth rate of the carbon value seems too high compared to what would be socially desirable, suggesting that we are currently in too slow a transition pace (Gollier, 2020).

Carbon budgets should be a guiding tool in understanding the costs of the necessary effort to stay within the targets and also as a way to track progress.

In this report, we take the 2°C target as given. Economists disagree on whether this objective is too ambitious or too weak. Answering this question requires making normative judgments about how to weigh the sacrifices to be made by the current generation against the reduction of climate damages incurred by future generations if these sacrifices are made. An alternative to valuing carbon as the shadow price of the 2°C target would be to use the Pigovian approach based on the social cost of carbon (SCC). The SCC is the present value of the flow of marginal damages generated by emitting one tCO_2 today. This is a legitimate measure of the benefit of a climate effort to be used when examining its social value creation. Integrated assessment models such as the DICE[1] of William Nordhaus have estimated this flow of climate damages, but the uncertainty surrounding them remains very large, in particular for temperature increases exceeding 2°C. Moreover, economists disagree on which discount rate should be used to compute their present value, since a large fraction of these damages materialize in the distant future. Even if one treats all generations equally, there are two main arguments to discount them at a positive

[1] Dynamic Integrated model of Climate and the Economy.

rate. First, future generations are expected to be wealthier. Under inequality aversion and in a growing economy, the discount rate should be interpreted as the minimum internal rate of return of an investment that compensates for the fact that investing for the future requires sacrifices from the poor (the current generation) for the benefit of the wealthy (future generations). The low current interest rates and the possibility of secular stagnation reduces the power of this argument. Second, the discount rate should be adjusted for the risk profile of the benefits of the project. Dietz and al. (2018) have shown that in the DICE model, most of the benefits of reducing emission materialize if future generations are prosperous. This means that fighting climate change does not hedge the macroeconomic risk. This justifies adjusting the discount rate upward.

All in all, a discount rate in the range of 2-3% seems to be justified to estimate the SCC. Nordhaus (2018), who used a larger discount rate of 4.5%, recommends a carbon price around €35/tCO_2 in 2020 and €100/tCO_2 in 2050. On the contrary, Stern (2007), who uses a much smaller discount rate around 1.4%, obtained much larger estimations of the SCC. For the medium range of discount rates between 2% and 3% that we recommend, the SCC and the shadow value of carbon for 2020 are in the same range of €50-€100/tCO_2. Carleton and Greenstone (2021) suggest a discount rate of 2% and a social cost of carbon at €100/tCO_2.[1]

So far, we have only described carbon pricing as an operational tool for determining whether climate action is socially desirable. This is only the case if the net cost per ton of CO_2 avoided of this action is smaller than the carbon value. In theory, one could imagine a world where the state would evaluate in this way the myriad possible climate actions that are under the control of a myriad of economic actors, consumers, companies, state and local governments. In theory still, the state could impose on each of these actors to carry out these socially desirable, but generally individually undesirable, actions. But the state is not omniscient and omnipotent, and this planning can only work for large-scale actions that are relatively easy to verify, such as anti-pollution standards in the automobile and residential sectors, or the banning of coal and national flight connections.

Hence the second question asked at the beginning of this section: how to organize society so that the actions that should ideally be carried out by this myriad of actors are actually carried out? How can we adapt our society based on individual freedom within the framework of a democratic society to achieve our collective goal of reducing greenhouse gas emissions? As will be explained in more detail in the following section, economists are almost unanimous in recommending that a carbon price, equal to the carbon value defined above, be imposed on all emitters without exemption. Faced with the question of whether

[1] Carleton, T. and M. Greenstone (2021), "Updating the United States government's social cost of carbon," University of Chicago, Becker Friedman Institute for Economics, *Working Paper*, No. 2021-04, January.

to emit by paying this carbon price or not to emit, this universal carbon price would naturally lead each emitter to efficiently integrate in the evaluation of its actions their impact in terms of emissions reduction and climate damage.

This carbon pricing can be done through a tax proportional to emissions, or through an emissions permit market. These two pricing systems are in place in France, but the price of carbon they induce remains too low. A necessary step to make progress in climate policy is to implement more aggressive carbon pricing. As we explain below, a carbon price has the very appealing features of being technically simple to implement, covering many sectors without picking ex ante the winners and the losers from the transition (leading to cost efficiency gains), and allowing a quick ramp up in the ambition of climate policies without the need of large sums of public spending, rather increased revenues.

In theory, carbon pricing could be implemented through subsidies rather than through taxes. Indeed, the right price signal of the climate constraint could be sent to all emitters by offering a universal subsidy per tCO_2 saved. But funding that scheme would require raising additional tax revenues elsewhere in the economy anyway. And determining the benchmark emission from which emission savings would be measured is not feasible. We are not aware of any economist defending this solution.

Unfortunately, carbon prices as high as those reported in Table 2 are unrealistic at the national and European level, and even more at a global scale. However, it is important to still advance carbon pricing strategies, even if imperfectly implemented. Indeed, a recent MIT study highlights that even modest carbon prices, in combination with other policies, can substantially improve the efficiency of the combined policy portfolio.[1] The new EU ambition to reduce emissions by 55% by the year 2030 makes carbon pricing more necessary than ever.

Strengthened carbon pricing, locally and globally, should be an important step to cost-efficiently fight climate change.

A successful policy portfolio to deal with climate change will need to incorporate several other policies. A successful portfolio of climate change policy should include actions along a wide range of policy tools (e.g., see Acemoglu et al., 2012), such as subsidies, standards, etc. There are several reasons why a full battery of approaches is needed, ranging from the existence of market failures that limit the effectiveness of carbon pricing to political economy considerations that make the policy tool set acceptable.

[1] Dimanchev, E. G. and C.R. Knittel (2020), "Trade-offs in climate policy: Combining low-carbon standards with modest carbon pricing", *MIT CEEPR Working Paper*, No. 2020-020, November.

Before examining the possible instruments of these non-price policies in detail, let us list the reasons why such instruments should be considered. They are listed in the so-called Stern-Stiglitz report (Stiglitz et al., 2017):

> "Achieving the Paris objectives will require all countries to implement climate policy packages. These packages can include policies that complement carbon pricing and tackle market failures other than the GHG externality. These failures are related to knowledge spillovers, learning and R&D, information, capital markets, networks, and unpriced co-benefits of climate action (including reducing pollution and protecting ecosystems). Some countries may conclude that the carbon-pricing trajectories required, if carbon pricing were the sole or dominant instrument, could entail excessive distributional or adjustment costs. Others may conclude that, given the uncertainties, requirements for learning, and scale and urgency of the transformation, rapid and more equitable change could be achieved more efficiently and effectively in other ways."

The coordination of the large transformation ahead has been highlighted as a benefit of more directive policies. Some researchers (e.g., see Rosenbloom et al., 2020) frame the climate challenge as a complex system problem whose decarbonization requires a coherent sequence of strategic decisions by different actors. The transformation of cities illustrates the complexity of the ecological transition from the point of view of a systems problem, in which prescriptive coordinated policies can be useful and preferred to a carbon price.

While these policies are generally more popular and well received, a challenge when implementing a wide range of policies is that it can be overwhelming to select which actions one should take. For this reason, a systematic and comprehensive cost-benefit analysis should guide action in this area, as we explain below. It is also important to ensure that the set of measures taken are consistent across sectors and consistent with an ambitious carbon budget overall goal.

Finally, due to the greater popularity of climate change policies that are more directed towards particular sectors (e.g., bans, subsidies, sector-specific taxes), it is tempting to lay out recovery plans that only rely on such measures, ignoring the need to increase the price of carbon. There are two points worth mentioning in this regard. First, this would be a missed opportunity. Failing to integrate the necessary pricing signal in the economy can lead to more inefficient, costly outcomes, potentially missing novel approaches to mitigation, and it is an implicit subsidy to the consumption of emissions-intensive products. Second, policymakers should be aware that the state cannot do everything, and that the bulk of climate efforts will be carried by the private sector. The extent, depth, and aggressiveness of directed climate change policies should be increased very substantially to match the targeted carbon budget. The war against the climate can only be won by mobilizing all economic actors. In the absence of a stronger carbon price, and particularly

for policies involving subsidies, incentives or public investment, it is important to consider how revenues will be raised to match the challenge.

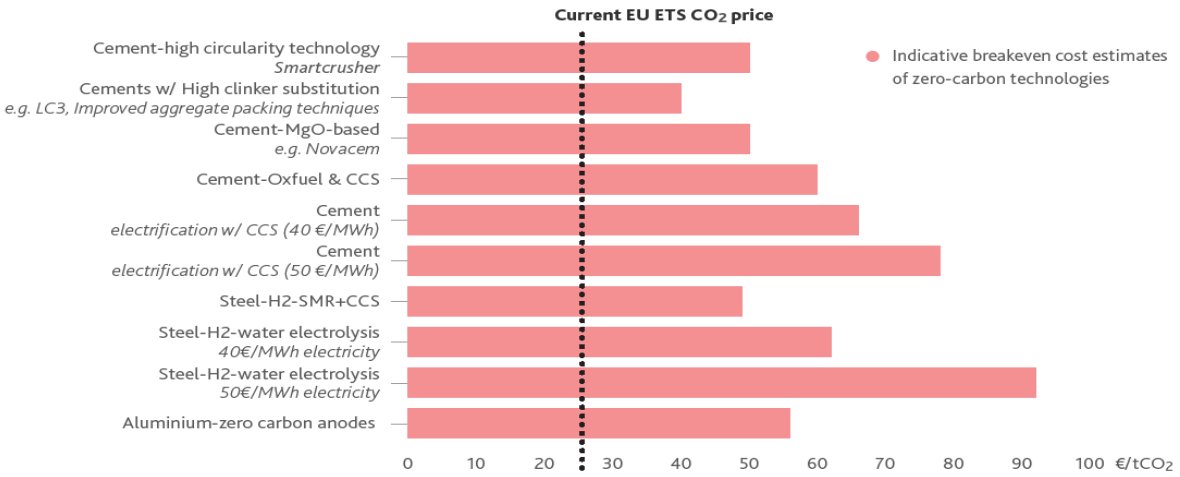
A wide range of targeted policies are needed to adequately fight climate change. Given limited resources, these policies need to be evaluated to inform the design of an effective policy portfolio. The ambition of such policy portfolio needs to match the desired target.

2. Carbon Pricing

In a free-market economy of free people, consumers and corporations have no natural tendency to integrate the global carbon budget constraint in their own actions plans. Thus, "climate change is a result of the greatest market failure the world has seen" (Stern, 2007). Since Pigou (1920), economists have been discussing a simple operational solution to solve this market failure. Over the years, this solution took a simple name, the polluter-pay principle, a principle that is overwhelmingly supported by French citizens. If a carbon price is uniformly imposed to all economic agents and is established at a level compatible with the global emission target, it aligns the myriad of private interests on this collective goal. If it is combined with other policies to tackle other sources of inefficiencies, it does this at the lowest possible collective cost. It therefore provides the best compromise between "the end of the month" and "the end of the world", a key condition of social acceptability in particular if the distributive effects are neutralized by a transparent redistribution of the carbon dividend. The urgency and the intensity of the climate challenge should be translated into a large carbon price. Carbon pricing has the advantage of being the policy tool that puts emphasis on the cost efficiency in terms of cost per tCO_2 built-in without the need of identifying the policies that will work in advance.

This point is very clear when considering the impact of a carbon price in a particular sector. Figure 4 presents estimates for different decarbonizing strategies in the cement and steel industries, which account for 18% of GHG emissions in Europe. These estimates suggest that costs are between €40 and €90/tCO_2 depending on the exact technology chosen. Instead of choosing a technology, the carbon price signals the costs of emissions and leads to the most cost-effective choices. It might also spur the development of alternative technologies not represented in Figure 4. As opposed to more prescriptive policies, a carbon price leaves room for innovative responses to the increased cost of carbon.

Figure 4 – Cost per tCO_2 saved in the cement and steel industries



Source: Sartor and Bataille (2019)

A value to carbon emissions also helps inform the needed actions across sectors. To illustrate the choice dilemma, let us consider three specific climate actions:

- Coal-to-gas: In Europe, the levelized cost of electricity (LCOE, which ignores the carbon price) is larger for natural gas than for coal, but one kWh of coal electricity generates more CO_2 than one kWh of gas electricity. It is estimated that a carbon price around €30/tCO_2 will make natural gas more competitive than coal to produce electricity in Europe. In other words, switching from coal to natural gas would have a cost per tCO_2 saved of €30/tCO_2. Such a reallocation of the EU electricity would have a large impact on EU emissions.[1]

- Residential photovoltaic panels: In France in July 2020, the feed-in-tariff program offered to all households willing to install photovoltaic panels on their roof a 20-year contract with a guaranteed price of 18.44 cents per kWh. Let us consider the best-case scenario in which such green kWh production eliminates coal kWh production for two decades. The policy increases the cost of the kWh for consumers by 10.94 cents and eliminates 340 g of CO_2. This raises the social cost of emission reduction to €304/tCO_2 saved.[2]

[1] A simple estimation of the cost per tCO_2 saved comes from the observation that in Europe in 2030, the levelized costs of electricity of new coal and gas power plants are expected to be equal to respectively €80/MWh and €97/MWh. One MWh emits 0.99 tCO_2 on average when produced with coal, but only 0.43 tCO_2 on average when produced with natural gas. In other words, one can save one tCO_2 at a cost of 17/0.56 = 30.36 euros by switching from coal to gas. This estimation does not take account of the other costs (lost jobs in the mining sector) and co-benefits (coal is dirtier) of this climate action.

[2] In 2010, the guaranteed price was 60 c/kWh, leading to a cost per tCO_2 around €1,544. We ignore here various other costs and benefits of the PV investment, such as the elimination of particulate matters around

- Speed limitation: In 2018, the Commissariat général au développement durable estimated the impacts of reducing the speed on French highways from 130 km/h to 110 km/h. The reduced death toll, the increased time lost in transportation, the fuel saved, the reduced noise, the cost of changing traffic signs, the increased congestion and the reduced emission of CO_2 were all taken into account. This cost-benefit analysis resulted in a measure of the social cost per ton of CO_2 saved around €500.

Implementing measures ranked by the marginal abatement cost (MAC) per tCO_2 saved minimizes the monetary costs for a given emissions reduction goal. Even if policies are not approved only based on this measure, the calculation of a unified MAC makes clear potential inconsistencies in climate change policy. For example, it would be inefficient to limit the speed on highways for the climate argument while continuing to use coal to produce electricity in Europe. Taking the first action and not the second leads to reach the goal of reducing emissions at a higher social cost. It also highlights that one of the best climate actions is to switch off all coal power plants on the continent and stop its extraction at a much faster and ambitious pace than currently planned.

People often underestimate the impact that prices have on our life. There exists no societal transition in History that has not been accompanied by a radical change in relative prices. Gutenberg printing invention dramatically reduced the cost and the price of books, thereby triggering the Renaissance and the Reformation movements. From pricey whale oil in the 16th century to the LED today, the cost and price of light has been reduced by a factor 1000, thereby transforming the "Dark Age" into a planet of light. After WWII, France controlled housing rental prices, with dramatic consequences on the supply of housing in the 1970's, with "bidonvilles" surrounding the cities, and with the actions of Abbé Pierre.[1] The price of gasoline at the pump has been twice larger in the EU compared to the United States over the last few decades, and this has a huge impact on the structure of the fleets of automobiles on the two sides of the Atlantic. Similarly, a growing price of carbon is necessary to accompany the energy transition.

A carbon price induces firms and consumers to choose the least-cost abatement options at that given carbon price. In the long run, price signals have a transformative impact on our lives.

There exist two possible carbon pricing mechanisms. Under the carbon tax mechanism, the state controls the carbon price by fixing the level of the carbon tax, and economic agents facing the tax adapt their emissions to this price signal. In that system, the price is

the coal power plants, the environmental cost of producing and recycling PV cells, or the other PV subsidies such as tax shields on capital expenditures and zero-interest-rate loans. A more comprehensive cost-benefit approach is discussed in more details below.

[1] We don't want to mean here that an unregulated competition on the housing rental market is the solution.

determined by the state, and the quantity is determined by the market. Alternatively, the state could sell emission permits to emitters and allow them to exchange these permits on a market where an equilibrium price of carbon will emerge. In that "cap-and-trade" system, the quantity is determined by the state, and the price is determined by the market.

A carbon price, implemented in either form, can be very effective and efficient at signaling necessary changes in production, as it signals the external costs of emitting CO_2 without the need to ex ante know what the best options are. The EU has had a carbon price in place since 2005 with its European Union Emissions Trading Scheme (EU-ETS), a cap-and-trade market. In 2019 in the EU, CO_2 emissions from the power sector fell by 12%, led by a steep decline in coal power generation, which was replaced half by natural gas and half by renewables. A plausible interpretation is that this comes mainly from a large increase in the price of CO_2 on the EU-ETS, from around €5/tCO_2 earlier in the decade to around €25 in 2019. It has reached €38 at the beginning of 2021. A tax on carbon dioxide emissions in Great Britain, the "Carbon Price Support" (CPS) of around £18/tCO_2 introduced unilaterally in 2013 on top of the EU-ETS mechanism, has led to the proportion of electricity generated from coal falling from 41% in 2013 to 7% in 2018 in that country (Gissey et al., 2020). Leroutier (2019) estimates that the CPS has reduced the total power sector emissions in the UK by almost 50% by 2017.

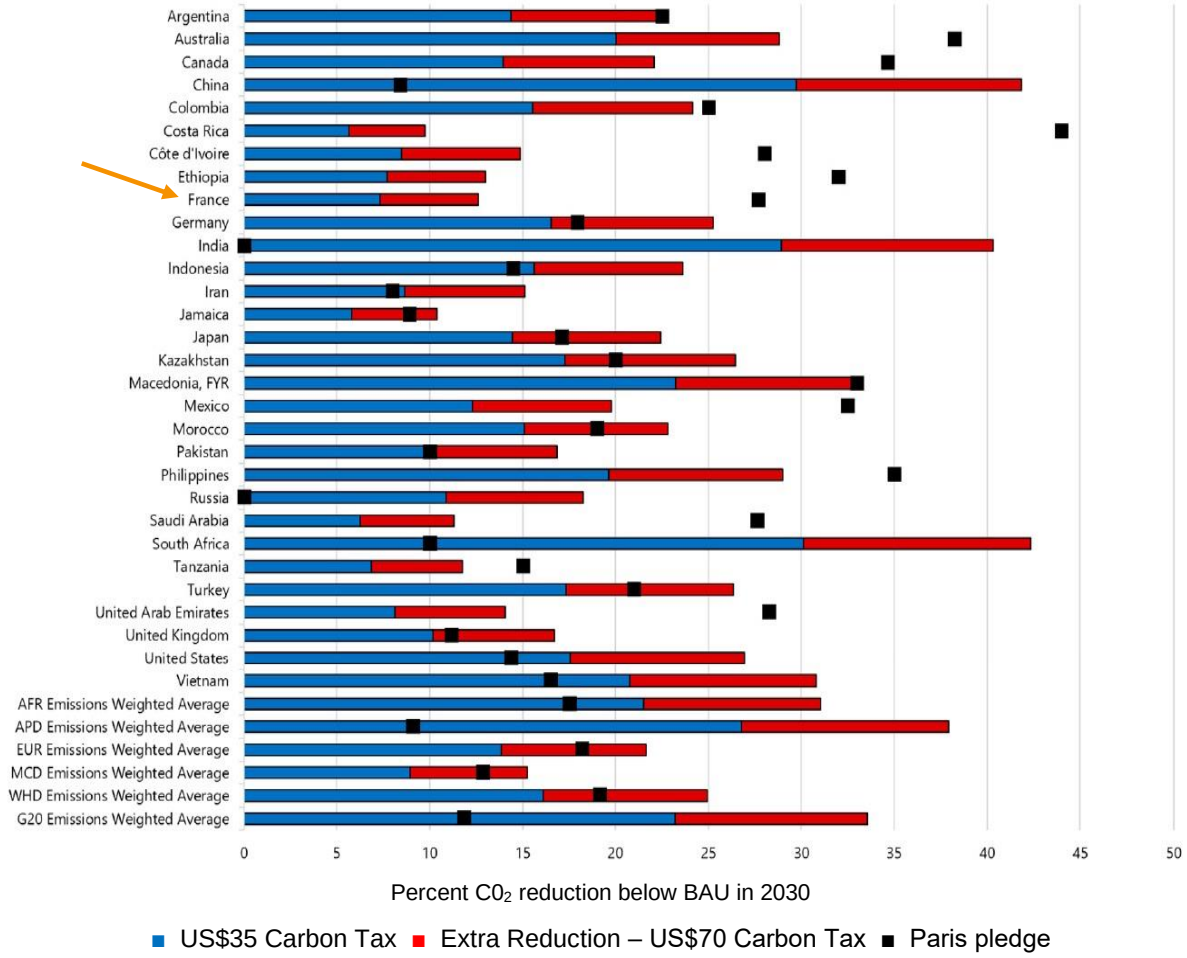
A carbon price does not only modify the production processes of goods and services in a more sustainable way. It also reduces the consumption of these goods and services whose production cannot be decarbonized. For example, it increases the price of gasoline at the pump, thereby reducing its consumption. For example, the £18/tCO_2 CPS in the UK raised the price of electricity by 20% (Gissey et al., 2020), because coal electricity is often the marginal technology that balances supply and demand in the UK. And a €50/tCO_2 tax on gasoline raises its price by 12 cents per liter. The long-term price-elasticity of gasoline demand has been estimated somewhere between -0.5 and -1.2.[1] This means that price-signals work, as illustrated by the difference in car characteristics between Europe and the United States linked to the vastly smaller gasoline taxes on the other side of the Atlantic. A carbon tax is thus compatible with the concept of degrowth, but a degrowth targeted on carbon-intensive goods.

A recent econometric analysis of the impact of carbon taxes on CO_2 emissions in Europe has been performed by Metcalf and Stock (2020). They use the important heterogeneity of carbon tax levels and timing across European countries over the last 20 years. They show that a \$40/tCO_2 carbon price limited to 30% of emissions sources would reduce global EU emissions by 4 to 6%. They argue that reductions would likely be greater for a broad-based carbon price mechanism since the study does not include in the tax base those sectors with the lowest marginal costs of carbon pollution abatement. (IMF, May 2019) is more optimistic,

[1] See for example the recent meta-analysis by Labandeira, Labeaga, and López-Otero (2017).

since this analysis shows that a uniform carbon price of \$35/tCO_2 could easily generate enough reductions of CO_2 to attain many national NDCs of the current Paris Agreement. However, this will be much easier for countries such as Germany, India or China, which use coal in their electricity mix than for France. More information is available in Figure 5. The French case is specific, because of its already vastly decarbonized electricity mix. Because the United States do still heavily depend on coal and did not incentivize people to save energy in the past, it would be much easier for that country to reduce emissions. The Stern and Stiglitz's report of the High-Level Commission on Carbon Prices (Stiglitz et al., 2017) claimed that "the explicit carbon-price level consistent with achieving the Paris temperature target is at least \$40-80/tCO_2 by 2020 and \$50-\$100/tCO_2 by 2030."

Figure 5 – Impact of a \$35 or \$70/tCO_2 carbon tax on CO_2 emissions, and comparison with Paris pledges

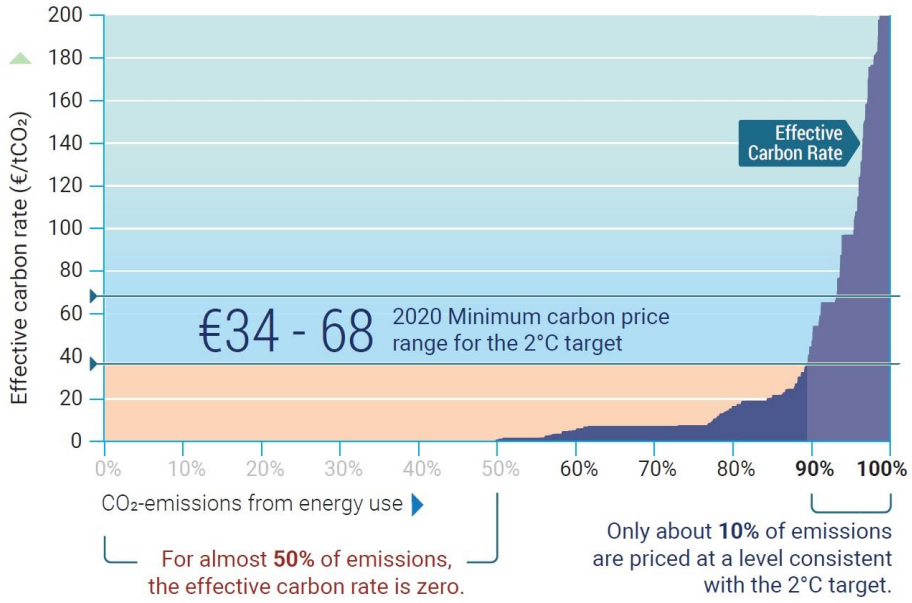


Source: Stiglitz et al. 2017

Carbon pricing not only incentivizes cleaner production processes, it also signals the benefits of reducing consumption of emissions-intensive goods leading to the necessary transformation of our society.

Carbon prices should be applied uniformly. However, we are very far from such a uniform carbon pricing in the OECD and G20 countries, as illustrated in Figure 6. Measuring effective carbon prices is made complex because of the other taxes covering energy products. In Europe for example, non-carbon taxes are imposed on gasoline to finance road infrastructures and to cover other externalities (local pollutants, congestion, noise). For France, it has been estimated at the occasion of the *Grenelle de l'Environnement* that these other taxes cover the value of these non-climate costs (Rocard, 2007).[1]

Figure 6 – Distribution of effective carbon prices over energy-related CO_2 emissions for 42 OECD and G20 countries, representing 80% of global CO_2 emissions



Note: Carbon prices include carbon taxes, permit prices related to existing ETS and excise taxes on energy (also including those not motivated by a climate policy objective).

Source: OECD and UNEP (2018)

The absence of exemptions to the carbon price is critical for the lobby-proof argument, but more importantly for least-cost efficiency. The government must resist the influence of the lobbies in this area. Any difference in carbon prices faced by different consumers, producers,

[1] Indeed, Figure 6 can be very misleading for gasoline products. A recent IMF report (Coady et al., 2019) shows that gasoline is still subsidized relative to its true cost to society in France and the EU, and, therefore, its effective carbon rate is below the desired level. The effective carbon rate of gasoline products is mostly zero in the European Union.

sectors, countries or regions is cost inefficient, as transferring some efforts from agents confronted by a high carbon price to agents confronted by a lower carbon price would reduce total cost for the same total emissions reduction. Similarly, imposing specific emissions targets to specific sectors or regions would raise the global cost with no global benefit associated. Splitting the global carbon budget into sectoral or regional carbon budgets will require imposing different sectoral or regional carbon prices, which is not least-cost efficient.

The fairness of the allocation of emission reductions should be measured by the allocation of net costs, not by the allocation of emissions in the economy. The French *Stratégie nationale bas-carbone* (SNBC) by the ministère de la Transition écologique et solidaire (2020) provides a reference scenario of sectoral reductions until 2033.[1] The executive order ("décret") 2020-457 of April 21, 2020 translates this scenario into sectoral carbon budgets.[2] But visibility and predictability should be on future carbon prices, not on sectoral reduction efforts. Ideally, the SNBC should be optimized by ensuring that the sectoral targets it sets lead to an equalization of marginal abatement costs, i.e. implicit sectoral carbon prices.

The important exemptions to the carbon tax offered to taxis, farmers, fishers, truckers or airline and maritime companies do not only demonstrate the inefficiency of the system. They have also nurtured a sense of inequity that has been at the origin of the *Gilets jaunes* movement (Yellow Vests). The dual mechanisms of a carbon tax at €44/tCO_2 for consumers, and the EU-ETS price at around €25/tCO_2 for the industry, reinforced this sentiment.[3]

There is a strong consensus among academic economists around the world on this issue. In January 2018, the Climate Leadership Coalition (CLC) published a statement to support a uniform carbon tax in the United States.[4] In its first article, it stated that "a carbon tax offers the most cost-effective lever to reduce carbon emissions at the scale and speed that is necessary." It was signed by more than 3,500 academic economists, 27 Nobel Laureates in economics, all former Chairs of the Fed, and 15 former chairs of the Council of Economic Advisers. In Europe, a similar statement[5] was coordinated in 2019 by the European Association of Environmental and Resource Economists. In the early summer of 2020, a coalition of three

[1] It is fair to say that the SNBC is not a compulsory allocation of the mitigation efforts in France. Its periodic revision should be based on the equalization of the marginal abatement cost across sectors.

[2] See *Journal Officiel*, décret n° 2020-457 du 21 avril 2020. For example, the transportation sector should reduce emissions from 0.137 $GtC0_2$ in 2015 to 0.94 $GtCO_2$ in 2029, whereas the agricultural sector should go from 0.089 to 0.072 $GtCO_2$.

[3] The use of the carbon tax to increase budgetary revenues, as opposed to benefit households, also reinforced such perception (Douenne and Fabre, 2020b).

[4] "Economists' statement on carbon dividends", first published in the *Wall Street Journal* on January 17, 2019: https://clcouncil.org/economists-statement/.

[5] https://www.eaere.org/statement/

German Academies of Sciences[1] published a statement "to create a uniform price for all greenhouse gases, covering all sectors, regions, stakeholders and technologies."

In France, several public institutions have publicly recommended to relaunch a redistributive carbon tax after the carbon tax freeze by the government in December 2018 at the occasion of the *Gilets jaunes* movement. The Haut Conseil pour le climat, the Conseil des prélévements obligatoires,[2] the Conseil d'analyse économique,[3] the Commissariat général au développement durable,[4] the Conseil économique du développement durable[5] and the French-German council of economic experts have all recently expressed their support for using such a solution, as an inescapable instrument to attain our climate objectives. Several French think-tanks, like Institut Montaigne[6] and Terra Nova[7], and NGOs share this view. Over the last three decades, France Stratégie has published a series of reports to revise the values of carbon that are compatible with the French climate ambition.

Ideally, governments should use their fiscal power to price all emissions, using a unique carbon price per tCO_2, without any exemption.[8] Any emitter would examine its own options to reduce its emissions, and it would rationally decide to implement all those which would cost it less than the carbon price, and only these ones. This universal carbon pricing system is a crucial signal to decentralize the mitigation decisions of the myriad of emitters on this planet. It is easy to implement when the sources of GHG emissions are observable and it does not require raising revenues. It is also a transparent decentralization procedure whose lobbies will find hard to manipulate.

Recognizing a growing consensus among academic economists and elsewhere, we recommend to decentralize our collective climate ambition through uniform carbon pricing.

For a given capital stock in the energy, industry, transportation, housing and agricultural sectors, the margins to reduce emissions exist but are relatively limited. The current carbon

[1] *Energy Transition 2030: Europe's Path to Carbon Neutrality*, German National Academy of Sciences Leopoldina, ACATECH - National Academy of Science and Engineering, Union of the German Academies of Sciences and Humanities, June 2020.

[2] CPO (2019), *La fiscalité environnementale au défi de l'urgence climatique*, September.

[3] CAE (2019), "A proposal for the climate: Taxing carbon not people," by Bureau, D., Henriet, F. and K. Schubert, note No. 50, March.

[4] See Commissariat général au développement durable (2020), *La tarification des émissions de CO_2 en France*, July.

[5] CEDD (2019), "Impact du prix du carbone sur les émissions de CO_2. Des indices aux preuves", November.

[6] Chaney E. (2019), "Dividende carbone : une carte à jouer pour l'Europe," Note.

[7] https://tnova.fr/revues/taxe-carbone-comment-la-fiscalite-verte-s-est-mise-en-place-dans-certains-pays.

[8] We discuss in Section 3 (1.2) which sectors and emissions are likely to be included in practice.

price affects the incentives to reduce emissions using intensive margins: drivers can reduce their speed and distance; people can consume less beef; frequent flyers can switch to trains; households can use air-conditioning less intensively. However, there are limits to what can be attained in this way. The ecological transition requires more radical large-scale transformations that will affect the capital structure of the economy.

Most investment projects necessary to green our capital structure have long maturities: 15 years for electric cars, 20 years for PV panels and windmills, 50 years for nuclear power plants and the housing sector, and a century or more for high voltage electricity networks and transportation infrastructures. The decision to invest in these assets is determined by the expectations about what the carbon price will be during the entire lifetime of the investment rather than by the current carbon price. The carbon prices that will prevail until at least 2050 are the key determinants of the profitability of most green projects today. The low expectations about them is a key element of resistance to the triggering of the green revolution. Many green investments are socially desirable given our collective climate objectives and their associated carbon price, but they are not perceived as privately profitable because of these low expectations. The hesitations of the French government on the level of the carbon tax, and the EU's procrastination on the indispensable reforms of the EU-ETS system do not reassure the private actors involved in the transition. Too many producers and consumers continue to invest today in long-lived, carbon-intensive projects.

In spite of their large size, the announced recovery plans of 2020 do not provide a transparent way to green our economies. In particular, public money has been used to bail-out carbon-intensive industries, whereas consumers and corporations continue to invest in projects that are not compatible with the EU climate ambition. Governments can save our jobs and companies and, at the same time, reallocate productive capital in line with this ambition by credibly committing on large future carbon prices. It is also recommended that France and other EU countries abandon their current support for the fossil fuel industry, which takes the form of public loans and guarantees at below-market price for exploration, insurance, investments by state-owned companies, or direct fossil fuel tax exemptions. IISD (November 2020) recently estimated that G20 governments provided "$584 billion annually (2017–2019 average) via direct budgetary transfers and tax expenditure, price support, public finance, and [state-owned entreprise] investment for the production and consumption of fossil fuels at home and abroad." It also observed that "G20 countries allocated some $170 billion in public money commitments to fossil fuel-intensive sectors in response to the Covid-19 crisis between January 1st and August 12th, 2020." States should not interfere in the industrial organization of fossil fuels markets in any other way than carbon pricing.

To trigger now an extensive ecological transition compatible with our collective climate ambition, it is necessary to commit on a trend of growth for carbon prices until 2050. All subsidies to fossil fuels should be immediately banned.

There is much uncertainty today about which mitigation technologies will be available in even a few years from now, and about the associated cost per tCO_2 saved. This implies that we don't know today what carbon price will be necessary in the future to attain the planned emission target. Among the 356 IAM models used in the 5th report of the IPCC that are targeted to a 450 ppm CO_2 concentration, the mean carbon price in 2030 is $\$118/tCO_2$, with the standard deviation of $\$273/tCO_2$ and a range between 0 and $\$500/tCO_2$. This large heterogeneity reflects the technological uncertainty we face to decarbonize our economies (Gollier, 2020). This scientific uncertainty is reflected in the public debate, with some experts promising degrowth as the only possible abatement strategy (such as Jean-Marc Jancovici, from the Shift Project), while others believe that we will be able to completely decarbonize the European electricity mix by 2050 without increasing the price per kWh (such as Philippe Quirion, from Cired). Targeting quantities – i.e., fixing an objective in terms of limits to temperature increases, an intertemporal carbon budget, or emission pathways – leads to a large uncertainty on future carbon prices that will be borne by green entrepreneurs. At the same time, it may be socially desirable to allow for more emissions in the future than initially planned if marginal abatement costs remain prohibitively large. Under uncertainty, flexibility is key. Incomplete markets, i.e., the inability to find insurance against the carbon price risk, justify completing markets by imposing floors and ceilings to future carbon prices (see Section 3, 1.1).

The macro-finance literature over the last three decades has demonstrated that uncertainty is a key element in the timing of the decision to invest. In the absence of long-term risk-sharing mechanisms, more uncertainty induces entrepreneurs to postpone their decision to invest. The OECD (2021) has recently built climate policy uncertainty indices for a set of countries and it has correlated these indicators with the firm-level intensity of green investments. It shows that "the overall increase in environmental policy uncertainty observed in the countries covered by [its] indicator in recent years may have significantly slowed down efforts to decarbonize the economy." Thus, targeting emission reductions may have been a bad choice in the policy debate since the Kyoto Protocol when these initial quantity targets were negotiated. Then, why not commit to price targets? Price targets have the advantage to reduce the risk borne by green entrepreneurs. They are thus likely to trigger a strong movement towards the ecological revolution necessary to fight climate change. A carbon pricing pathway should be planned today for the next 30 years aimed at maintaining the temperature increase below 1.5 °C with some predetermined probability (90%, 95%?). Some variations below or above this price targets would be allowed by using some predetermined rules (Metcalf, 2019).

A key challenge of the current EU-ETS mechanism is that it is quantity-based, and therefore its prices can fluctuate substantially. This is particularly true with a carbon emission pathway approach where fixed emission reductions must be achieved at different dates. A given temperature target is associated to an intertemporal carbon budget, which allows more flexibility to react to the resolution of uncertainty surrounding green technological progress. The lack of a clear future price signal can limit investment. A clearcut illustration of this is given by the feed-in tariffs for PV panels in many EU countries. The existence of a guaranteed price for the electricity generated by these panels over 20 years triggered a huge demand that forced many countries to reduce the incentive. If this is possible with a subsidy to PV, why wouldn't it be possible with a carbon price?

Economists have discussed passionately about quantity targeting versus price targeting since the publication of the seminal paper by Weitzman (1974) on this topic. Given risk-bearing argument against the quantity targeting, there is now a consensus among economists that price targeting should be favored, as exemplified by the Economists' statement on carbon dividends of the Climate Leadership Coalition signed by 27 Nobel laureates in economics. As explained later on, the high price uncertainty generated by a quantity target limits the strength of the price signal. This must be fixed by switching to a hybrid mechanism in which the quantity target is framed by a price collar (see Section 3, 1.1). Yet, in practice quantity targets are much more common place.

France and the EU should commit on a carbon budget that is compatible with their climate goals with high confidence. Carbon price predictability should be promoted over emission targets to trigger the large-scale all-encompassing ecological revolution today in spite of the low current carbon prices.

3. Evaluating Complementary Climate Change Policies

We support a holistic approach to fighting climate change. The intensive work performed by the 150 randomly-selected citizens of the Convention citoyenne pour le climat produced a report (CCC, 2020) which illustrates the wide variety of possible actions [1] (see Box 1, next page).

[1] Other measures not directly related to climate change are not discussed here.

Box 1 – The "climatic" measures proposed by the Convention citoyenne pour le climat

- Banning terrace heaters.
- Banning advertisements for carbon intensive goods, such as S.U.V.
- Banning airline connections between French cities that can be traveled within 4 hours by train (see Section 3, point 7).
- Taxing the aviation industry proportionally to its carbon emissions (ibid.).
- Improving the attractiveness of trains, bicycles and shared transportation systems, through specific subsidies and a stronger public support for train/bike/car-sharing infrastructures.
- Banning soon the most polluting cars from densely populated cities (ibid.).
- Planning the phase out of the fossil fuel cars in Europe (ibid.).
- Banning fuel and coal heat systems, together with housing units ranked F and G, by 2030 (see Section 3, point 3).
- Reinforcing subsidies for global thermal retrofitting of the poorly insulated housing units, improving regulation (certification and labelling systems) of the energy efficiency market (ibid.).
- Developing the carbon accounting for all goods and services, and enlarging the scope of firms with a climate reporting obligation (see Section 3, point 5).
- Compensating and re-training workers most affected by the transition (see Section 3, 1.4).
- Imposing a carbon border adjustment mechanism (see Section 3, 1.3).
- Reducing the tax deductibility of carbon-intensive transport expenses.
- Rebalancing truck freight to (more efficient) railways.
- Reducing the speed limit on highways.
- Reforming the international pollution standards prevailing in the shipping industry.
- Promoting low-carbon organizations of labour.
- Investing in the energy efficiency of public buildings.
- Reforming the EU Common Agricultural Policy to green the agricultural sector (see Section 3, point 6).
- Penalizing environmental crimes ("*écocide*").

A large set of specific climate policies should be implemented at an intensity compatible with the strong EU ambition and the global transformation of our society necessary to achieve them. This climate policy package should be optimized to attain the emission target at a minimal social cost in order to reinforce its social acceptability. On a more positive tone, the portfolio of climate policies should be aimed at maximizing its positive impact on the welfare of French citizens, under the constraint of satisfying our emission target. It is a prerequisite for its acceptability. This requires being disciplined when comparing alternative policies given the wide range of options that are available and its varying implications in terms of co-benefits and potential spillovers. The intuition suggests that many recommendations of the CCC are expected to pass this test, but others not. For most of them, as we write this report, this cost-benefit analysis remains to be done.[1] A counterexample is the recommendation to reduce the speed limit to 110 km/h, which is known not to pass the test of generating more social benefits than social costs, as demonstrated by the Commissariat général au développement durable (Fragnol, 2018). Or, it is clear that short flights are dominated by fast train connections from a social point of view, but the threshold of train travel time of 4 hours to ban flights, as proposed by the CCC, should be optimized considering all costs and benefits. Even if some recommendations do not pass a strict cost-benefit analysis, it is necessary to provide a justification behind their adoption. This will increase transparency and avoid backlash as more and more ambitious policies are put in place. Even if suggested by the CCC, these more ambitious policies will also leave winners and losers behind, and thus generate some tensions. Finally, the recommendations of the CCC, whose global impact on French emissions have not been estimated, will certainly be insufficient to attain the 55% reduction target for 2030, in particular because they failed to address the key issues of the electricity mix and carbon pricing. In this report, we recommend to combine a portfolio of specific efficient policies with the imposition of a universal carbon price. Both legs are necessary to achieve our climate ambition.

Many, but not all, recommendations made by the Convention citoyenne pour le climat are likely to have a positive net social benefit for our citizens under the climate constraint. They will not be sufficient to reach the climate ambition of the country.

The multiplicity of targeted policies is a potential source of complexity and inefficiency. For example, subsidizing the development of solar and wind electricity in Europe is costly for the public purse, but it will have no effect on EU emissions, at least in the short run, since the electricity sector is covered by the EU-ETS system. These subsidies simultaneously reduce the demand for allowances by the electricity sector and their equilibrium price. This mechanically generates an equivalent increase in emissions by the

[1] The CCC's recommendations that will be translated into law will have to be evaluated ("*étude d'impact*") in the spring of 2021.

other sectors covered by the ETS (waterbed effect). In short, the solar and wind subsidies are pocketed by the cement and steel industries. These subsidies should at least be neutralized by an equivalent reduction of allowances on the market. It is also inconsistent to impose an eco-contribution from the airline industry, and at the same time asking it to fully compensate emissions by planting trees, to integrate the EU-ETS system, and to ban local flight connections. Social acceptability and least-cost efficiency require transparency, coherence and simplicity. In particular, if citizens accept the idea that a price signal is useful, a single instrument across sectors should be used. It should be a reformed and enlarged ETS system.

A first benchmark for evaluating the efficiency of policies at reducing GHG emissions is to create standardized measures of the monetary costs of reducing a ton of CO_2 for alternative policy tools, what is often called the Marginal Cost of Abatement (MAC). Cost measures in euros per tCO_2 can be very useful to elucidate which policies are urgent, which policies are more in a middle area in which other trade-offs should be considered, and which policies are unlikely to generate enough benefits even if feasible. This analysis can be performed by a public institution to evaluate any specific climate policy, by a socially responsible investor to evaluate the alignment of her portfolio to the common good, or by a corporation interested in measuring the extra-financial merits of its investments. This shadow price would then play the role of an “internal price of carbon” (see Section 3, point 5).

To make this classification, simply compare this MAC to the carbon value. The shadow price, or internal price of carbon, is likely to be larger than the carbon price that is put in place, given its limited social acceptability, thereby illustrating the second-best nature of the global climate policy package under this motivation. Valuing additional policies at the shadow cost of carbon makes it precise that current carbon pricing efforts are not on par to the challenge. Importantly, this shadow price of carbon should be unique for all policies being evaluated and included as an integral part of policy-making more generally.

The CCC recommended that climate impacts be included in the list of criteria for the evaluation and for the selection in public procurement procedures. The evaluation of the competing projects should be based on a sound cost-benefit analysis, in which their non-financial performances are integrated into the global measure of performance through transparent tutelary values. For example, decision-makers should use the public carbon value (from Quinet 2) to measure and compare the effective societal value creation of the projects under scrutiny. The greenness of a project cannot be in itself a sufficient condition for its selection against other competitive proposals. Public decision-makers should not get discretion about how to value extra-financial performances of offers submitted in public procurement, and clear evaluation guidelines should be published at the central level.

Transparent measures of the cost of reductions of alternative policies should be calculated. The shadow price of carbon should serve as a signal to all aspects of public policy making.

For most interventions, the cost per tCO_2 will be only one dimension of a much broader cost-benefit analysis (CBA). These policies will have other impacts, or co-benefits, beyond reducing CO_2 emissions. They will generate positive externalities (learning by doing, dynamic benefits from investing, knowledge and network spillovers, reduced local air pollution, etc.), more jobs, and they could have an impact on inequalities. The evaluation of public interventions, in particular from the EU Green Deal, should incorporate the social value of (good) jobs in more labor-intensive projects, probably tilting actions toward locally produced biofuels or reforestation in comparison to capital-intensive windmills for example. But contrary to the current practice of a multiple criteria approach, we recommend using CBA with a transparent way to value co-benefits, in particular, labour and inequality benefits. Many climate actions will transform society in a non-marginal way, so that the CBA must include general equilibrium effects that are difficult to predict in this context. Additionally, green policies tend to be seen more favorably by the constituents.

In addition to the cost of reducing one tCO_2 and its benefits, the degree of effectiveness in reducing emissions and the certainty around the estimated reductions is another important aspect to consider. Following the example from above, stopping coal extraction and consumption is likely to have immediate impacts on emissions, given that all likely substitutes, including natural gas, have smaller emissions intensities. Carbon capture and sequestration at power plants, on the other hand, can be more speculative over long horizons and its effectiveness harder to measure. The monitoring and verifiability of the reductions is also of crucial importance.

For policies to effectively reduce greenhouse gas emissions, they must be additional. Given scarce resources to fight climate change, it is inefficient to incentivize measures that would have occurred even in the absence of such incentives. This can be true at a micro level,[1] or at the macro level.[2] Given limited resources to expand these policies, it is important to consider these potential inframarginal effects when evaluating policies.

From a practical perspective, incorporating climate change at all stages of policy making requires: (i) transparently publicizing the official shadow price of carbon used in the evaluation of policies, (ii) setting guidelines for how to compute the climate change benefits and co-benefits of proposed policies, and (iii) creating a body of public servants that can provide guidance on the climate risks associated with given policies.

[1] See Boomhower and Davis (2014) for an application to energy efficiency on ways to measure additionality.

[2] For example, compensate the exit of a declining industry under the premise of climate change regulation.

Independent evaluation offices should be enhanced to systematically consider the climate change impacts of a wide range of policies. The CBA analysis should quantify the costs per tCO_2 abated and account for additional co-benefits in a transparent way.

There are many justifications for sectoral policies complementary to carbon pricing. In the remainder of this section, we discuss three of them: the learning effect, redistributive impacts, and employment co-benefits.

The learning effect is an argument often put forward in favour of using sectoral measures for the rapid deployment of green technologies. The use of a technology in real-world conditions generally leads to the acquisition of new knowledge that contributes to its improvement. Photovoltaic electricity is a good example of this. In the mid-2000s, many European countries willing to support the emergence of national champions in this sector offered generous feed-in tariffs, which created a green bubble. This bubble burst when the installed capacity exceeded that needed to acquire the new knowledge. Production was then relocated to China, limiting the co-benefits of local jobs to the installation of the photovoltaic panels alone. Calibrating the required size of a feed-in tariff program can be complicated, as the potential learning and spillover effects are unknown ex ante and difficult to assess ex post. However, as does the degree of uncertainty imply a trade-off between quantity and price in carbon pricing, this example reveals the importance of incorporating explicit quantity and performance targets in subsidy programs, which is now much more common.

Our income tax system is imperfect. As is well-known, in a second-best world, it may be undesirable to impose first-best solution, such as a universal carbon price. Stiglitz (2019) illustrates this idea with a simple example that supports the Stern-Stiglitz recommendation for a menu of policies. Consider for example the airline industry, whose services are consumed more intensely by wealthier people. Imposing a larger shadow price of carbon for that sector is optimal because it has the additional advantage of being paid by less vulnerable households, and because it allows the policymaker to reduce the carbon tax in other goods and services consumed by the poor. Cremer, Gahvari, and Ladoux (2003) calibrated an optimal carbon tax model in the context of France, where energy has an income-elasticity smaller than unity. They found that “the redistributive role of environmental taxes requires the polluting goods to be taxed at a rate much below their marginal social damage.” In Section 3 (1.4) we will come back to the redistributive issues related to carbon pricing.

A clear difficulty comes from using one instrument – the carbon price – to address two objectives at the same time: climate change and inequality. It is not appropriate in any cost-benefit analysis to adapt the value of one impact to take account of another impact that is not valued. Rather, the right method is to put a value on each of the impacts of the policy. This suggests to value inequality reductions independently of valuing emission reductions. CBA toolboxes should include distributional weights (Adler, 2019) that have the effect of valuing more benefits accruing to poorer households.

The French bonus-malus system is a good example, where people must pay a tax of €20 000 when purchasing a new car that emits more than 185 gCO_2/km. If one assumes 200,000 km lifetime distance for the car, and if we consider a substitute at 120 gCO_2/km, this sends an implicit carbon price signal of more than €1,500/tCO_2. However, these high-emission cars are mostly purchased by wealthy households, which may contribute to the justification of this policy, supported by the Convention citoyenne pour le climat. A similar observation should also be made for canceling some local airline connections in France, as proposed by the CCC, since they are mostly used by businessmen. Notice that these recommendations are based on a degree of collective inequality aversion that is larger than what is implicit in the French income tax system. These climate policies are more redistributive than the income tax system. This could be justified by the low price-elasticity of the demand for these goods.

Because the standard CBA toolbox in France and in Europe does not contain any notion of distributional weights, this evaluation remains to be performed. Distributional weights are already used for intertemporal comparisons. Recall that the concept of the discount rate is based on the idea that investment increases intergenerational inequality, and that it is therefore desirable only if its rate of return is high enough to compensate for this undesirable inequality effect. While discounting plays a key role in the evaluation of public policies carried out, for example, by the General Secretariat for Investment (SGPI), its equivalent concept in the context of intragenerational inequality (the weighting of benefits by the marginal utility of beneficiaries) is practically absent from analyses. We recommend that interpersonal distributional weights receive the same attention in CBA as intertemporal discount weights. In other words, we recommend that the French government strengthen its socio-economic evaluation toolbox by explicitly integrating a value of inequality reduction, rather than making it a separate argument in the evaluation of the impact of public policies.

A high carbon price will generate losers among the poor even when redistributing the carbon dividend. Clear examples are found among coal miners in Poland, or some rural households in France with limited green options. Specific tools should be used to address this problem, such as the EU Just Transition Fund or the development of public transport infrastructures. In the context of involuntary unemployment that is particularly intense during the Covid-19 crisis, public policies should value the social benefit of creating good jobs, as discussed in the previous Blanchard-Tirole report (Blanchard et al., 2003). Special attention should be given to regions that have been hit hard by the phasing out of carbon-intensive industries. Other climate policies, including direct subsidies to industries, should be evaluated by using job values that are specific to the local labor market characteristics.

The evaluation of climate change policies should include an explicit valuation of the benefits of reducing inequalities (distributional weights), and of creating jobs in regions facing involuntary unemployment. The quantifications of the relevant trade-offs should be made clear in an integrated cost-benefit analysis.

Summary – A Policy Portfolio to Fight Climate Change

- Enhanced carbon pricing should be an important step to increase the ambition in climate change mitigation.
- A wide range of other policy tools should be engaged to fight climate change to ensure adequate pace and to optimize against large uncertainties.
- These policies can target areas where co-benefits are substantial.
- Because these policies do not tend to raise revenue, and given restricted budgets, careful selection of projects is desirable.
- Performing transparent cost-benefit analysis is crucial to limit the cost of the transition:
  - valuing carbon reductions at the true cost of carbon, as informed by the shadow price of the budget constraint;
  - valuing the other benefits of these policies with clear assumptions and weights;
  - evaluating a wide range of public policies, even if they are not strictly targeted to fight climate change, to flag inconsistencies or unveil possible synergies.

Each sectoral measure must be consistent with all other climate policies, and with the carbon pricing mechanism.

SECTION 3

A CLOSER LOOK AT SPECIFIC POLICIES

In this section, we explore a number of global and sectoral climate policies, starting with the keystone thorough reform of the European carbon pricing system.

1. Strengthening the EU-ETS

Strengthening the EU-ETS seems to be the most feasible path of action within the EU. However, current efforts in Europe are modest, leading individual countries to enhance the extent of carbon pricing with country-level initiatives.

In France, carbon pricing in its dual form (EU-ETS market and carbon tax for non-ETS sectors) failed to obtain the popular consent, as illustrated by the *Gilets jaunes* movement (Yellow Vests). It is too complex to be transparent and it continues to be perceived as an additional tax without any ecological benefit. This is confirmed by the absence of redistribution of the fiscal revenue, both from the tax and from the auction of allowances (EUA). The large discrepancy between the EUA price and the forthcoming carbon tax levels in France, together with the existence of very visible exemptions to the tax, demonstrated the inequity of the system to the public. These observations, along with the lack of a clear vision of how to attain the announced climate objective, make it necessary to propose a more transparent, more efficient, more effective, and fairer approach.[1]

Given the nature of the climate challenge (carbon leakages, free-rider problem, difficulty for coordination and progress on international agreements, etc.), the European Union and its partners appear to be at the right level for decision-making on, and implementation of, carbon pricing. Only the EU is in a position to put in place a coherent and ambitious climate

[1] The complexity induced by the duality between the carbon tax and the permit market also led, in 2009, to the rejection of the first carbon tax project in France, resulting from the Grenelle Environment Round Table.

policy on the continent, with the following advantages: (i) avoid natural tendencies to environmental dumping among members, (ii) enhance the benefits of cooperation in the face of the common enemy, climate change, (iii) speak with one voice in international negotiations, and (iv) serve as an example of climate cooperation among nations. One possibility would be to create a uniform carbon tax. However, a formal carbon tax at a level compatible with the EU climate ambition will never materialize in the Union given the unanimity rule necessary to implement any fiscal reform in Europe. Therefore, we believe the best way forward is to work on the strengthening of the EU-ETS along several key dimensions. If the reforms are successful, it would eliminate the need for the French carbon tax. Separate pricing systems for different sectors or for different countries can only be interim solutions.

In order to evaluate any reform of the EU carbon pricing system, it is useful to think about its aspects that need strengthening along three dimensions: ambition, scope, and incidence. We list them in Table 3.

To ensure economic efficiency, the EU-ETS should be reformed to widen its scope, increase price predictability, and increase price ambition to a level closer to the shadow price of carbon. The fiscal revenue should be used in a transparent way, possibly to make the tax progressive.

Table 3 – Summary of the goals of a reform of the EU-ETS

Ambition	• **Price level**: Prices should be raised in line with EU climate goals • **LT Credibility**: Multi-decade price commitment
Scope	• **Raise ETS sectoral scope**: All local emissions should be covered • **Raise ETS geographic scope**: All imported emissions should be covered • **Raise ETS temporal scope**: All future emissions should be covered
Incidence	• **Transparency**: Carbon dividend should be transparently allocated • **Progressivity**: Compensate the lower deciles

Source: Own elaboration

1.1. Strengthening price ambition and predictability

The EU-ETS, created in 2005, has a long history of half successes and half failures. It has the merit to exist, but it still covers only 45% of the global EU emissions. Because of the

structural EUA supply-demand imbalance since 2012, the equilibrium price of the CO_2 permits has been much smaller than the social cost of carbon, i.e., the present value of marginal climate damages generated by the corresponding emission. Thus, it has not induced market participants to internalize the social cost of their pollution. Moreover, equilibrium prices have been very unstable. Finally, economists and experts have divergent beliefs about which shadow price of carbon will be necessary in the future to support the EU climate goals (Gollier et al., 2020).

The bottom line is that, under a quantity target mechanism such as the EU-ETS, households, corporations, innovators, and investors face deep uncertainties about the future cost of not shifting to greener technologies soon. This raises the important issue of who bears the risk of the energy transition. Because economic agents can hardly share the carbon-pricing risk through an insurance scheme, markets are incomplete, and the transition risk is inefficiently shared in the economy. This inefficiency inhibits the necessary green investments and justifies a departure from the pure quantity target mechanism of ETS. Let us recall here that many states have succeeded in setting up a system of guaranteed prices for photovoltaic kWh over several decades, which has had unexpected effects on the creation of considerable solar capacity. Why couldn't what has been done in this sector be achieved by setting a carbon price target over the same period of time?

Another argument in favor of switching from a pure quantity target to a hybrid system is based on the necessary coexistence of the specific climate policies that complement this carbon pricing mechanism. Any specific policy that reduces emissions in a sector will have the undesirable effect to depress the price of EUAs, thereby raising emissions in other sectors. This justifies moving toward a price target.

Several events of political interventions to reform the EU-ETS system have not improved its long-term credibility issue, but have already transformed it into a hybrid mechanism that combines price and quantity targets. The adoption of the Market Stability Reserve (MSR) in 2014 had no significant impact.[1] In 2017, the announcement of a complex mechanism to cancel excess allowances from the MSR had a strong impact on the EUA price. It increased the Linear Reduction Factor that specifies the annual reduction rate of the supply of allowances. The rate at which the MSR cancels allowances from auctions when the stock of unused allowances exceeds a certain level was doubled for the period from 2019 and 2023. We believe that this hybrid system remains too complex to restore credibility and long-term visibility. And there is still a long way to go to bring the long-term predictability required to trigger the extensive green transition.

[1] As allowances can be banked by market participants, putting excess allowances in a reserve (rather than invalidating them) should have no effect on their equilibrium price.

In this report, we propose two possible strategies to strengthen the current EU carbon pricing system. They are summarized in Table 4. Option 1 is in line with the current discussions to impose a minimum carbon price (see for example Fischer et al., 2019). In option 2, we recommend the creation of an independent Carbon Central Bank to solve the long-term credibility problem. In the spring of 2020, the Conseil économique pour le développement durable (CEDD, 2020) provided similar recommendations.

Table 4 – Summary of the options for a reform of the EU-ETS

Option 1 **Price collar on EU-ETS**	• EUA price floor and ceiling growing at 5% per year • CBA indexed on EUA price
Option 2 **Carbon Central Bank**	• Independent CCB with EU mandate • Announce price targets, annual revision

Source: Own elaboration

Option 1 – Predictable price collar for an all-encompassing EU-ETS

The EU Green Deal of the von der Leyen Commission contains several critically important initiatives. A key element of the EU-GD is to implement a carbon price floor when new allowances are auctioned. Unsold allowances due to the price floor should definitely be removed from the market (in exchange for imposing a price ceiling, see below). This is a highly relevant policy reform that goes in the right direction to reduce the uncertainty faced by green entrepreneurs. It mixes a quantity target with a (minimum) price target.

Notice that if the floor price is large enough, this reform could be reinterpreted as an EU carbon tax without the name. There is therefore a legal issue about whether introducing such a price floor should require unanimity of the members of the Union. (Fischer et al., 2019) argue that it should not. Otherwise, a grand bargain negotiation should be made where an ambitious carbon floor should be negotiated with countries with low MACs (such as Poland) against compensations (Just Transition Fund).

One critical ingredient is still missing here. The lower price predictability should not be limited to short time horizons. The grand bargain should be made on the basis of a carbon floor pathway covering the time horizon of the CO_2 reduction pathway. A Climate Treaty should make that explicit, together with a scientifically-founded revision mechanism. In the absence of a clear rule-based mechanism to control the evolution of the floor price, the long-term credibility of the system will remain limited.

Many western countries such as France (Quinet, 2019) and the United States ("Interagency Working Group on the Social Cost of Greenhouse Gases: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866", 2016) have established commissions in charge of periodically revising the carbon price pathway compatible with the national climate ambition. One of President Biden's first decisions on the first day of his arrival at the White House was to sign an executive order recreating a scientific commission in charge of setting a carbon value for the United States. In spite of its key role in this domain, and up to our knowledge, the European Union has never attempted to translate its greenhouse gas reduction targets into a sequence of carbon prices compatible with its highly publicized climate ambition. For example, it would be interesting to estimate the impact of the recent upward revision of the EU emission target (-55% in 2030 with respect to 1990) on the carbon value necessary to attain this new ambition. Given the critical importance of providing such a long-term price signal to the myriad of public and private operators of the energy transition, delivering this information would be very useful. This work could serve as an input to establish the carbon price floor and its projection over a long time horizon. Mobilizing Integrated-Assessment modelers (IAM), every year the European Commission should publish an estimation of the path of future shadow values of carbon necessary to achieve its climate ambition.

There are various challenges associated with this political long-term commitment. In particular, the constitutionality of binding future governments to a climate policy may be questioned. Notice, however, that France is already engaged through its ratification of the Paris Agreement and the binding EU climate ambition. This long-term climate ambition has also been translated in our legal system in the "*loi du 8 novembre 2019 relative à l'énergie et au climat*," which acknowledges the net zero emissions target for 2050. The associated carbon price should be considered as a corollary of this commitment.

Policymakers should be concerned by the complementarities that prevail between the various climate policy instruments. An important issue is the so-called "waterbed effect": direct subsidies for renewable electricity reduces the demand for EU-ETS emission permits and the corresponding equilibrium carbon price. The effect of the subsidy on total emissions is zero in that case. The intensification of non-price instruments should therefore be combined with an equivalent reduction of emission permits on the ETS market (Van den Bergh, Delarue, and D'haeseleer, 2013). This is yet another reason to advocate for an increasing price-floor or a price-based (as opposed to quantity-based) scheme.

Policymakers should also be concerned by the potential scenario in which the anticipated technological progress necessary for the energy transition does not materialize. The marginal abatement costs could skyrocket under that scenario, triggering economic

and social catastrophes. This would mean that the marginal cost of our sacrifices would be much larger than their marginal benefit. The carbon pricing mechanism should eliminate ex ante this possible efficiency by introducing a "safety" valve in the form of a carbon price cap growing over time at a predetermined rate. California has implemented such a mechanism. It should be noted, however, that setting a price cap creates the risk that emission reduction targets will not be met.

The EU-ETS system should be reformed to credibly commit to a carbon price floor and ceiling growing at a predetermined rate over the next three decades.

Option 2 – An EU Carbon Central Bank

The prevarication of States on the implementation of a carbon pricing policy necessary to achieve their stated emission reduction objectives makes their future promises not very credible, which reduces the speed of the transition. The political sphere already encountered a similar long-term credibility issue. Fighting climate change requires implementing effort in the pursuit of a long-term goal that can be eroded by more urgent objectives. The temptation is always present to postpone the necessary climate effort, thereby raising a credibility issue. Fighting inflation in the 1980's had a similar flavor, and the credibility issue has been successfully resolved by creating an independent institution, the European Central Bank, with a democratically-determined, long-term mandate to let consumption prices grow at 2%. This inspiring example suggests the creation of an independent Carbon Central Bank (CCB), with the mandate to keep the EU carbon price path compatible with the climate goals created by the democratic institutions of the Union. The EU-CCB would replace the current EU-ETS.

The governance of the EU-CCB would be independent.[1] Its board would be composed by legitimate scientists nominated by the National Academies of Sciences. Its prescribed goal would be to attain the emission targets prescribed by the Union. Its instrument would be the price of the emission permits that any importers or local extractor of carbon must pay to the CCB. The CCB would set the annual carbon price and make multi-decade projections for future carbon prices.

An alternative strategy for an EU carbon pricing mechanism would be to create an independent Carbon Central Bank with the mandate to set the carbon price based on the EU climate ambition.

[1] For more details, see Delpla and Gollier (2020).

1.2. Strengthening the sectoral scope

As stated above, the EU-ETS as of today covers only part of CO_2 emissions. A key proposed improvement under the European Green Deal is that the EU-ETS should cover a larger set of emissions sources. The extent of the sectoral expansion is still to be determined.

We propose to go one step further by making the EU-ETS an all-encompassing reliable system of EU carbon pricing. This would have the benefit of cost-efficiency and effectiveness. It would also make the system much more transparent, fair, and understandable.

To cover the transportation and housing sources of emissions, sellers of fossil fuels should have to purchase the corresponding allowances on the market. This all-encompassing carbon pricing mechanism would be an extraordinary achievement and would make Europe the most environmentally efficient region of the world. Moreover, it would be easy to implement due to the limited number of fossil fuel producers.[1] Given the relatively high price of allowances on the EU-ETS, the inclusion of currently uncovered sectors may generate a large shock to the economy. Rather than solving this issue by creating sector-specific ETS markets (as currently discussed in Brussels), we believe that a transition could be organized by converting CO_2 from different sectors at different rates converging to the same value within a few years.

In the polluter-pay principle, it is the polluter who pays the tax. The tax collection may be complex when the number of polluters is very large, as is the case for CO_2. If the Carbon Border Adjustment Mechanism is made politically and diplomatically possible, an alternative solution would be to tax the fossil fuels at the source. This would mean taxing fossil fuel producers rather than CO_2 emitters. The price signal would therefore be made upstream rather than downstream on the economic chain of carbon products. Following Stavins (2020), focusing on the carbon content of the three fossil fuels upstream "could enable a policy to capture 98% of the US CO_2 emissions with a relatively small number of compliance entities – on the order of a few thousand – as opposed to the hundreds of millions of smokestacks, tailpipes and other sources that emit CO_2 after fossil fuel combustion." Because the same quantity of fossil fuel can emit different quantities of CO_2 (and other pollutants) in the environment, this upstream carbon pricing mechanism should be combined with complementary policies to regulate the functioning of the combustion (boilers, cars, etc.).

[1] For example, refineries in California are already subject to carbon prices with limited additional administrative burden.

In the case of EU, that would mean imposing the carbon price on the importers of gas and oil when these raw products enter the EU soil, and on the exporters of the coal and limestone mines. The carbon price would be easier to collect as the number of importers and local extractors of fossil fuels is much smaller than the number of emitters. This upstream mechanism is likely to reduce the risk of manipulations, and to make the overall system more socially acceptable. It would also facilitate the expansion of the sectoral scope of the EU-ETS.

Fossil fuel emissions should be priced upstream, as opposed to at the point of combustion, to facilitate their total inclusion in the EU-ETS market and put an end to a longstanding missing gap in the coverage of transportation and heating emissions.

Greenhouse gases are not only limited to CO_2, and therefore a relevant question pertaining the strengthening of the EU-ETS is whether its sectoral scope should also be expanded to include other greenhouse gases. The EU-ETS has already been expanded with the inclusion of nitrous oxides and perfluorocarbons (PFCs) from aluminum production, but one could potentially enhance its umbrella.

Our position is that including all other greenhouse gases under the same scheme would probably be difficult from an administrative point of view, especially when thinking about agricultural and land emissions. Given that CO_2 emissions are over 70% of greenhouse gases and they are easier to monitor, we consider a first-order issue to properly include these emissions together with those already regulated.

That said, methane emissions should be better integrated in the calculations of CO_2-equivalent emissions, at the very least for oil and natural gas. Recent studies suggest that methane emissions from the extraction and combustion of natural gas are much larger than previously believed (Howarth, 2019). These additional emissions should be incorporated into the calculation of the relevant rates for the combustion of fossil fuels as a way to further enhance the scope and cost effectiveness of the carbon pricing scheme. These policies could be complemented with reinforced incentives to reduce methane leaks, e.g., for local distribution utilities where leaks are believed to be substantial according to recent measurements in the United States (e.g., see Von Fischer et al., 2017).[1]

Additionally, there has been a sustained growth in recent years of highly potent greenhouse gases (HFCs). Even if their share is relatively small, these are extremely concentrated gases that are human produced, and therefore their regulation seems

[1] Several studies lead by EDF in collaboration with several universities and companies document extensively methane leakages along the supply chain of natural gas, see https://www.edf.org/climate/methane-research-series-16-studies.

important. Because of their presence in major appliances due to their cooling properties, the bank of HFC gases that are expected to be released to the atmosphere, if not properly captured and destroyed, will increase the burden on mitigation efforts (Velders, Solomon, and Daniel, 2014). We believe that international agreements to search for alternatives and ban their utilization are probably the best approaches to address this growing threat.

Active policies to reduce or mitigate greenhouse gas emissions not covered under the EU-ETS should be put in place, including efforts to reduce methane emissions and bans to highly potent greenhouse gases.

1.3. Strengthening the geographic scope

In an open economy, imposing a carbon price generates carbon leakages, i.e., a partial offset of emissions in the ambitious country by the transfer of carbon-intensive production to other countries. However, the EU-ETS system has not had such an effect, at least not in the first decade of its implementation. Existing studies suggest that these carbon leakages remained limited over the last decade in Europe, but this may be due to the low observed carbon prices during the period (Fowlie and Reguant, 2018; Branger and Quirion, 2014). Attaining the EU climate ambition will require a much larger carbon price than its current level. The carbon leakage problem will therefore become first order. If firms delocalize the production of their carbon-intensive production to low-ambition countries that do not price carbon emissions, the net effect of the carbon price will be zero for humanity, and vastly negative for the ambitious country, in terms of incomes and employment. This carbon leakage problem reinforces the free-rider problem. In Europe, this environmental dumping has induced the EU Commission to repeatedly offer free allowances to its industrial corporations facing international competition.[1] If the future allocation of free permits depends upon current emissions, this distorts the incentive to decarbonize. And the distribution of free allowances on the basis of historical emissions raises the question of fair competition in the sector concerned and access to the market for new entrants. Moreover, the loss of revenue generated by the non-auctioning of these allowances reduces the carbon dividend to be redistributed to European citizens. This system of free quotas is therefore not good.

Fortunately, the EU Green Deal will replace the free allowance instrument to level the international playing field by imposing the Carbon Border Adjustments Mechanism (CBAM). The European Union is a net importer of CO_2. It is estimated that the emissions generated by the production of imported products in the EU is equivalent to 30% of the

[1] At the beginning of the current trading period 2013-2020, the manufacturing industry received 80% of its allowances for free. This proportion decreased gradually to 30% in 2020. Airline companies continue to receive their allowances mostly for free.

domestic emissions of CO_2 (Lamy, Pons and Leturcq, 2020). The absence of any carbon price signal faced by many importers – and thus by their European customers – is a source of legitimate concern for the Europeans. To level the playing field, importers of carbon-intensive goods should pay the same carbon tax as local producers, when combining the carbon price they pay at home with its adjustment at the border of the EU. Beyond its primary goal to eliminate carbon leakages, the CBAM is a transparent way to project the European ambition to price the global carbon externality to the rest of the world. As suggested by (Nordhaus, 2015), this is also an efficient strategy to incentive low-ambition countries to do more. This is because the CBAM is collected by the EU and not by the exporting country. The CBAM should be based on the carbon tax differential between the EU and the exporting country. This may seem easier on paper than in reality. For example, an exporting country could impose an explicit carbon tax to its manufacturers that could be less explicitly compensated by a reduction of other taxes. Sweden has a large carbon tax on gasoline, but the price paid by customers at the pump does not differ much compared to other countries.[1] This complexity suggests starting the CBAM on a restricted list of items for which the tax issue is limited.

The CBAM is also a better instrument than conditioning trade deals (CETA, Mercosur, etc.) to the compatibility of the parties to the Paris Agreement, i.e., to Nationally-Determined Contributions (NDC). This solution could be counterproductive. Because the NDCs are nationally determined without any norm and a limited pressure from naming-and-shaming (a necessary condition for the success of the Paris COP 21, and probably for future COPs too), imposing such conditions in future trade deals will incentivize countries to be less ambitious when renegotiating their future NDC. This raises the complex question of the fair distribution of the effort to reduce emissions at the global level. This issue cannot be solved in bilateral trade negotiations. On the contrary, the establishment of a universal carbon price, potentially with compensation, is based on a well-established efficiency argument. The CBAM is also more transparent and more efficient. It should be fully automatic and symmetric across all trade deals with the European Union, without the partners having to negotiate the types of economic development followed by each of them.

Various articles – II:2(a), III:2, III:4, XX – of the GATT may be invoked to defend the CBAM at the WTO. But a CBAM is only possible if Europe is itself completely clean on its own uniform carbon pricing system, removing free output-based allowances for energy-intensive and trade-exposed sectors. The current text from the EU Parliament that supports simultaneously the CBAM and the preservation of free allowances contradicts the objective of leveling the playing field, and will fail to convince WTO. This is a pre-requisite to a successful WTO negotiation, as the non-discriminatory nature of the global pricing

[1] For example, in February 2021, the price of super E5 was €1.44/liter in Sweden and in France.

proposal will be key. We recommend that the EU-ETS be reformed in scope, in price stabilization, and in intensity before implementing a CBAM. In order to justify fairness with external competitors to the WTO, it is essential to first organize the fairness and transparency of a uniform carbon price internally.

Given the many technical difficulties of a CBAM, it should be implemented gradually, starting with the energy-intensive, trade-exposed sectors, such as cement, steel, aluminum, paper and electricity, for which the CO_2-content is relatively easier to measure (as proposed for example by Mehling et al., 2019). This narrow coverage is likely to imply competitiveness and leakage problems for downstream producers not covered by the CBAM mechanism. A long-term goal would be to impose CBAM to all goods and services imported in Europe, based on actual CO_2 emissions along the entire upstream value chain ("scopes 1 and 2"). One could impose ISO rules for all importers to report the CO_2-content of their product, as they already emerge in Europe. A more immediate but approximate strategy would be to estimate the CBAM adjustment on the basis of a benchmark production process from which the emission associated to transportation would be added. The difficult issue is to characterize this benchmark. Economists have discussed three possible benchmarks for imports: (1) the carbon content of equivalent goods produced in the EU; (2) the carbon content generated by the best available technology; and (3) the carbon content generated by the worst available technology, unless the concerned importer can demonstrate that it uses a better technology. This third benchmark would avoid discriminating a priori between import sources. As far as electricity to produce the imported good is concerned, the average emissions of CO_2 per kWh of the exporting country should be used as a basis to estimate the CBAM. The CBAM should not be an instrument to reinstall protectionism in Europe.

Finally, the question of trade retaliation is central. The lump-sum refund to each country of the total amount of taxes paid by its firms is not a tool providing appropriate incentives. The transfer of pollution-reducing technologies is preferable, but raises the question of compensating firms harmed by such a weakening of intellectual property rights (Gollier, Schmidt and Schubert, 2020). EU politicians and trade partners should realize that the CBAM is an environmental policy, not a competition or trade policy. It just requires that all things consumed in Europe are covered by the same carbon price. The creation of the CBAM should follow an intense diplomatic campaign to convince trade partners to join an ambitious climate coalition. The CBAM, as an environmental policy, should be an act of last resort. Finally, let's keep in mind that even if exporters to Europe formally pay the adjustment, market forces imply that most of this additional cost will be paid by European consumers. The idea that we will make the Chinese producers pay is mostly a fantasy.

Carbon border adjustments mechanisms indexed on the EU-ETS carbon price should gradually be implemented to level the playing field, to eliminate carbon leakages, to suppress free quotas, to project the European carbon pricing ambition abroad, and to incentivize other countries to improve their ambition.

The ETS should also be examined as a building block of a more global carbon pricing mechanism. Suppose that the European Union and the United States, potentially with China, would be able to form a climate coalition with a friction-free interconnection of their ETS markets. Other regions of the world could be interested in joining this ETS coalition. In its international negotiations at the annual COPs, the North should offer a deal to other countries that would take the following form. The joining parties would accept to cover their emissions under the ETS and, therefore, require their constituents to obtain allowances that match their emissions. In exchange, the North would offer them free allowances. In the extreme version of the mechanism, adopting the moral principle of distributing free permits in proportion to their population, most developing countries would have a net benefit to join the ETS. Here, the opaqueness of this cross-country redistribution of wealth is an advantage, given the reluctance of the western world to support the South financially, as illustrated by the failure of the Green Fund established by the COP 16 in Copenhagen. Cap-and-trade systems, together with the CBAM, are a powerful mechanism to redistribute wealth across regions and countries, and is a useful instrument to build a larger climate coalition. Of course, it requires a strong infrastructure to measure actual emissions and to impose penalties to non-compliant parties.

The European Union should aim at forming a coalition of climate-ambitious countries (including the United States) with a unified ETS market. This climate coalition should encourage other countries to join its ETS in exchange for the distribution of free permits.

1.4. Strengthening transparency and redistribution

In the framework of this reform, the income from the carbon pricing implemented at EU level is fully redistributed to the member states. In this section, we examine the possible allocation strategies of this resource by France.

Eurostat estimates the EU-27's carbon footprint at 7.0 tons per person in 2018. Pricing it at €60 per ton would generate a carbon dividend of €200 billion per year. In contrast to the strong consensus among economists to price carbon, there is no consensus about how to spend this fiscal revenue. Many EU experts propose to use it as a new source of funding for the European Union, for example to repay the Covid-19 recovery plan gradually.[1]

[1] See for example Fuest and Pisani-Ferry (2020).

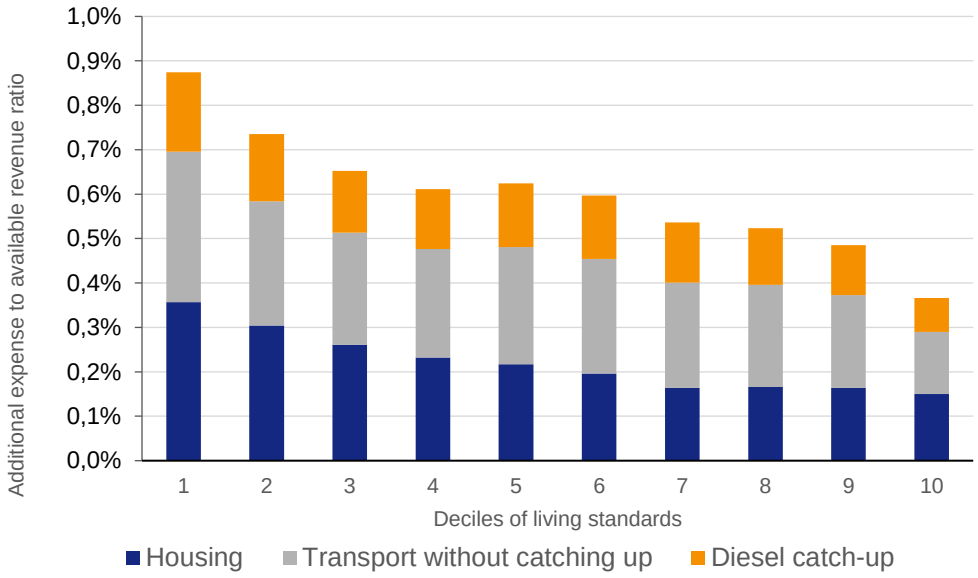
We oppose this view. As explained earlier in this report, redistributing the carbon dividend to the states proportionally to their historical national emissions can contribute to social acceptability, to compensate the lower deciles of the income distribution among their citizens. It should also be used to compensate the most visible losers of the energy transition such as the coal miners through the Just Transition Fund. At the end of the day, the use of the carbon dividend should be left to the European negotiators to build a stable coalition supporting an ambitious ecological transition. Given the social acceptability problem, we recommend that the carbon pricing mechanism would never be used as a new fiscal resource, neither for the EU nor for France. The entire revenue generated by the CBAM and the auction of allowances should be redistributed to the member states, and France should redistribute this revenue to its people.

In no way should carbon pricing be associated with the idea of raising a fiscal revenue. The carbon dividend should be entirely redistributed to the people.

How should France redistribute its carbon dividend? Four in every five respondents in a recent HCC's survey (Haut Conseil pour le climat, 2020) believe that the climate policy should reduce social inequalities. In the western world, poorer people devote a larger fraction of their income to purchase energy. This has the immediate consequence that any uncompensated policy that implies an increase in the cost of energy is regressive by nature. For example, replacing the cheap coal with the more expensive natural gas or biofuels would raise inequalities. Levinson (2019) shows that pollution standards in the automobile sector are regressive. Of course, the same problem arises with a carbon tax. But carbon taxation has the advantage of generating tax revenues that can be used to reverse its impact on the net income distribution, i.e., to make the carbon tax-and-dividend policy progressive. This "carbon dividend" is a key element of economists' recommendations for a just fight against climate change.

Bureau, Henriet and Schubert (2019) have estimated the impact of an increase in the French carbon tax from the current €44.6/tCO_2 to €86.2/tCO_2 accompanied by the catching-up of the diesel tax by 7.8 cents per liter, as was planned for 2022 before the *Gilets jaunes* movement. Figure 7 shows the impact of this proposed change in the carbon tax on the household disposable income, as a function of the decile of living standard. The richer the households, the lower their burden expressed as a fraction of their incomes. It is 0.3% for the top decile, compared to 0.9% for the first decile. Thus, in the absence of any redistribution of the fiscal revenue, the carbon tax is regressive.

Figure 7 – Impact of increasing the carbon tax from €44.6 to €86.2/tCO$_2$ (plus diesel catch-up) on household disposable income



Source: Bureau, Henriet, and Schubert (2019)

One could easily increase the progressivity of the tax-and-dividend policy by concentrating the redistribution of the fiscal revenue of the carbon tax to the lower deciles, taking account of the fact that the social acceptability problem is mostly concentrated in that specific population. The think-tank Terra Nova proposed to pay a dividend in France that linearly decreases from €500 for the first decile to €100 for the fifth decile, leaving an unused net fiscal revenue of €2.3 billion on the table (Guillou and Perrier, 2019). Bureau, Henriet and Schubert (2019) estimates that this combined tax-and dividend policy would increase the disposable income of the first decile by €250/year per household. The first four deciles would see their disposable income increase with the reform. If properly explained, this policy could be perceived as socially acceptable and simpler than other approaches. Conditioning the payment of the carbon dividend to specific investments or expenses, as is currently the case with the energy voucher (*chèque énergie*) that must be used to purchase energy, might also complicate the access to the dividends for some households.

The carbon pricing mechanism should contain a transparent redistribution of its revenues. Redistributing the carbon dividend to the first few deciles of the population, with no condition attached to this dividend payment, can be a simple approach that can also be socially acceptable.

This redistribution should not affect the power of the price signal. For example, it is undesirable in the long run to link the redistribution of the carbon dividend to the geographic location of the household. The carbon tax should affect the incentive to telecommute, to

share rides, and to incentivize people to live closer to their workplace. However, specific sustainable compensation to rural households would be detrimental to efficiency. Climate change is forcing us to rethink land-use planning. Without additional compensation, the rural world will probably suffer more than the urban one from most climate policies. In the absence of additional offsets or technological changes, poor rural households will inevitably lose if the carbon tax increases, even with an income-based carbon dividend. In France, the rise in property prices has been greater in cities than in rural areas, so an increase in the carbon tax further increases the loss of relative wealth realized by rural residents except if they do benefit from increased teleworking and public transport provision. Grandfathering rules for the redistribution of the carbon dividend could alleviate this problem. These losers of the climate transition could be compensated by a well-calibrated “green cheque” based on their initial location. But there should be a predictable path in removing the “green cheque” in the medium and long terms. This “horizontal inequity problem” that cannot be satisfactorily solved by the carbon dividend may justify using non-price policies (Stiglitz, 2019). It also provides an argument for taxing more land rents.

Piketty (2019, pp. 1156-59) has proposed several options to combine the fights against climate change and against inequalities. He first proposes that each increase in the carbon price should be compensated by a corresponding transformation in the progressivity of the income tax system to compensate the regressivity of carbon pricing. Second, he proposes to distribute free allowances to the EU citizens on a per capita basis, so that the wealthy will have to purchase allowances from the lower deciles of the population. These two solutions are closely related to our proposal to sell EU-ETS allowances and to redistribute the carbon dividend to the lower deciles of the population. Third, in the spirit of Cremer, Gahvari and Ladoux (2003), Piketty proposes to tax more heavily the carbon-rich goods and services that are more intensively consumed by the wealthy, such as business class flights. His fourth option is more controversial. It consists of implementing a progressive carbon tax system. The marginal carbon price would be zero below 5 tCO_2. It would increase gradually to attain plus infinity above a certain threshold, thereby imposing an individual cap on emissions. Beyond the difficulties to implement such a mechanism, this system raises several issues. It breaks down the rule of a uniform carbon price that is necessary to minimize the global cost of the transition. In particular, it gives no incentive to low emitters who could face low marginal abatement cost and it wrongly suggests that climate change is the problem of the rich. It is true that, in a second-best world, carbon pricing should also be used to contribute to the reduction of inequalities. In our plan, this is done through the redistribution strategy of the carbon dividend. A non-linear carbon pricing mechanism is a less flexible solution, as it does not solve the horizontal equity problem of poor rural households with a high energy demand, for example. Finally, given the limited size of the fiscal revenue generated by carbon pricing, the incidence on inequalities of this complex non-linear carbon pricing will be much smaller than that of the income tax system.

Specific jobs will also be affected by the ecological transition. Coal electricity plants will soon be closed in France. In the absence of a predictable path to decarbonize the airline industry, one should expect a reduction of employment there. Some of these job losses will certainly be compensated by the partial transfer to the railways industry, particularly in countries that have already decarbonized their electricity mix. Other sectors will be booming, such as the renewable energy sector, or the retrofitting of public and private buildings. Network infrastructures, such as in rail and electricity transportation, should also be vastly expanded in the short future. The net effect on employment may well be positive thanks to a Keynesian multiplier effect, but there is another social problem created by the necessary redistribution of jobs in the economy. The issue of training the labor force adequately in France and elsewhere is addressed in Chapter Two.

The rising carbon price in Europe will affect countries asymmetrically. The core idea is that it will be the countries that have the larger reserve of least-cost abatement actions that will be more negatively impacted by the carbon pricing mechanism. France, which has already almost fully decarbonized its electricity mix, will lose less than other countries, such as those which continue to heavily depend on coal for electricity. This needs to be treated properly, in particular by training workers in anticipation of the new job opportunities. Within the European Union, the Just Transition Fund (JTF) should contribute to the solution. It is necessary to link the ambitious reform of the ETS with the reinforcement of the JTF in an EU grand bargain to attract the approval of the coal-rich countries.

The carbon dividend in the EU-ETS should be used to compensate the sectors and households most affected by the transition in a transparent manner. Land rents should also be further taxed to better share the burden of the reallocation of town planning and regional development.

2. Finalizing the Electricity Transition

The electricity sector is one of the areas in which progress towards zero-carbon targets is in reach within a relatively short time horizon. It is also the sector that has contributed the most to the lowering of European emissions in recent years. Thanks to the introduction of larger scale renewable projects and the growth in natural gas utilization in detriment of coal, carbon intensity decreased from 524 gCO_2/kWh in 1990 to 296 gCO_2/kWh in 2016.[1] Furthering the lowering of emissions intensities will require increasing sources of renewable production and phasing out all thermal generation in the near future. Decarbonizing the electricity sector is particularly important because other sectors

[1] European Environment Agency (2018), Overview of electricity production and use in Europe – Indicator assessment.

(housing, transportation) have few other alternatives to decarbonizing their activity than electrifying their production processes, for example by using green hydrogen.

Renewable electricity has recently benefited from strong technological progress. According to Systemiq (2020),

> "in 2015, solar and wind were expensive forms of generation. Today, just five years later, solar/wind are the cheapest form of new generation in countries representing over 70% of GDP. […] This is driven by precipitous cost declines. Since 2015, prices have fallen 50-65% for each of solar, wind and batteries. These declines will only continue with projected falls of 30-60% across solar, wind and batteries in the next ten years."

Examining estimates of the levelized costs of energy for new projects, solar and wind are already cheaper than natural gas at modest carbon prices, as shown in Figure 8.[1] This is extremely good news, even if the comparison of levelized costs of electricity between dispatchable sources (gas, coal, nuclear, biomass, hydro) and non-dispatchable sources (wind and solar) is rendered complex by the difficulty to store electricity and to make electricity demand flexible to spot electricity costs.[2]

The cost of intermittency of wind and solar electricity will grow in parallel to their share in the EU electricity mix, especially when it comes to managing long spells with lack of sun or wind. Recent advancements in batteries, which have witnessed substantial cost reductions in recent years, will facilitate smoothing short-cycle intermittency. For longer-cycle intermittency (days or weeks), one could potentially use hydrogen storage and fuel cells, or increased pumped hydro storage. When it comes to hydrogen fuel cells, the technology uses electrical power to produce hydrogen by electrolysis. The hydrogen can be used for other purposes or be stored and used later in a fuel cell to produce electricity. Whereas fuel cells have a limited role in the power sector as of today, several countries, including France, are planning on investing in fuel cells to balance the electric grid.[3] Extra- or ultra-high voltage transmission projects that allow renewables to be harvested at different locations can also be very valuable, although it remains to be seen if an aggressive transmission roll-out will be feasible given the implementation difficulties and opposition that these projects often face.

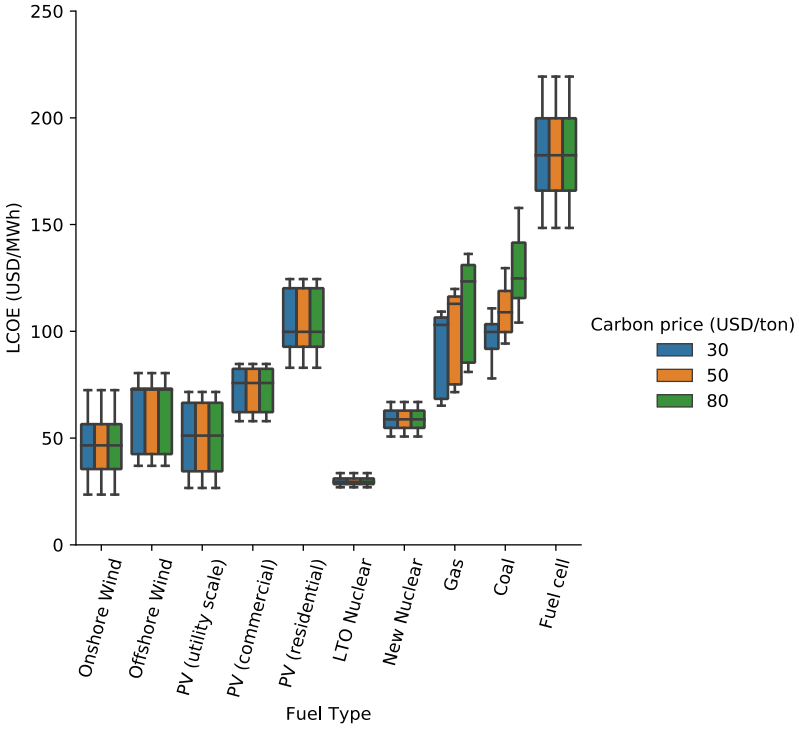
[1] In Europe, renewable projects come ahead in several LCOE calculations even absent carbon pricing. In the United States, and given the presence of "fracking", carbon pricing is necessary to displace natural gas.

[2] The International Energy Agency (IEA) has been expanding the ways LCOEs are computed to better account for intermittency. Even taking intermittency into account, renewables remain competitive at modest carbon prices for the purposes of LCOE calculations (IEA, 2019). Some more uncertainty remains on the operational issues at 90% renewable penetration.

[3] Given limited applications and the many assumptions that go behind these calculations, it is difficult to provide levelized costs of energy (LCOE). The EIA LCOE calculator has its LCOE around $200/MWh, suggesting steady technological progress in this area (or higher carbon prices) can make it viable.

Today, and no doubt for a long time to come, the problem of electricity storage is the number one technological hurdle for the energy transition.

Figure 8 – Levelized cost of electricity (in 2020) for new construction projects except life-time extensions for nuclear ("LTO Nuclear")



Note : Data taken from 13 European countries and 63 distinct power plants with an interest rate set to 7%. The number of observations in each Fuel Type category ranges from 2 (new nuclear) to 13 (onshore wind), with a median of 8.

Source: Own elaboration based on the "Projected Costs of Generating Electricity 2020" IEA Report.

What are the necessary steps towards the decarbonization of the electricity sector? How to accommodate growing renewables given their uncertain output? What should be reasonable goals? What battery technologies will emerge? What will be the role of green hydrogen and nuclear? Will carbon capture sequestration be part of it? How will electricity demand interact with the market? Deep uncertainties exist regarding what a decarbonized grid will look like. However, there is one obvious policy that should be implemented immediately: exiting from coal in Europe.

2.1. The need to eliminate coal

The elimination of coal extraction and consumption in Europe is among the lowest hanging fruit to reduce the emissions of greenhouse gases. In the absence of appropriate carbon

prices, coal production and consumption are heavily subsidized, through various public aids and in view of the lack of pricing for local pollution related to mining and coal combustion. Removing coal from the electricity mix has a cost per tCO_2 of less than €40, without counting the other environmental co-benefits of the policy. Whereas France uses almost no coal in its electricity grid,[1] it is part of an interconnected European system that still heavily relies on the use of coal. One must be aware that production of electricity from coal, in the absence of proper pricing of externalities, is cheap and thus still used in several countries. Poland produces the highest amount of electricity from coal, and Germany follows closely. Indeed, coal still represents about 80% of electricity generation in Poland. In 2017, Germany remained the world's largest producer of lignite, the most emissions-intensive type of coal.

The production from coal decreased substantially in 2019 thanks to the stronger pricing signal in the EU-ETS, around €25/tCO_2, leading to a more decisive switch to natural gas.[2] Yet, it is unclear that such a relatively modest carbon price can trigger the necessary changes to fully stop coal production (and extraction) in Europe. Whereas Germany has announced the phase out of coal by 2038, this is too far out in the future considering the cost advantage of stopping production from coal sources as a mitigation strategy.

The coal sector in Poland employs a sizeable amount of workers in mining and production. It is also a flagship of coal mining regions, making the transition away from coal in these areas difficult. Once the job of over 300,000 workers in Poland, it still employs around 80,000 people nowadays. The presence of such strong ties to the labour market should be considered when reaching a European-wide agreement to phase out coal much more aggressively than currently planned. But such difficulties should not stall this necessary change in the operation of the European electricity market. If the exit from coal is organized through an increase in the EU carbon price, we believe that the carbon dividend should be used in part to compensate the low MAC countries which will be hit the hardest by the rise of the carbon price.

Given the low marginal abatement cost of phasing out coal, failing to phase it out decisively at the European level is detrimental to the credibility of its climate change policies. It is vital that all European countries sit down in conversations to phase out coal much more rapidly than currently stated in national plans, in particular Polish and German. It is our opinion that, given the gravity of the climate change challenge and the lack of international leadership with the same urgency as the formation of the European Coal and Steel Community, which facilitated peace after the Second World War. Even if such a parallel might seem dramatic, the lack of progress in the climate change front is likely to lead to

[1] The last four coal power plants in France will be closed in 2023.

[2] Sandbag (2019), "Europe's great coal collapse of 2019".

conflict. A European-wide agreement on coal could be a good first step towards more explicit cooperation on sensitive matters.

Achieving a European-wide agreement on the rapid phase out of coal, embracing the spirit of the foundational values of peace of the European Union with a sense of solidarity for the losers, is vital for the credibility of climate change policies in any other front.

2.2. The need for a timely elimination of baseload natural gas

Given the traditional role of coal providing electricity generation during most of the day and in a predictable fashion, natural gas has emerged as a natural substitute to coal (e.g., in the United States thanks to fracking, or in the EU thanks to higher carbon prices). Yet, natural gas production is still responsible for a large share of GHG emissions, both CO_2 and methane. While cleaner than coal power plants, output from natural gas needs to basically disappear if a net-zero electricity system is to be achieved. Therefore, it should be seen as a transitional technology.[1] The timing of this removal is uncertain, as it depends upon the emergence of mature technologies to store electricity. Moreover, in countries which currently heavily rely on coal, switching to natural gas looks like the only viable strategy to preserve a source of dispatchable electricity.

Given that natural gas is among the most competitive, dispatchable, and reliable technologies to generate electricity at the present time, it is useful to consider the shadow price of carbon and its implications for its competitiveness. At a price of €100/tCO_2, the marginal fuel costs of natural gas roughly double. At €250/tCO_2, its marginal costs would be above €120/MWh, including only fuel expenses, and therefore natural gas becomes less competitive to possibly renewable electricity combined with improved battery storage, which has seen dramatic improvements in recent years. Whereas these are not expected carbon prices, these are within the range of the shadow price of carbon.[2] Based on these considerations, investment in new combined-cycle power plants has an uncertain profitability from a social point of view and is likely to create an even larger stranded assets problem. Faced by the universal carbon price, gas companies should be left free to determine their investment strategy under the deep uncertainty relative to the place of natural gas in the energy mix over the next three decades. Their shareholders bear the risk in full knowledge of the facts. On the contrary, imperfect information and limited foresight on the side of

[1] A small set of plants could be maintained to add reliability in moments of extreme conditions, which would likely be preferred from a cost-benefit analysis to the complete loss of power of large areas, for example, under extreme temperature events. However, their production share should become residual.

[2] See Quinet (2019), who estimates the shadow price of carbon to be €100-€250/tCO_2 in 2030.

individual households may justify an early ban of home heating systems using fossil fuels.[1] The timing of this ban should be based a cost-benefit analysis of the alternative heating solutions. Finally, taking account of other pollution externalities, we recommend to (re-)confirm the prohibition of shale gas extraction in Europe.

Natural gas for electricity generation is a transitional (and residual) technology which remains crucial in the short run as a source of dispatchable electricity. Carbon pricing should drive its sequential exit.

2.3. The need to trade-off the value and risks of nuclear

French electricity is already almost fully decarbonized mostly thanks to its nuclear capacity.[2] The LCOE of nuclear electricity of the second generation (i.e., non-EPR) in France has been estimated between €50 and €60/MWh (Cour des comptes, 2014), (Grandjean and Hariri, 2020).[3] The *Commission de régulation de l'énergie* has evaluated it at €48/MWh in September 2020. Given the deep uncertainties surrounding the cost of alternative decarbonized technologies in the electricity sector, we believe that any plan to decommission nuclear plants should be made contingent on the emergence of viable baseload renewable alternatives.[4] Because the timing of this scenario is highly uncertain, it is crucial to preserve – and maybe extend – our nuclear capacity in the near future. Extending the lifetime to 50 years of most of the 56 existing nuclear plants after some retrofitting (*grand carénage*) is justified by standard cost-benefit analysis, taking into account the projected path of future carbon prices. The decommissioning of the Fessenheim plant in 2020 has probably been a mistake, given its high financial cost for France, and the fact that its production has been substituted by marginal gas and coal production elsewhere in Europe.

Maintaining existing nuclear power plants, as long as their safety is ensured, is preferable to producing from fossil fuel plants.

[1] Given the relatively temperate weather in France, heat pumps are already cost-efficient for many households, but wide adoption might require coordination due to its perceived lesser value in the housing market.

[2] France: 60 gCO_2/kWh, Germany: 450 gCO_2/kWh, Poland: 750 gCO_2/kWh.

[3] This includes all nuclear costs (decommissioning of power plants and long-term storage of nuclear waste) but not the cost of the risk of a nuclear accident.

[4] It is inappropriate to compare the levelized costs of electricity from dispatchable and non-dispatchable sources. As the share of renewable electricity increases in the EU mix, the mean sale price of this fatal electricity goes down, compared to dispatchable electricity which will be sold preferably at peak prices.

More credible information is required about the LCOE of the third generation (EPR) nuclear technology to evaluate its role in the optimal electricity mix.[1] Given the current failure of the EPR to demonstrate its cost-efficiency, other nuclear technologies such as the small modular reactors could be reexamined. The possibility to develop the International Thermonuclear Experimental Reactor (ITER) and fourth generation nuclear technologies (project Astrid) should also be taken into account, as they generate decarbonized electricity with (almost) non-exhaustible resources. The next five years will be critically important to plan the future of nuclear electricity in France.

The Cigéo project to store the medium- and high-activity nuclear waste generated by the first two generations of nuclear power plants in France has seen its cost dramatically increase over the last decade. ANDRA estimated the cost at €35 billion in 2017, from around €7 billion 10 years earlier. This inflation is mainly due to the legal necessity to implement a permanent storage of these wastes that could be reversed by 2156 when the storage site in Bure should be closed. These costs were not anticipated at the time when the law imposing this reversibility was passed in Parliament in 2006. Given this new information, we believe that the environmental and health benefits of the reversibility should be compared to its estimated cost to reoptimize the architecture of the project. Beyond the nuclear issue, all sources of decarbonized electricity should be optimized in order to level the playing field, and to provide the socially desirable energy mix to the economy.

2.4. The need to incentivize demand

Demand reductions and demand response are an additional avenue for facilitating the decarbonization of the electric grid. Due to the electrification of part of the transportation fleet, demand for electricity is likely to rise in the medium term, putting additional pressure on the decarbonization progress. Reducing (or limiting) these demand increases also makes the decommissioning of existing fossil fuel generators more palatable. Demand response also needs to be engaged in the presence of extreme weather events, which trigger peaks in demand and can put additional pressure on the grid, as recently experienced in California.[2]

Increasing electricity prices via the pass-through of carbon costs and renewable subsidies already provides incentives towards energy efficiency. There have also been plenty of

[1] Grandjean and Hariri (2020) observes that the UK government offered a fixed price contract of €120/MWh for the electricity that will be produced by the EPR of Hinkley Point. They also estimate the LCOE of the EPR of Flamanville around €160/MWh.

[2] The lack of effective load management during the wildfire season has led to numerous blackout periods in which consumers are left without power for several hours or days in 2020.

programs for appliance standards and subsidy programs. More stringent building codes can help minimize the need for water and electric heating and air conditioning going forward. The Convention citoyenne pour le climat proposes some extreme measures (with strict limits on the temperature settings in the home). Whereas this seems to go too far in the restrictions of individual freedoms, smart meter technologies coupled with smart thermostats could be used to perform non-linear pricing based on thermostat settings. These policies can incentivize reducing consumption of air conditioning while ensuring a minimum of comfort at reasonable costs. Because the steep pricing would depend on comfort measures, they could be perceived as more fair. These technologies can also ease the management of load during extreme events, such as the wildfires experience recently in California.

Critical pricing mechanisms have been successfully used to curve demand in moments of extreme weather events (Wolak, 2010; Jessoe and Rapson, 2014). One could also increase their prominence and effectiveness by making them the default tariff (Meredith Fowlie et al., 2017). Pricing mechanisms can be more effective than purely informative persuasive campaigns (Ito, Ida and Tanaka, 2018). One major concern of these price mechanisms is that the most vulnerable households might face large surprise bills unexpectedly, which they might not be able to afford. An important aspect to consider is how to prevent large negative impacts through energy poverty safety valves.

Lowering demand and/or increasing its response to high frequency prices can help minimize the larger costs of grid reliability in the presence of growing renewables. It can also make the phase-out of fossil fuel generators more economical. Incentive schemes should be improved, and ex post assessment of costs and benefits should be enacted to provide the right signals for investment and innovation by private firms and utilities. Coordination with electric vehicle and appliance manufacturers could also ensure that these capital investments are ready to respond in the smart grid, enhancing the ability of consumers to contribute to reducing the costs of the transition while lowering their bills.[1]

Demand efficiency and demand response can ease the process of decarbonization, contribute to limiting the increases in electricity prices, and make the grid more reliable in the presence of extreme events. Safety valves for low-income households during extreme pricing conditions should be considered.

[1] For example, electric vehicle manufacturers have been reluctant to allow electric vehicles to act as a battery, i.e., send power to the grid. However, such demand response would be extremely valuable as more and more electric vehicles come online. Clear policies and incentives should be put in place.

3. Energy Efficiency in the Housing Sector

A recent report by the Haut Conseil pour le climat (HCC, 2020) demonstrates the need for a combination of various policy instruments (subsidies, regulation, certification, norms) to tackle the challenge of decarbonizing the housing sector. We support these recommendations, which require important reforms in the current existing mechanisms. Energy efficiency in buildings is crucial to reduce the need for energy and to protect households in the face of extreme weather events, such as prolonged heat waves. Energy efficiency will be important as heating becomes electrified via heat pump (which could also work with natural gas or biogas) and puts pressure to the electricity grid. Solutions based on heat pumps fueled by natural gas or biogas should therefore also be included in the system, at least in a transitional period until the problem of intermittent renewable electricity has been solved. Geothermal technologies can also contribute to limiting fossil-fuel heating. Retrofits and upgrades in housing should require a collection of policies, including better standards and norms, consumer information, and well-calibrated subsidies based on realized efficiency gains.

Each housing unit in France generates more than 3 tCO_2/year on average. Electrification will not solve the problem in the short run because high electricity demand for heating typically materializes when marginal electricity production is carbonized. Several public programs already exist in France to help households to improve the energy efficiency of their apartment: a tax credit (*crédit d'impôt pour la transition énergétique*, CITE), a direct subsidy (*certificats d'économies d'énergie*-CEE, *opération "coup de pouce"* in 2019-2020), a zero-interest eco-loan (*éco-prêt à taux zéro*, EPTZ), and the reduced VAT rate. According to (Giraudet et al., 2019), these subsidies saved energy in 2015 at a cost of 4 to 12 cents per lifetime discounted kilowatt-hour, which is large compare to the cost of energy. But observed efficiency gains are smaller than gains predicted by the experts. Economists call this puzzle the "energy efficiency gap" according to which the realized energy efficiency gains are systematically lower than the anticipated gains. In an ex post evaluation of the efficiency of housing retrofits in France, Blaise and Glachant (2019) showed that for every additional €1,000 spent, the average reduction in the annual energy bill amounts to only €8.29. In a more recent analysis of the CEE program, Glachant, Kahn and Lévêque (2020) showed that the average retrofitting investment amounts to €11,750 that generates an average reduction of the annual energy bill by €160. They estimated the abatement cost of the CEE program at €350/tCO_2 saved.

An important problem is the systematic optimistic bias of the energy gain of the retrofit. In France, this may be due to the fact that the subsidy is paid unconditionally, and to the low quality of labeling process for the professionals (Belin and Lefort, 2017). This creates a lemons problem that tends to reduce the private demand. In France between 2014 and 2016, 75% of the renovations (over 1.3 million actions) did not have an impact on the

energy efficiency category (DPE) of the renovated housing unit (ADEME, 2018). This should be corrected by conditioning the public subsidy to an ex post evaluation of the energy efficiency gain, as in Germany. Observing the low take-up of free energy efficiency programs in the U.S., Fowlie, Greenstone, and Wolfram (2018) conclude that high non-monetary costs and asymmetric information are higher than usually assumed.

Even when accounting for the broader societal benefits derived from emissions reductions, the costs still substantially outweigh the benefits; the average rate of return is approximately − 7.8% annually in that study. These results raise doubts about the effectiveness of non-selective and blind public support for renovation, at least in the short run. Another explanation for the energy efficiency gap is based on the "rebound effect," when demand for energy end uses increases as a result of greater efficiency, in the absence of a carbon price. In short, public support in energy efficiency is not a substitute to a carbon tax on emissions by the housing sector.

More competition among energy efficiency companies should be promoted, and the regulation of this key industrial sector should be reinforced, in terms of quality control and consumer protection and information (ATEE, 2020; CEDD, 2019).

The recommendations of the CCC in this domain is to ban fuel and coal heating systems by 2030, and to force homeowners to retrofit their housing unit by 2030 (for units ranked F and G in the energy efficiency scale) or 2040 (for units ranked D and E). In the long run, decarbonizing heating systems will probably require their electrification (potentially through heat pumps) and increasing the use of geothermal in houses and neighborhoods. Due to the impact on electricity consumption from electrifying heating, energy efficiency standards and building codes can interact with the decarbonization costs of the electricity sector. One must be aware that energy efficiency standards for electricity-heated units will generate fewer climate benefits in the future once electricity is fully decarbonized. Given the existing inefficiencies mentioned above, we believe that the current flow of subsidies of €4.5 billion per year allocated to retrofit subsidies under the French recovery plan is satisfactory. This policy should be reevaluated once those regulatory inefficiencies and skill shortages are removed.

Public support programs for energy efficiency should be focused on retrofitting the worst housing units, and these subsidies should be paid in relation to the actual energy efficiency gains. The quality labelling and certification of the operators should be better regulated.

4. Priorities in Innovation

Innovation is an area with large coordination failures and spillovers, which has traditionally benefited from the role of public intervention via R&D policies (Aghion, Akcigit, and Howitt, 2014). Innovation policies should play a crucial role in the fight against climate change, given the technological bottlenecks that are preventing a faster (and more economical) decarbonization of our economies. Carbon pricing alone is unlikely to provide the necessary incentives for the necessary level of innovation due to the high level of uncertainty, the lack of complete future markets, and the path dependence in innovation that makes transitioning away from fossil fuels difficult (e.g., see Acemoglu et al., 2012 and Aghion et al., 2016). Innovating aggressively in clean technologies can also avoid locking additional capital investments in fossil-fuel emitting assets.

But how should such policies be designed? Should particular innovation areas be subsidized, or should more generic approaches that incentivize climate change solutions be adopted? It is useful to differentiate technologies in separate categories depending on their relationship to the climate change problem:

- **Green technologies that can become a substitute to fossil fuels,** such as *economically viable* and *scalable* renewable-plus-storage solutions.
- **Technologies that reduce emissions from fossil fuels** but that, at the margin, cannot be cheaper than burning fossil fuels alone, such as carbon capture sequestration (CCS) at power plants.
- **Technologies that reduce the need for energy**, such as energy efficiency solutions (e.g., as experienced with LEDs).
- **Technologies that capture emissions directly (negative emissions),** such as direct air carbon sequestration, rock weatherization, or agricultural sequestration.
- **Technologies that directly modify the climate** without capturing CO_2 (geoengineering).

We believe that more emphasis in funding should be given to technologies that make fossil fuels irrelevant (i.e., they are cheaper than burning fossil fuels), such as renewable sources of energy and cheaper battery solutions.[1] These technologies are crucial to ameliorate the global climate change problem and are maturing quickly. Technologies making emitting technologies irrelevant have the desirable property that, with intellectual transfer, they are incentive compatible even for countries that do not have the resources or the willingness to contribute to the effort of reducing emissions. More emphasis should be put on the

[1] Green hydrogen also falls in this category. It can be particularly helpful if it is made sufficiently economical and, thus, incentive compatible for non-compliant countries.

impact of these innovations on resources at a very large scale, e.g., on rare minerals, focusing on technologies with lean resource footprints, with the goal of rapid worldwide adoption in mind. Given that renewable technologies are already more attractive than fossil fuels in several geographies (even in the absence of carbon prices, e.g., in Hawaii or Chile), innovations that can help further cut costs and make adoption more scalable seem within reach and particularly valuable.[1]

Technologies making fossil fuels less dirty (at a cost, such as carbon capture sequestration at power plants) will be useful in countries with a high carbon price that have large sunk investments and resources in fossil fuels, such as the United States.[2] Indeed, the carbon price itself should provide a signal for fossil fuel companies to invest privately in carbon capture sequestration technologies. These technologies can also help other countries more actively abate emissions, which will positively contribute to mitigating climate change. However, given the tragedy of the commons and the global nature of the climate challenge, fossil-fuel enabling technologies are unlikely to bring the necessary global reductions in emissions, as they sustain a fossil-fuel based economy that is likely to substantially leak in other parts of the world.[3] Even if focused on making fossil fuels cleaner, public subsidies to R&D can become a transfer to an industry that is likely to significantly contribute to global emissions in non-compliant countries, even under best-case scenario conditions.[4] In other words, using public money to fund R&D for carbon capture and sequestration means subsidizing Saudi Arabia and Russia. We thus discourage the use of public funds for fossil-fuel related R&D and appeal to the signal sent by carbon pricing, which should be improved by properly including all fossil fuels under the EU-ETS and increasing the carbon price.

Energy efficiency is an area in which public policy has taken a very active role, not only in the form of explicit R&D support but other means such as subsidies and energy efficiency standards, e.g., in the car sector (with mixed results due to concerns about compliance), buildings, and appliances. We should note that the presence of larger energy prices

[1] Renewable technologies might have additional valuable features in a developing context. For example, poor countries that are not rich in fossil fuels often face contracting issues and an unreliable supply of fossil fuels. Even if renewable power can be intermittent, it can be more reliable on these other dimensions.

[2] Fracking has contributed to the phasing out of coal power plants in the United States. Yet, it has also led the United States to a path of dependence of natural gas for many years to come, due to the large investments in long-lived capital assets (Acemoglu et al., 2019). The recent target in the US of a net-zero carbon electricity by 2035, if achieved, is likely to invoke carbon capture sequestration.

[3] Brown hydrogen would be another area in which one keeps relying on fossil fuels that can leak (methane and CO_2) and in which sequestration during extraction and combustion is unlikely to be appealing for non-compliant countries.

[4] For example, Fossil Energy R&D public budgets in the United States are considerable, with over $500 million being spent in 2019 for clean coal projects together with almost $200 million on reserve exploration, out of a total budget of $2.5 billion for the DOE energy-specific projects. See Deparment of Energy (2018), "FY 2019 budget request fact sheet," February.

through more ambitious carbon pricing should already provide a re-energized private incentive for energy efficiency innovation. However, special attention could be given to regulated sectors that might lack the incentives to innovate, such as distribution companies of both natural gas (to reduce leaks using sensors and smart meters) and electricity (to reduce losses and adopt innovations, either technological or with regards to innovative pricing schemes, to encourage demand-reducing behavior).

Negative emissions technologies can contribute substantially to limit the extent of damages from climate change, and, as discussed in Section 1 (point 3), will be crucial to ensure that modest temperature targets are still within reach. Therefore, an aggressive battery of R&D spending towards negative emissions seems useful, precautionary, and necessary to mitigate climate change. Emphasis should be placed on negative emissions technologies that can demonstrate their additionality and long-term reliability, e.g., in the face of increased storm and fire risk for soil storage and afforestation innovations. Emphasis should also be placed on carbon capture not directly linked to human activities, to avoid perverse incentives.[1]

We believe that a potential way to approach the issue of negative emissions is via innovation tournaments. Given their importance in solving the global nature of the problem, international competitions should be in place to achieve measurable sequestration of emissions that can be ensured to be additional, and that are not directly related to the active production of man-made emissions. A potential way to implement the tournament is to guarantee the purchase of a large amount of negative emissions at a strike price, e.g., €150-€200/ton CO_2, to the first one or two projects that can deliver economical negative emissions. R&D during the tournament would be eased by substantial amounts of public funds. As witnessed recently with the Covid-19 vaccine, companies and innovation are unleashed in the presence of high stakes (economical and societal).

Current targets in warming are unlikely to be satisfied in the absence of these breakthroughs. That said, one should not bank on a breakthrough to avoid the necessary transition towards a decarbonized economy. Additionally, negative emissions that cannot be properly measured should not be used as a safeguard to limit climate policy ambition. Given previous experiences with offsets in several markets (EU-ETS, California), it is important to ensure that negative emissions are additional. It is important to clarify that such a tournament would not include carbon capture sequestration of human-made

[1] Such perverse incentives have in the past been the source of concern in the market for Clean Development Mechanisms (CDMs), by which it was more profitable for industrial producers of HFCs to generate emissions and re-capture them than to produce them for sale, leading to limited additional reduction in spite of high transfers of payments (Wara, 2007).

emissions, due to the perverse incentives described above. It would also not include emissions from power plants.

Indeed, "negative" emissions from power plants are already covered under the EU-ETS. Rather than "negative" emissions, one should think of carbon capture sequestration at power plants as "less positive" emissions (or "zero" at best). If power plants can verify their reductions, the total cost of their allowances will substantially decrease or even cancel. Unfortunately, the carbon price at the EU-ETS has been too low to encourage aggressive investment by power producers. This could be another potential benefit from increasing the EU-ETS carbon price.

Regarding geoengineering, we consider these technologies a last resort in dealing with the climate challenge, although possibly one that countries will unilaterally consider (Wagner and Weitzman, 2018). Geoengineering, which is focused on directly changing the climate, does not stop the underlying threat to life and ecosystems of our current system, which is the growing presence of CO_2 in the atmosphere. Therefore, it is at best a temporary fix. In addition to having extremely uncertain geopolitical and environmental consequences, geoengineering can harm the credibility and commitment of governments to reduce emissions (Acemoglu and Rafey, 2018).

While not the focus of this report, substantial public investment in R&D should be devoted to research on how to adapt to a changing climate, with an emphasis on those areas that are unlikely to receive private attention, such as cheap structures to protect vulnerable households from extreme events or research on how to better manage and adapt forests to changing climates, e.g., to slow down desertification. Governments and private parties should also publicly invest in R&D to understand how extreme sustained temperatures can affect critical infrastructures (e.g., the electric grid).

Innovation efforts should be devoted to those areas that can generate positive spillovers to non-complying countries, such as innovations that make zero-emissions technologies cheaper or negative emissions technologies that can enable the European Union to go above and beyond its stated targets.

5. Involvement of Consumers, Corporations, Investors and Financial Institutions

The energy transition has already begun. In recent years, progress on low-carbon solutions and markets has been faster than ever. Today, a stealth technological revolution is propelling us towards a low-carbon future. In Europe, a growing fraction of the population is imposing a constant pressure on governments and corporations to face our collective responsibility to protect our environment. They exercise their power as citizens by

penalizing irresponsible politicians in the ballot box, as consumers by boycotting high-carbon products, and as savers by divesting from brown assets. Private institutions have also initiated a revolution in the way they evaluate their own role in our society, in particular in relation to climate change. In this section, we review some of the difficulties associated to these welcomed initiatives, and we explore the solutions to improve their efficacy.

Greening a production process is often costly and is thus hardly feasible in a competitive environment without losing market share (another form of carbon leakage) in the absence of carbon pricing. Consumer activists expect to pay a premium for greener products, but this growing fraction of the population can exercise its power only if they can access the right information on the carbon content of these products. For example, can we measure the carbon intensity of a tomato grown in a field in Spain but transported by truck relative to a tomato grown in a greenhouse heated with natural gas in France? If one wants to maximize the positive effect of consumers' activism, this comparative evaluation must be done. Empowering consumers thus requires imposing a carbon accounting system to the whole economy, in parallel to the monetary accounting system that gradually emerged in the 19th century. The carbon account of all legal institutions should be made compulsory and public information, in particular to consumers and investors. Scope 3 in the existing carbon accounting standard, which covers all GHG emissions along the value chain, is the key concept to be promoted, but double-counting should be avoided. This proposition is aligned with the recommendation of the Convention citoyenne pour le climat to impose green labels.

One should empower consumers and investors to promote decarbonized products by implementing a transparent carbon accounting and labeling system.

Corporations are often said to green-wash their business strategy, with limited real environmental effect. This is made possible because of asymmetric information and the ambiguities surrounding the existing labelling and ESG reporting systems. The European Taxonomy should be developed and extended to further help investors identify climate compliant investments.[1]

The concept of corporate environmental responsibility, or its dual concept of naming-and-shaming, are useful to mobilize private initiatives. A growing number of corporate leaders, realizing that carbon-intensive assets face the risk of being stranded soon, are willing to tackle the challenge of climate change, and want to be recognized as doing so. This is not an easy task, in particular because of the mimicking strategy of the green-washers and the absence of a clear methodology. Climate finance is lacking a clear narrative as an efficient instrument to play a central role in the energy transition. Bankers and

[1] This EU taxonomy should recognize the merits of nuclear electricity in this domain.

responsible corporations, as well as any economic agent willing to act responsibly in the face of climate change, should use an internal carbon value to evaluate their actions. Many companies are already using an internal carbon price as a common management tool. In doing so, they seek to replicate the effective climate policy we have described in this report, at their level, and to replace failing states in using their sovereign power to implement it at the level of their entire economy. If this price is close to the collective shadow price of carbon, these firms' investment strategies will be socially desirable. In the short term, this strategy may negatively affect profitability, but it serves as a hedge against the risk of the emergence of more ambitious public policies penalizing unambitious firms. It is an insurance against holding "stranded assets." It will reassure investors who anticipate the rise in the price of carbon on the EU-ETS market. Many large corporations around the world have already incorporated an internal price of carbon to shape their investment strategy, but they should make their internal carbon pricing more transparent and subject to scrutiny.

To align their institutions with the common good, responsible corporate leaders should use a transparent internal carbon price to shape their corporate strategy.

Financial markets should also play a role. Climate change creates two new sources of risk for investors: 1. future climate damages, and 2. rapid obsolescence of carbon-intensive investments. Sadly enough, the waiting game observed on the international climate negotiation continues to limit the investors' trust about the future profitability of greener technologies. The bottom line is that too many investors around the world continue to bet on the profitability of carbon-intensive sectors and to be reluctant to finance green projects. This creates a systemic risk associated with the scenario of an abrupt emergence of stranded assets. There is a misconception that the energy transition is hampered by capital rationing directed towards green sectors. Under this assumption, it would be sufficient for the States to give credit to these sectors to solve the problem. The reality is that if the energy transition is struggling to take place, it is because most low-carbon projects are not able to withstand competition from their more carbon-intensive counterparts, because of the low price of carbon and its future prospects. Recent recovery plans have promised large sums of public funding to green our economies, but this is vastly insufficient to finance the transition. The private sector has to play a central role in the ecological transition. Although public funding is absolutely necessary to finance the greening of our public infrastructures (railways, schools, hospitals, etc.) and services (public transportation, etc.), these plans cannot solve the problem of the lack of profitability of the energy transition whose keys are in the hands of the private sector. This is why these plans should be associated with the reinforcement of the carbon price signals.

The financial return of brown assets remains based on an overestimation of the true social value creation of the corresponding activity, potentially by a wide margin. Responsible investors and financial intermediaries could restore their right social valuation by

subtracting the value of carbon emissions of the asset from its financial performance. This should be done by using a transparent internal carbon price. Socially responsible (SRI) climate funds should be optimized on a risk-return efficient portfolio estimated on the basis of the social valuation of firms. It is completely clear, for example, that coal assets will be excluded from these climate funds. This is why this methodology is fully supportive of the coal divestment movement. A good example of a responsible methodology of internal carbon pricing is provided by the European Bank for Reconstruction and Development (EBRD, 2018).[1]

But one must be aware that the divestment movement currently has a limited impact on the allocation of capital in the economy, due to the financial carbon leakage problem. Banks that divest from the coal sector are usually replaced by other banks that invest in it. Divesting should have increased the cost of capital of brown assets, but the effect has been limited due to this financial carbon leakage, or to this easy capital substitution. Real carbon leakages due to national carbon pricing are harder to implement, since it means dismantling a plant to rebuild it physically on the other side of the frontier. The divestment movement should have reduced the return of low-carbon indices around the world, symmetrically to the intended reduction of the cost of capital of low-carbon firms. However, this effect has been quite limited in the past (Andersson, Bolton and Samama, 2016).[2] At the same time, investing in climate funds, i.e., divesting from carbon-intensive assets, is a hedging strategy that insures investors from the risk of a rapidly increasing carbon price in the future.

Financial institutions are weaker than governments to induce the ecological transition of our economies. To illustrate, it is not the divestment movement that has weakened the tobacco industry, but the high taxes that have been imposed on cigarettes in the western world. Because of the financial carbon leakage problem, responsible financiers face a much harder challenge than sovereign powers to induce the necessary ecological transition. The divestment movement could play an important role in the future, but this would require most capital-rich countries to join that movement too.

The quantitative easing policies that have been implemented by the Fed and the European Central Bank (ECB) have transformed them into key financial market makers. Should the ECB become a new climate activist by divesting from carbon-intensive industries? This interesting proposal raises various legal and financial issues. First, the ECB, contrary to the EU Parliament, has no mandate to fight climate change. Second,

[1] The EBRD uses an internal carbon price of \$50-\$100 per tCO_2 in 2030, then growing at a rate of 2.25% per year. The methodology also imposes for each project the calculation of the switching carbon value at which the investment decision changes, i.e., the cost per tCO_2 saved.

[2] On September 17, 2019, Bill Gates explained that “divestment, to date, probably has reduced about zero tonnes of emissions”.

national and European democratic institutions have been very reluctant to penalize brown sectors, and it would be problematic for a non-democratic institution such as the ECB to serve as a proxy to perform this task. Our proposal is that the ECB should comply to the EU climate ambition by using an internal carbon price when valuing the collateral of its loan programs.

Climate finance is a poor substitute for state-controlled climate policies within the state jurisdiction. Responsible finance principles should be based on an internal carbon price, to be used by responsible investors, financial intermediaries and central banks.

Two additional financial innovations should also be considered. We support the issuance of green bonds by public and private institutions, under stricter rules for their labeling. In theory, the existence of responsible investors in the economy should introduce a "green premium" (greenium) at equilibrium for this class of assets. This premium should help improving the competitiveness of green activities. In reality, the green premium is currently close to zero. This may be due to the lack of credibility of the green label. It should be reinforced.

Finally, financial indices represent a powerful tool to rapidly reallocate the flow of private capital toward more sustainable sectors. Many FCP, SICAV and ETF in France aim at duplicating the composition of the CAC 40 portfolio. We support a strategy to create a "Climate CAC 40" index, whose composition would be compatible with the 2°C target of the Paris Agreement. Euronext, the operator of the indices of the CAC family, has announced the creation of such an index. This is likely to have an important effect on the cost of capital of the assets included in the index, and to create an incentive to reduce emissions by all large corporations in France (Voisin et al., 2020). Currently, market indices such as the CAC 40 contain the 40 largest capitalization of the Paris market. Our recommendation would be to define the "Climate CAC 40" with the 40 largest capitalization net of the present value of the flow of the GHG emissions of their current physical assets, valued at the shadow carbon price of the Quinet 2 report. This is simple and transparent, and it incentivizes firms to immediately modify the portfolio of their physical assets. We expect this new climate index to rapidly replace the classical CAC 40 as the financial market reference in France.

Financial indices such as the CAC 40 should be made compatible with the 2°C target by modifying their market capitalization rule to include the carbon value of their assets' emissions.

6. The Role of Agricultural Policy[1]

Food accounts for about 31% of the EU's total GHG impacts (Garnett, 2011). For example, one kg of beef implies an emission of methane equivalent to 40 kg of CO_2. Current trends suggest that aligning agricultural practices with the EU climate ambition will not be an easy task. EU agricultural GHG emissions went down until around 2010, but have slightly increased since. According to (Guyomard et al., 2020), "significant changes in farming practices and systems are now required to achieve further substantial reductions, including a reduction in the use of nitrogen fertilization and in the number of animals farmed."

Despite its large contribution to climate pollution, the food sector is not concerned by most existing climate regulatory schemes such as a carbon tax or ETS. Food has been considered as the single strongest lever to optimize human health and environmental sustainability on Earth (EAT-Lancet, 2019). Most emissions from food come from the production stage, namely agriculture, through emissions of methane and nitrous oxide (manure, urine and nitrogen fertilizers) in particular. The biggest share of emissions come from animal agriculture, with life-cycle impacts of the lowest-impact animal products typically exceeding those of vegetable substitutes per kg, calorie or protein (Poore and Nemecek, 2018). The recent IPCC report on land use (IPCC, 2019) states: "Balanced diets, featuring plant-based foods, such as those based on coarse grains, legumes, fruits and vegetables, nuts and seeds, and animal-sourced food produced in resilient, sustainable and low-GHG emission systems, present major opportunities for adaptation and mitigation while generating significant co-benefits in terms of human health (high confidence)."

The carbon footprint of food/agriculture is significantly higher if one accounts for the opportunity cost of carbon, namely the opportunity for storing carbon in the vegetation and soil by changing land use practices. As an example, more than 85% of the deforestation in South America is caused by animal farming, namely the forest is converted for pastures and for producing animal feed (Sy et al., 2015). Importantly, a significant portion of this production is imported in Europe, such as soy for feeding the European cattle. Accounting for this opportunity cost, it has been estimated that the carbon impact of animal food products may be three to four times higher than previously estimated (Searchinger, Wirsenius and Beringer, 2018). The cumulative potential of CO_2 removal on land currently occupied by animal agriculture is comparable in order of magnitude to the past decade of global fossil fuel emissions (Hayek et al., 2020).

It is widely and increasingly recognized that the price of food products does not reflect their environmental footprints, and that immediate action is necessary. The greening of the EU

[1] We gratefully acknowledge Nicolas Treich (TSE and INRAE) for his valuable inputs to this section.

agricultural policy has been recognized to be a failure for decades (Navarro and López-Bao, 2019), one reason being that it pursues many objectives such as providing income to farmers and ensuring food security. Moreover, climate change raises a particular challenge for the agricultural sector, both in terms of the adaptation to the changing environment and to the cost of greening their activities. The agricultural sector is well known to be politically powerful, and difficult to regulate in general (Bonnet et al., 2020). This issue, together with the difficulty to measure emissions and sinks at the production level, explains why we do not recommend to price carbon upstream in the case of food production. Many argue that directly targeting consumers rather than producers would be more efficient (Poore and Nemecek, 2018). We support this recommendation. Moreover, using novel environmental impact tools such as Agribalyse makes it now fairly easy to assess the full environmental impact of each food product over their entire lifecycle, and thus to compute the relevant tax that must be applied on each food product. Various studies have estimated the impact of the implementation of a carbon tax on food products. This carbon tax should of course be aligned on the price of EU-ETS. Springmann et al. (2016) for instance show that the global climate change mitigation potential of emissions pricing of food commodities could be substantial, and further emphasize much higher health co-benefits. Pieper, Michalke and Gaugler (2020) have evaluated the impact of carbon pricing on the production cost of various foodstuffs in Germany. Using a carbon price of €180/tCO_2, they showed that the impacts are highest for conventional and organic animal-based products (146% and 71% surcharge on producer price level), followed by conventional dairy products (91% surcharge) and lowest for organic plant-based products (6% surcharge).

Rather than asking farmers to pay for their greenhouse gas emissions, food products should be taxed in proportion to their contribution to climate change.

Agricultural production is subject to important leakage problems and, therefore, the taxation of carbon footprints at the consumption level is desirable to mitigate deforestation pressures in other parts of the world. If the EU taxed production of agricultural products only if produced in the Union, it would incentivize land use changes in other areas that would likely negatively contribute to climate change. By taxing food consumption, the carbon footprint of both domestic and imported production are by design accounted for. The introduction of a carbon adjustment at borders should also be considered for imported agricultural products.

The risk of shifting land use change pressures to other parts of the world also applies to other aspects of the agricultural policy. Apart from the negative impacts on deforestation to these other areas, it is important to avoid the growth of unmanaged vegetation areas in the Union, which are now subject to increased fire risk. More generally, agricultural policy will likely also take the form of many complementary policies, as considered under the Common Agricultural Policy (CAP), some not directly targeted to climate change but to biodiversity and sustainable agriculture. It is crucial to take into consideration the climate

change implications of these other policies, with an eye on the potential for deforestation and leakage in other parts of the world, which could lead to even larger biodiversity loss and contribute to global warming.

A consumption-based environmental footprint tax can be effective at avoiding leakage. The leakage implications of other policy tools need to be examined.

Finally, concerning the reform of the CAP, we support the recent recommendations made by Guyomard et al. (2020) in a report submitted to the EU Parliament:

> "General principles of public economics and fiscal federalism help to clarify the goals and roles of the various CAP tools. First, it is vital to more effectively apply the 'polluter-pays principle,' upon which conditionality relies, in order to better justify the increased implementation of the 'provider-gets principle' that underlines both the eco-schemes and climate- and environment-related measures. Second, the Pillar 1 eco-scheme measures that are fully financed by the European budget must target global public goods; that is, climate mitigation, biodiversity preservation and restoration, as well as animal welfare. Third, the eco-schemes must be supplemented by Pillar 2 measures that are focused on local public goods; notably, water quantity and quality, soil fertility and diversified landscapes."

7. Contributing to the Transformation of Transportation and City Systems

In 2017, 27% of total EU-28 greenhouse gas emissions came from the transport sector (22% if international aviation and maritime emissions are excluded).[1] In France, given the relatively low carbon intensity of the electricity sector, it represents an even larger share of emissions (around 40%). Given the important network effects in transportation, and the lack of viable alternatives in some areas, e.g., aviation, decarbonizing this sector will require substantial policy action.

Public policy can play a central role in coordinating the phase out of fossil fuel cars, for which carbon capture sequestration is not possible. There are also large co-benefits from removing cars from highly dense areas that are not fully priced in the cost of gasoline (e.g., see Coady et al., 2019 or Holland et al., 2018, in the United States). The recent announcements in Paris and Strasbourg (excluding diesel engines from the city in 2024 and 2025 respectively, and all combustion engines by 2030) go in the direction of

[1] European Environment Agency 2020), « Greenhouse gas emissions from transport in Europe », indicator assessment, 18 décembre.

coordinating city planning with the phase out of combustion engine cars from cities.[1] Recent announcements from the executive also point at providing clear dates for which fossil-fuel engines need to be phased out. Indeed, the *Loi d'orientation des mobilités* (LOM) of 2019 has fixed the prohibition of new combustion engines for transportation for the year 2040. Similar announcements have been made in other jurisdictions, with a phase out of all fossil fuel vehicles in 2025 in Norway, 2030 in the Netherlands and Ireland, and 2035 in the United Kingdom, for example (International Energy Agency, 2020). In this context of rapid change, the French law of 2019, the first announcement of this kind, might not be as binding as initially thought. We believe that the necessary carbon pricing mechanism presented earlier in this report will eliminate most fossil fuel engines on our roads much earlier than in 2040. Given that the phase-out of cars from cities, and eventually out of roads, might be accelerated, it is important to publicly plan for alternatives. Efforts should be put in place to ensure that the transition does not leave behind low-income households without reliable means to travel, e.g., by ensuring the presence of public transport or public ride-sharing electric vehicles. The costs of this urban transformation, direct or indirect through the differential growth of land rents, should not be transferred to the suburbs. This requires a strong push in public transportation infrastructures, an increase in population density by changing building standards, and a reform of the local tax system.

Since 2008, the automobile market in France is regulated by a bonus-malus (feebate) system in which low-emission cars get a bonus that is funded by a penalty paid by buyers of high-emission cars. Because this system does not incentivize consumers on the basis of actual emission, it is a second-best mechanism to reduce emissions. In particular, once a high-emission car is purchased, its buyer has no incentive at all to limit its use (rebound effect). Also, the bonus for low-emission cars attracted people who would not have purchased a car otherwise, since the non-purchase option is not subsidized. In fact, the implementation of that system in 2008 yielded an initial increase in emission by 1.2%. D'Haultfoeuille et al. (2014) showed that this feebate mechanism would have increased emissions by 9% in the long run if its parameters would have not be adapted. As explained earlier, a bonus-malus system could be justified for its redistributive advantage over a direct carbon pricing system only if the state remains unable to redistribute the carbon dividend efficiently.

At a broader level, re-thinking the transportation sector will require re-thinking the end goal. Rather than thinking of a solution in which each household replaces their traditional car with an electric car, it is an opportunity to transform the way we travel, with the need to enhance clean public transportation. This presents an opportunity to reduce the use of cars in cities, improving congestion, noise, and particulate matter pollution, which is

[1] Similar announcements have been made by other cities such as Madrid and Barcelona (only zero-emissions vehicles allowed in the city by 2030).

still present with electric vehicles. It is important to highlight the advantages of reducing cars in cities in terms of space. Parked cars occupy valuable space in cities that can be used for alternative uses, such as enhancing mobility (safer and faster) with alternative vehicles (such as bicycles and scooters) or more greening of cities, which is crucial to regulate temperatures.

Finally, when it comes to shipping and aviation, the solutions to the decarbonization are much further away from being economical. And too many local railway lines in France use diesel as an energy source. For this reason, public policy should combine a carbon price on shipping and aviation emissions, together with active R&D efforts for decarbonizing these sectors, possibly using green hydrogen. In the short term, forcing the transportation sector to face a carbon pricing system that takes into account its environmental damages will have the positive effect to favor short-circuit systems of production and consumption.

The Convention citoyenne pour le climat has made several proposals to decarbonize air transport. Some of them are in the direction of carbon pricing. For example, the CCC proposes an eco-contribution on all flights (with the surprising exception of flights to French overseas departments and territories). A similar solution, but much more efficient and transparent, would be to force airlines to buy quotas on the EU-ETS system. The multiplication of sectoral mechanisms is inefficient, since it creates several carbon prices. This proposal illustrates the natural tendency to design sectoral policies, despite the global nature of the problem. Since all CO_2 molecules have the same climate impact, proponents of carbon pricing should support the principle of a single instrument pricing all emissions. As justified in Section 3 (1.2), targeted measures should respond to sectoral specificities (co-benefits, other externalities, information problems...), and should be justified on this basis.

The CCC also proposes to force airlines to fully offset their emissions (this time including flights from the French overseas departments and territories) by financing carbon sinks. The introduction of this proposal into the draft law, as we have seen, would go further by forcing airlines to offset their emissions through specific instruments, in particular through the financing of French carbon capture and storage (CCS) projects. It is inconsistent to impose both an eco-contribution (or coverage by the EU-ETS) and a complete offsetting of emissions, a fortiori by financing highly random R&D on decarbonation. This would duplicate the carbon pricing mechanism for the sector, which is inefficient. And it would impose two parallel instruments for a single objective. Why would we impose this double system on this sector and not on others? Moreover, if governments want to specifically finance certain carbon sinks, such as CCS in France, they can, for example, use the revenues from the ETS to do so.

CONCLUDING REMARKS

The time of the awakening is now over. Here comes the time of the action in the face of our responsibilities towards future generations. The von der Leyen EU Commission, the new Biden's administration, and many other countries around the world are aligned in their ambition to fully decarbonize their economies within the next three decades. This is a herculean ambition. A myriad of actions needs to be implemented by a myriad of actors. Sovereign powers must orchestrate this societal transition to insure efficiency, effectiveness, and fairness. Up to now, the tragedy of the horizons, the free-rider problem, and the lack of a clear vision and a strong political leadership, have limited progresses.

France counts for less than 1% of greenhouse gas emissions. But the French public opinion strongly supports efforts to reduce these emissions, which is an important political asset in international negotiations. With Germany and other ambitious European countries, France should drive the EU Green Deal agenda, and help create a climate club with the United States under the Biden administration. In particular, the climate club should strive to put in place a uniform and universal carbon price for the coalition, together with a WTO-compatible carbon border adjustment at its frontier. We may expect that such a club will soon become very attractive to join – the benefits, in terms of trade and carbon dividend, outweighing the costs, in terms of losing the advantage of environmental dumping if remaining outside the club.

The pricing of carbon is crucial to render profitable individual and corporate mitigation actions that are socially desirable. This should be done at the European level rather than at the national level. Because most mitigation actions are investments whose environmental benefits will be scattered over several years or decades, more visibility, predictability, and credibility about future carbon prices should offered. This should be done by reshuffling the EU-ETS market for emission permits. The system should cover all EU emissions, with no exemption. Free allowances to sectors exposed to international competition should be eliminated since the argument of environmental dumping will be

taken care of by imposing the carbon border adjustment mechanism. The credibility of future carbon prices should be organized through an EU agreement about a carbon price floor that should grow at a real rate of around 4% per year, or by the creation of a "Carbon Central Bank." The carbon dividend generated by the selling of permits should be redistributed to members in proportion of their national emissions. National governments could use this carbon dividend to compensate the lower deciles of their population, in order to make the whole carbon pricing mechanism progressive. To raise the political acceptability of this reform during the EU grand bargain, losing parties, and in particular coal-rich countries, should be compensated through the use of the EU Just Transition Fund, whose budget should be made sensitive to the agreed-upon level of the carbon price floor and its growth rate.

Because of several market failures, the presence of large uncertainties, incomplete markets and co-benefits, carbon pricing will not be enough to reorganize our economies efficiently in the face of this formidable climate challenge. The decarbonization of the electricity, industrial, and transportation sectors, the greening of agricultural practices and of cities, and the improvement of the efficiency of markets for housing retrofitting raise specific issues that need to be individually addressed. This report is not aimed at exploring them in detail. We stress the importance of performing cost-benefit analyses of the specific policies (subsidies, bans, norms, etc.) to address these market failures. In particular, their merit order should be based on the estimation of the cost per tCO_2 saved, taking account of all other social and environmental benefits and costs of these policies. Their timely implementation should be based upon the time at which their cost per tCO_2 saved becomes smaller than the value of carbon that should grow over time. For example, replacing coal by natural gas in the EU electricity mix should be implemented as soon as possible, given its very low cost per tCO_2 saved. Phasing out natural gas should come later. Nuclear energy, hydroelectricity and biofuels should be recognized as the only dispatchable sources of decarbonized electricity, a crucial property in the absence of a mature technology to store electricity. We also stress the importance of a massive investment program in green R&D, in particular for projects that are likely to develop renewable sources of energy able to compete with fossil fuels even in the absence of political will to act for the climate, i.e. in the absence of carbon pricing. Such technological discoveries would have significant benefits on the willingness and ability to decarbonize the world with global impacts.

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CHAPTER TWO

ECONOMIC INEQUALITY AND INSECURITY: POLICIES FOR AN INCLUSIVE ECONOMY

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EXECUTIVE SUMMARY

For economic opportunities to be widely and fairly distributed, France needs to take action in multiple ways and at several stages of people's economic lives. It must equalize access to quality education and revise the core pillars of the welfare state in terms of social protection and progressive taxation to take into account the changing realities of the labor market and the international landscape. It needs to ensure an adequate supply of good, productive jobs by focusing on labor market policies that partner with businesses and on industrial policies that target employment specifically. Finally, it must foster a better communication between different levels of governments and employers, as well as between the government and citizens.

Unlike the traditional approach which keeps the productive and distributional agendas of society distinct, with separate policy tools that address each respectively, our approach entails the joining of the two. Redistribution is important, and we show it can be carried out more effectively. But it must be adequately complemented with the creation of productive employment opportunities for those at the middle and the bottom of the income scale. Expanding the access to quality employment – what we call "good jobs" – in turn also directly contributes to higher productivity and economic growth for the economy as a whole.

French people's attitudes towards inequality, mobility, and good jobs

In a nationally representative survey carried out specifically for this report, we examine French citizens' attitudes towards inequality, insecurity, the labor market, and government policies. Overall, 73% of respondents believe that inequality in income is a serious or very serious problem; 62% believe the same about inequality in wealth. 70% of our sample believes that inequality in opportunity is a big issue. They also think that children from poorer backgrounds receive a lower quality of education than children from higher-income backgrounds, and that the latter have much better chances of getting a good job, even conditional on similar education levels.

We also ask people open-ended questions on what a “good job” means to them. The terms that come up most frequently are “good salary,” “well paid,” “a good environment/good feeling,” “good work conditions,” and terms related to “private life” and “family life” to indicate a desire for work-life balance. On the major causes of lack of good jobs in France, 57% of respondents believe it is due to outsourcing and globalization; 28% that it is due to technology. Close to 60% of respondents believe that a major factor in determining access to good jobs is the region of residence, and the same share believe that family background is. All groups except those who are geographically very mobile think it is increasingly hard to find employment, and more so if they feel more geographically constrained.

When it comes to what the government can do, around 60% of people believe the government should put priority on creating good jobs that meet sufficient quality criteria, even if that implies fewer jobs overall. Between 60% and 70% of respondents believe the government should intervene in the labor market, by subsidizing continuous training, improving labor market regulations, and incentivizing firms to create quality jobs. Respondents are also very favorable to fostering dual education programs, improving job search assistance, especially those in partnership with local employers. Respondents are quite favorable to government intervention to help workers from a company that either relocates abroad or replaces labor with robots.

With these survey results as background, we develop policy recommendations in a number of areas.

Inheritance and gift taxation

We propose a unified regime of inheritance and gift taxation to make it beneficiary-based and progressive in the cumulative amount received. Instead of taxing transfers at each death, the new system would tax the total transfers (gifts, inheritances, from all sources) received by the heir, so that those who receive more will be taxed at higher rates. It would still be possible to have preferential and reduced rates based on the relation between the donor and the heir. This tax needs to be very broad-based, covering all or most assets. It should also start at relatively high levels of transfers and be progressive.

Education policies

We address a number of policy issues in education, though few of them are new. Many have been part of the national debate for some time, and progress has been made in recent years. Our proposals center around providing better access to schooling for low socio-economic background children starting form early on, improving outcomes for children in lower-quality schools and difficult areas, rethinking the profession of teachers and making it more attractive, giving more responsibilities and autonomy to school administrations, boosting vocational and dual vocational-academic tracks, and improving the transition from school to the labor market.

Employer-focused active labor market policies

Taking a cue from successful sectoral training programs implemented elsewhere, we recommend some new (or enhanced) roles for the French public employment service (PES), Pôle emploi, requiring a more intensive engagement with employers. Pôle emploi can play a larger role in ascertaining employers' skill needs and ensuring that local training providers are offering the appropriate courses. They can be more proactive in assisting currently employed workers whose positions might be at risk due to company reorganizations. Their activities can move beyond providing better services to firms or cushioning the shocks of company restructuring to actually shaping the employment decisions of firms on an ongoing basis. In view of the uncertainty about what might work in the French context, we encourage decentralized experimentation by local PES offices, coupled with evaluation. This may require granting local offices a degree of autonomy that they may not presently possess.

Business incentives focused on good jobs

The main thrust of our proposals here is to create a structure for job-enhancing productivity assistance to firms that runs in parallel (and in cooperation) with the worker-oriented Pôle emploi. We propose the setting up of regional business promotion agencies that operate alongside the PES and cover the same territories. We call these "regional business bureaus" (RBB), though similar functions could perhaps be performed by existing agencies. The goal of RBBs (or their equivalent) would be to provide a portfolio of services to local firms or prospective investors with the overarching goal of assisting them to increase productivity while creating good jobs. Many of these services would normally be administered by other agencies, in which case the role of the RBBs would be mainly to coordinate those agencies and help firms navigate through them. For example, RBBs may cooperate with the Banque publique d'investissement (BPI) to help small and medium enterprises (SMEs) get access to financing or business advice. They may coordinate with the local PES to identify suitable workers and help recruit them. They may organize training providers to ensure the requisite skills are built up. They may also act as a go-between with the local bureaucracy as regards local regulations such as zoning. And they could be provided with additional resources to provide other services as well, as the needs reveal themselves. We provide some broad guidance for the appropriate governance of these incentive programs.

Labor-friendly innovation policies

We echo the late Tony Atkinson's call for making the direction of technological change an explicit concern of policymakers, so as to encourage innovation in a form that increases the employability of workers and is geared towards good jobs. There is little research on the possible effectiveness of policies of this type, but we suggest some broad areas for

policy attention. First, it would be useful to review the prevailing fiscal regime in France with a view to ascertaining whether there are excessive incentives for investment in automation. Second, it may be possible to incorporate employment considerations directly in the existing regime of tax incentives for R&D. Third, the government could apply a "prospective employment test" when determining public spending priorities for innovation. Fourth, the government can encourage the introduction and dissemination of learning organizations that empower workers (based on teamwork; development of cognitive, social, and soft skills; workers' autonomy and continuous learning) to replace Taylorist or lean organizational models. Finally, public policy can play a role in shaping public consciousness about the social and employment consequences of innovation.

Trade policies that address fairness

Policy must address the outsized concern the French public expresses with regard to job displacement due to trade and outsourcing. Certain kinds of imports, from countries with weak social standards and exploitative working conditions for labor, can undermine conceptions of fair competition and good jobs policies at home. We argue that trade policy must incorporate an explicit mechanism for addressing imports that pose such problems, while shielding from protectionism the bulk of trade that takes place under conditions of competition that differ little from domestic markets. We propose an anti-social dumping procedure designed to achieve that objective. An explicit safety valve for "problematic" imports may enhance the legitimacy of trade and outsourcing in general. While the policy can be implemented by France and other members of the European Union (EU), making it fully compatible with world trade rules would require the EU to negotiate a WTO agreement with trade partners. France and the EU can take the lead towards fairer global trade rules that take social concerns into account.

Rethinking tax systems

In many countries, tax burdens have shifted from capital to labor, a phenomenon that has been linked to aggravating inequalities, contributing to labor market rigidity and polarization, and exacerbating concerns about fairness. This is largely the result of globalization and increased mobility of capital and corporations. France has implemented recent reforms that pull in both directions. At the same time, fiscal burdens in France are very high, which has several detrimental consequences. We argue that several recent developments should prompt France to rethink its taxation of capital and labor. Our general proposal is to "tax better," not more. A push for policy change is underway and pressure is likely to increase post Covid-19. The biggest opportunity for improving capital taxation lies in the recent progress on the Automatic Exchange of Information (AEOI) implemented and pushed by the "Global Tax Forum." This new mechanism for exchange of information means that it is possible to tax capital in a more efficient way that was not feasible before and to limit loopholes and avoidance opportunities. We provide ideas for broadening tax

bases, improving compliance, and leveraging new tools to improve the efficiency of the tax and transfer system. With respect to taxation of high-skilled, high-earning professionals, who – like capital – are mobile, similar cooperation and coordination within the EU could be considered. On the efficiency of taxation and public spending, we discuss how to harness data and analytics tools, better information, and new methods to recover fiscal leakages and improve public sector productivity. On the taxation of multinational corporations, we endorse the OECD's and Global Tax Forum's Base Erosion and Profit Shifting (BEPS) initiative. We also argue against ring-fencing digital companies in a world where many companies have digital activities, use digital technologies, and present similar challenges for tax authorities.

Surveys as a key tool for understanding citizens and designing policies

Implementation of the policies proposed in this report and elsewhere will require data collection, experimentation, and policy evaluations. But we also need data that reveals what is otherwise invisible: namely, what people think. This type of data is not often systematically collected, and, yet, it is critical. "Surveys" are a way of getting into citizens' minds to elicit perceptions, knowledge, understanding, attitudes, and views. These may be context-dependent and require an on-going study. We argue that large-scale surveys should become a continuously used, well-designed, and interactive policy tool with which the government would communicate with citizens, as well as with employers and companies. They complement the direct dialogue that occurs between constituents and leverage mobile phone and internet technologies to reach a large and diverse set of people rapidly. They can be used to collect input and feedback from constituents, test reform ideas, detect implementation challenges, as well as study the impacts of policies in real time.

SECTION 1

RISING INEQUALITY, INSECURITY, HOLLOWING OUT OF THE MIDDLE CLASS

Many advanced economies are currently reeling under a structural problem of inequality and economic insecurity. Unlike many other countries, France has not experienced a large increase in overall inequality in recent decades. However, levels of economic insecurity remain large, socio-economic gaps across different strata have not closed, many regions lag behind in creating good jobs and economic opportunity, youth unemployment remains very high, and social mobility is low. Attitudinal surveys reveal a significant sense of unfairness regarding existing economic arrangements and a great deal of support for more active government policies to counter these trends.

Economic inequality manifests itself not only in differences in income and wealth, but also in gaps in health, education, opportunities, mobility, and access to quality work. In France as elsewhere, these gaps are rooted in two major divides. First, there is a labor market divide, also called labor market polarization, reflected in the reduction in the quantity and quality of jobs in the middle of the employment distribution. Second, there is a spatial divide, between successful metropolitan centers and outlying, less successful regions. These two divides are linked in that secular changes in technology and globalization have created a class of winners and a class of laggers. There is growing polarization between those who are benefitting from technology and globalization and those who are left behind. At the same time, the traditional “middle class” is hollowed out.

One of the visible and harmful consequences of these trends is a scarcity of what could be called “good jobs.” While the definition of what makes a “good job” varies across people, time, and space, many agree that what makes a good job entails to at least some extent a good pay, relative security, some career progression, access to adequate (re)training, safe working conditions, and the possibility of sustaining a normal “middle-class” life with a reasonable level of economic security and the scope for some savings.

A lack of good jobs and deeply unequal opportunities carry potentially large social, political, and economic costs. Social costs manifest themselves in the form of exclusion, broken families, drug and substance abuse, addiction, and crime. Political consequences emerge through declining trust in government, experts, and institutions, partisan polarization, the rise of populist nationalism, and backlashes against globalization and immigration. Furthermore, they are also accompanied by implications for economic performance. Lack of good jobs is a reflection of the fact that good technologies are bottled up in a few firms and among high-skilled workers only. Other workers remain unproductive, and growth suffers. Improving jobs and opportunities can be an efficiency and growth-enhancing endeavor as well as an inequality-reducing one. Hence, the growth and social agendas need to merge.

In this report, we will argue that for economic opportunities to be widely and fairly distributed, France needs to take action in multiple ways and at several stages of people's economic lives. It must equalize access to quality education and revise the core pillars of the welfare state in terms of social protection and progressive taxation to take into account the changing realities of the labor market and the international landscape. It needs to ensure an adequate supply of productive, high-quality jobs by focusing on labor market policies that partner with businesses and industrial policies that target employment specifically. Finally, it must foster communication and feedback between different levels of governments and employers, as well as between the government and citizens.

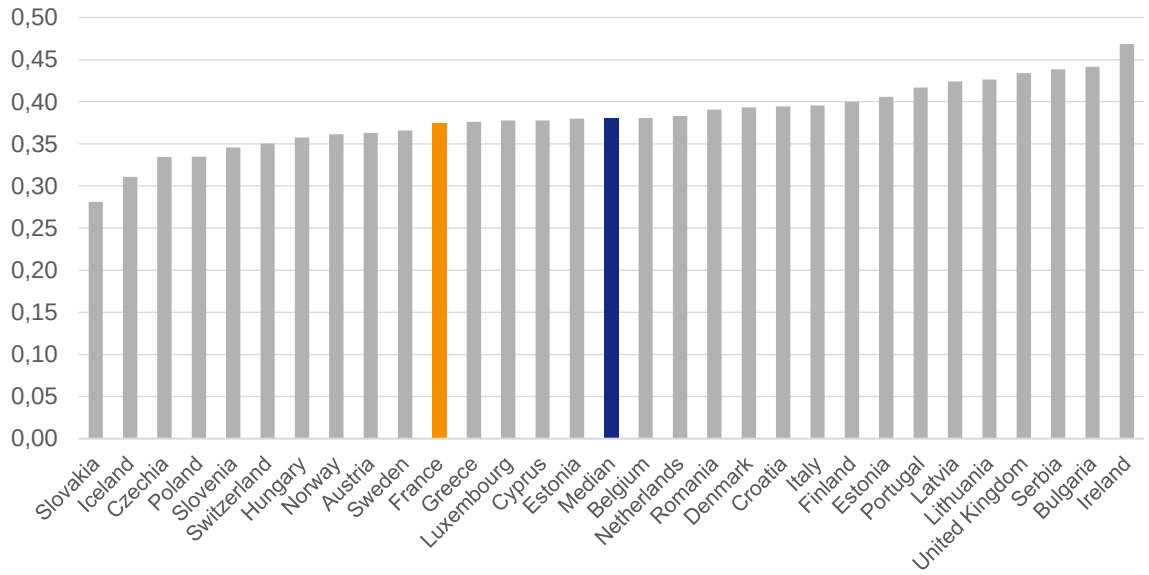
We start by providing some key facts about inequality, territorial disparities, social mobility, and labor markets in France, followed by some evidence on French citizens' attitudes towards inequality, insecurity, the labor market, and government policies.

1. Key Facts on Inequality and the Labor Market in France

1.1. Overall inequality in international comparison

Pre-tax income inequality in France as measured by the Gini coefficient is rather lower than in other developed countries (Figure 1). Moreover, the share of the top 10% earners is lower than in many OECD countries and comparable to those in Denmark and Italy (Figure 5). Post-tax inequality is moderate by international comparison (below the OECD and EU averages, see Figure 2). The poverty rate after taxes and redistribution is around 8% for the 18-65-year-olds, below OECD average (Figure 4). Pre- and post-tax inequalities have remained relatively constant over the last two decades, unlike Anglo-Saxon countries where inequality has increased sharply over that period. Furthermore, France is one of the few countries in Europe where income growth among the bottom 50% was higher than growth among the top 10% between 2007 and 2017 (Table 1). Wage inequality decreased slightly between 1995 and 2015 (Figure 6).

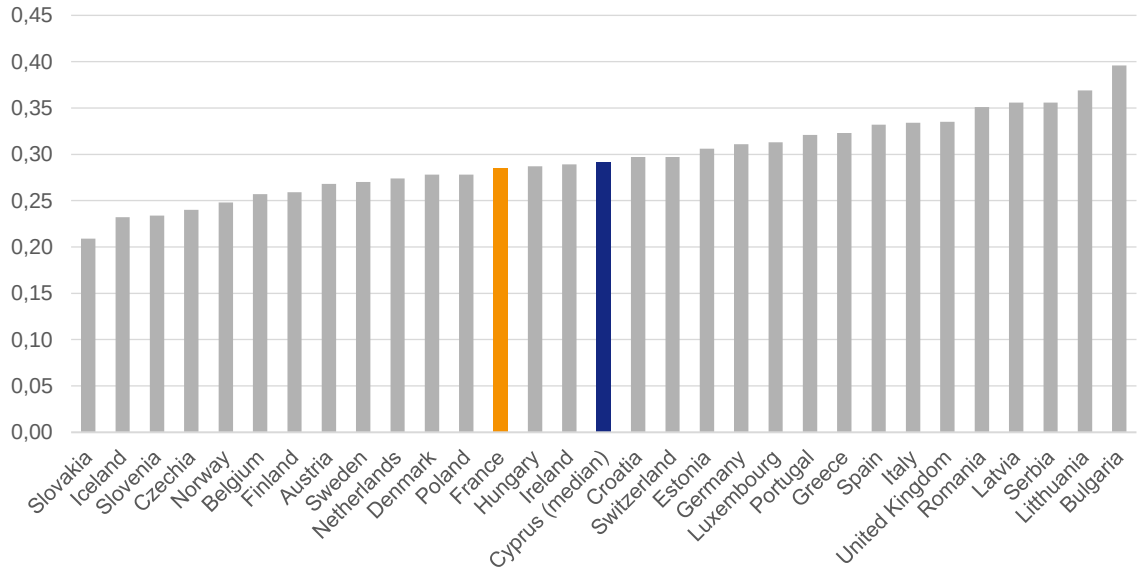
Figure 1 – Inequality of pre-redistribution income (before direct taxes and social transfers but including pensions): Gini coefficients of income per consumption unit, 2018 (2017 incomes)



Note: The German statistical institute refused access to its data.

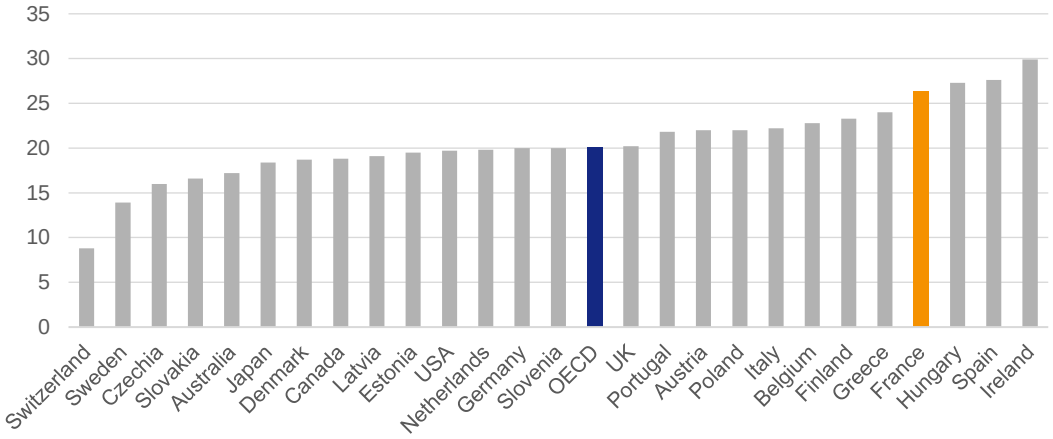
Source: France Stratégie (2020b), "Inégalités primaires, redistribution : comment la France se situe en Europe", Rousselon J. and M. Viennot, La Note d'analyse*, No. 97, December*

Figure 2 – Inequality of disposable income (after direct taxes and social transfers): Gini coefficients of income per consumption unit, 2018 (2017 incomes)



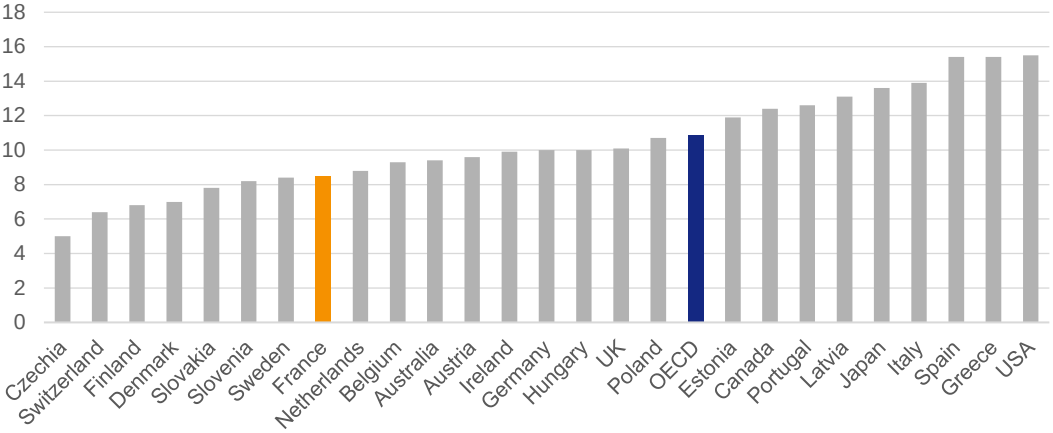
Source: Eurostat

Figure 3 – Poverty rate *before* taxes and transfers (population aged between 18 and 65)



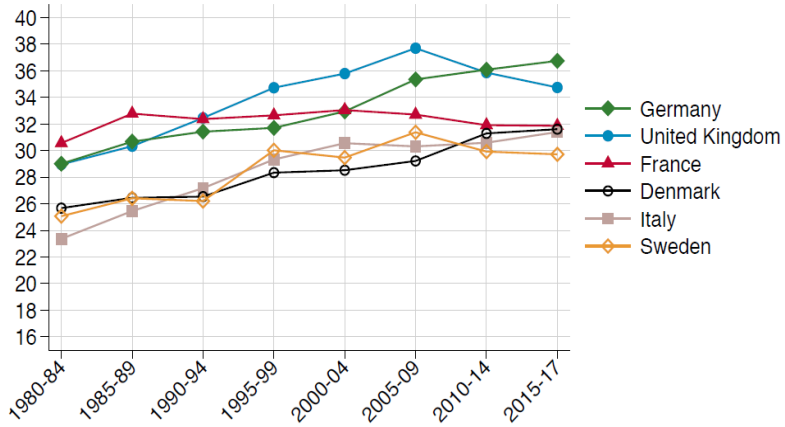
Source: OECD (2019). OECD Economic Surveys: France 2019

Figure 4 – Poverty rates *after* taxes and transfers (population aged between 18 and 65)



Source: OECD (2019). OECD Economic Surveys: France 2019

Figure 5 – Top 10% income share in Western and Northern Europe



Source: Blanchet T., Chancel L. & Gethin A. (2019), "How Unequal Is Europe? Evidence from Distributional National Accounts, 1980-2017", WID. World Working Paper, 6

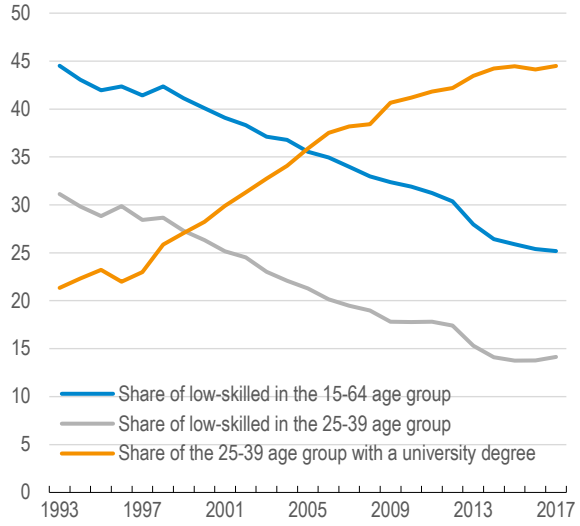
Table 1 – Difference between bottom 50% growth and top 10% growth in Europe between 1980 and 2017

	1980-2017	1980-1990	1990-2000	2000-2007	2007-2017
Eastern Europe					
Albania				2.8	12.0
Bosnia Herzegovina	-162.3	1.1	-127.5	-6.2	-1.3
Bulgaria	-220.6	-24.9	-45.2	-12.2	-23.1
Croatia	-17.0	-16.3	-2.6	-3.3	8.4
Czech Republic	-110.1	-20.4	-37.1	-8.0	-6.6
Estonia	-100.2	-49.2	-39.8	10.8	23.3
Hungary	-176.7	-33.7	-40.3	-52.5	7.0
Kosovo				-6.0	24.0
Latvia	-100.8	-10.0	-33.6	2.5	-3.8
Lithuania	-125.5	-22.9	-23.9	-15.4	-11.5
Macedonia	-35.0	0.9	-36.1	-4.4	11.3
Moldova			-13.9	16.9	46.3
Montenegro	-24.2	1.3	-15.9	-11.6	0.1
Poland	-206.1	-12.1	-88.8	-23.3	-0.7
Romania	-111.3	-2.2	-40.5	-66.7	38.2
Serbia	-47.8	-3.6	-17.9	-20.5	-5.9
Slovakia	-37.7	3.1	-31.3	-4.1	13.5
Slovenia	-68.7	0.0	-49.1	-4.4	-11.8
Southern Europe					
Cyprus			13.9	4.5	-23.8
Greece				45.3	-18.1
Italy	-53.2	-20.2	-24.0	0.4	-5.5
Malta				11.5	-53.2
Portugal	-60.6	-26.6	-26.2	-2.1	5.5
Spain	-4.0	-4.5	11.4	-2.7	-6.3
Western Europe					
Austria	-22.2	-3.7	1.4	-4.2	-8.4
Belgium	-13.0	-4.5	-2.2	1.5	-4.6
East Germany		-6.6			
France	-15.1	-15.7	-2.8	-0.6	6.3
Germany	-62.3	-17.2	-5.5	-28.1	1.0
Ireland	-154.7	0.7	-49.4	-10.2	-18.3
Luxembourg	-37.7	-3.7	-11.2	-16.7	3.0
Netherlands	-32.4	-2.2	7.5	-26.1	-3.6
Switzerland	-28.5	-3.0	-9.0	-4.3	-6.8
United Kingdom	-47.3	-22.3	-12.9	-11.5	13.4
Northern Europe					
Denmark	-68.4	-7.6	-14.0	7.9	-29.2
Finland	-52.6	12.9	-34.3	2.2	-15.4
Iceland				-31.6	29.7
Norway	-27.1	32.3	-65.1	1.0	-1.1
Sweden	-71.9	3.0	-22.6	-16.0	-7.3

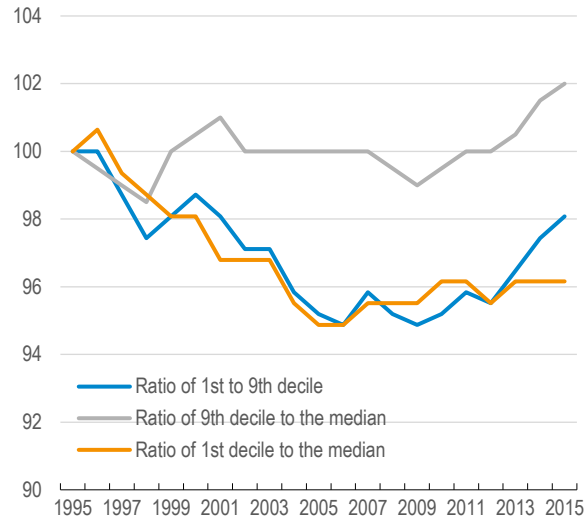
Source: Blanchet et al. (2019)

Figure 6 – Evolution of wage inequality and level of education in France in the 2000's

A. The level of education has increased*, per cent



B. Wage inequality decreased somewhat**, per cent



* As a percentage of the population; low-skilled workers correspond to a level of education that is equal to or less than the first cycle of secondary education.

** Decile ratios of net annual salary (full-time equivalent) for all workers. Mainland France until 2001, France excluding Mayotte as of 2002. All private-sector and state-enterprise workers, except agricultural workers, apprentices, interns and except for salaries paid by non-professional employers.

Source: OECD (2019), The Future of Work, OECD Employment Outlook 2019

1.2. Territorial inequalities in France

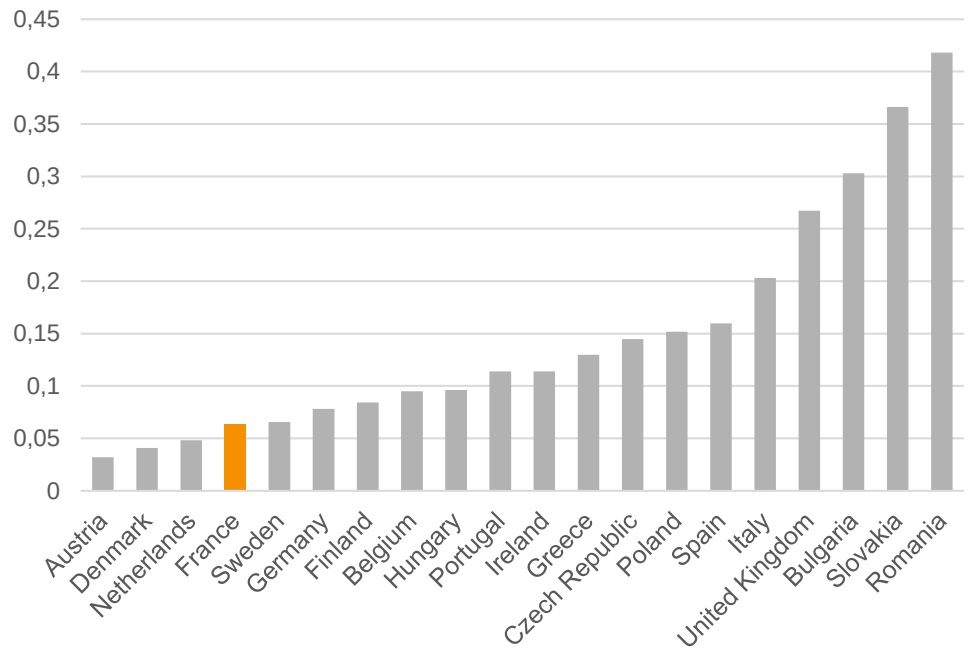
In spite of rather limited regional inequalities in European comparison (Figure 7), ten *départements*[1] in metropolitan France (as ranked by median income) face both the highest unemployment and poverty rates, according to INSEE's data. The vast majority of these *départements* are located in the northern and southern ends of the country. The poverty rate is 9 points higher before redistribution and 6.5 points higher after redistribution than the average for the other *départements*. The median income per consumption unit in these *départements* is €200 per month lower than elsewhere (€215 before redistribution, €170 after). Within this group of *départements* in difficulty, there are rural as well as urban places, and even large metropolitan areas. There are strong inequalities even at a geographical level finer than that of the *départements*:[2] the average hourly wage in the top 10% highest employment zones (mostly large urban areas) is 36% higher than in the bottom 10%.[3]

[1] These are subregions.

[2] The level covered is the one of employment areas (*zones d'emploi* as defined by INSEE).

[3] INSEE (2017), *Salaire net horaire par zone d'emploi*.

Figure 7 – Variation coefficient of average disposable income across regions in Europe



Note: We consider the NUTS 2 Regions, according to the EU nomenclature. Member states with less than 3 regions are excluded.

Source: Eurostat, calculation from France Stratégie

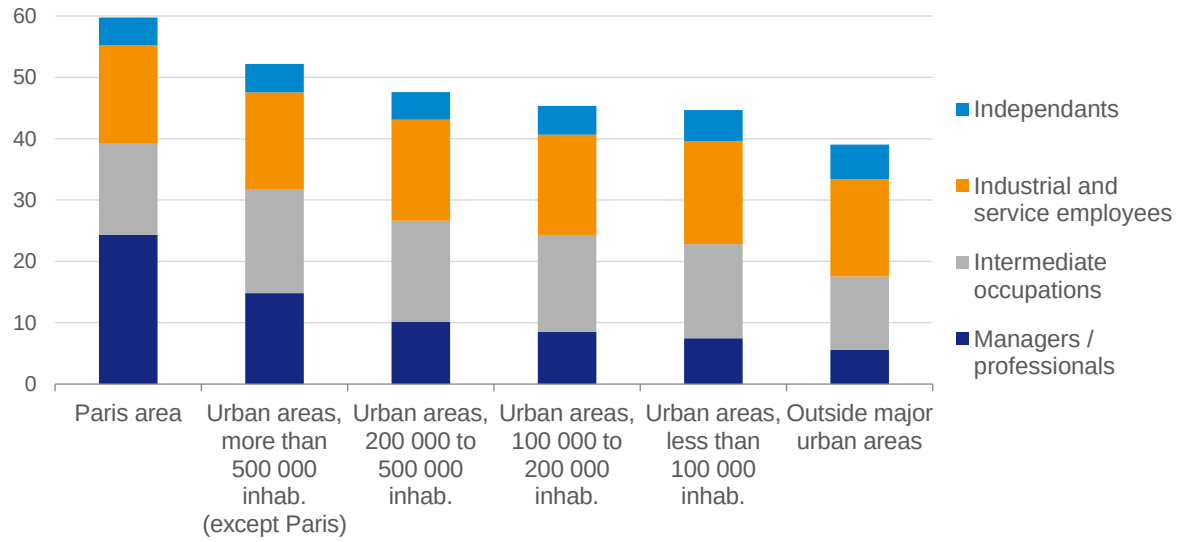
Income inequality and unemployment rates are not systematically different in rural or urban zones, small towns or large metropolitan areas. Even if the large metropolitan areas have seen their share in total employment increase, the differences in terms of incomes and labor market outcomes are primarily regional. Put differently, disparities are starker between *régions* than within *régions*.

Nevertheless, there are areas of high poverty and unemployment in the densely populated metropolitan areas as well. Unemployment is not on average lower there than it is in medium-sized cities. It is actually higher than in rural areas, partly due to different demographic composition and dynamics. It is hard to identify a *région* or group of *régions* that is consistently successful along all dimensions (employment, inequality, poverty, social mobility, growth, etc.). To give some examples, the Paris region is characterized by particularly high living standards (as almost all capital cities in Europe) and low unemployment rates, but it is also marked by a high level of income inequality and high poverty rates. Poverty rates are particularly low in the west of the country, but the median standard of living is not particularly higher. Unemployment is on average lower in the rural Massif Central and in the West (as in Brittany for instance).

Geographical inequalities appear to be stable since the 1980's, with little catch-up by poorer *départements*, as shown by Bonnet, d'Albis and Sotura (2020). INSEE data also shows that the regional map of economic difficulty has changed little over the last few decades. Unemployment rates in employment areas in 2019 are 90% correlated with those observed in 2003. In other words, the two *régions* with high unemployment rates in the north and south have experienced unemployment for a long time. Finally, with a few exceptions (i.e., the overseas territories or Corsica) the GDP per capita of lower-income and high-income *régions* does not seem to be converging.

Yet, it remains that large metropolitan areas capture a high share of total employment and the occupations with the highest potential of new job creation. By contrast, jobs at higher risk of destruction are located in low population density or rural areas. As an example, jobs in sectors with high new employment creation potential represent 60% of total employment in Paris urban areas but less than 40% in rural areas (Figure 8). These divergences could partly be linked to the educational disparities already outlined above, given that the share of 25 to 64 years old with higher education is above 40% in cities and only slightly above 25% in rural areas (Figure 9).

Figure 8 – Share of employment with high potential for job creation, depending on density

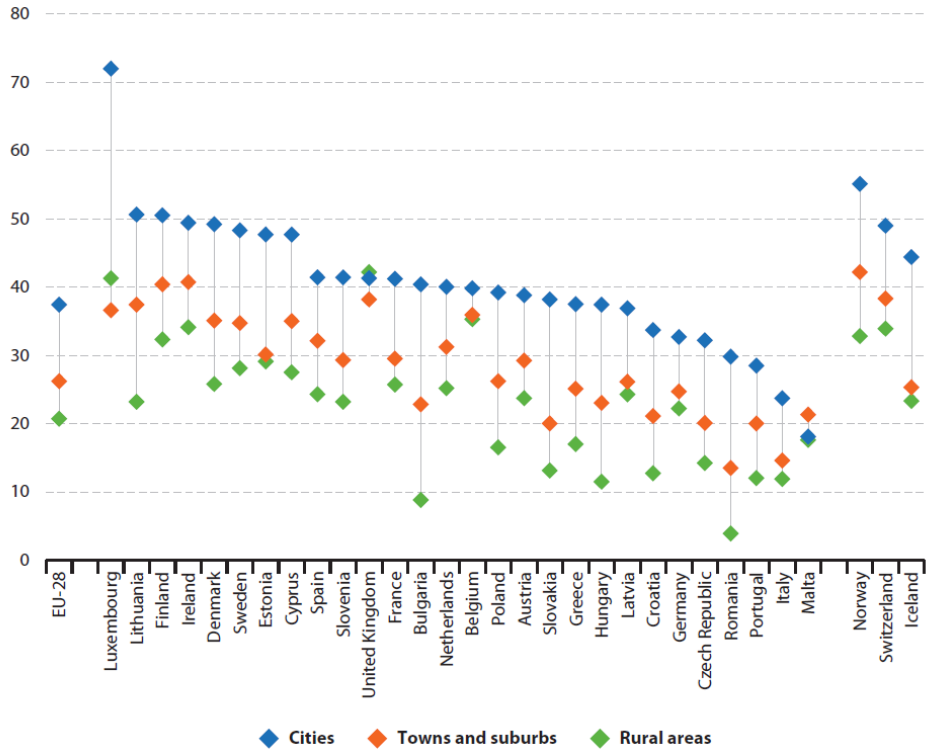


Note: Basing on a prospective analysis on employment in 2022, authors define employment with high potential for job creation as those for which the rate of creation is above the average on the period 2012-2022 (considering the benchmark scenario of the prospective analysis).

Reading: In the Paris area, employment with high potential représents 60% of the total employment; as opposed to 45% in urban areas between 100 000 and 200 000 inhabitants.

Source: France Stratégie (2017a), "Dynamique de l'emploi et des métiers : quelle fracture territoriale ?", by *Lainé, F.,* La Note d'analyse*, No. 53, February*

Figure 9 – Proportion of people aged 25-64 with a tertiary level of educational attainment, by degree of urbanization, 2014



Source: Kotzeva M. M. & Brandmüller T. (eds.) (2016), Urban Europe: Statistics on Cities, Towns and Suburbs, Publications Office of the European Union

Thus, with regards to income or employment, medium-sized towns and rural areas do not appear to be particularly disadvantaged or without prospects for those living there.[1] Nevertheless, the *Gilets jaunes* (Yellow Vests) movement has brought to the forefront the dissatisfaction of a significant part of the population in these territories. A study of the French Council of Economic Analysis (CAE)[2] highlights the deterioration in access to public and private services as a key element for understanding this dissatisfaction. Over the last thirty years the share of localities that no longer have local shops or schools has increased significantly, which has led to a perceived worsening of living conditions and quality of life.

[1] Eurostat statistics relating to the poverty risk after housing costs (broken down by degree of urbanisation) show that France posts the second lowest poverty rate from the EU as for rural areas.

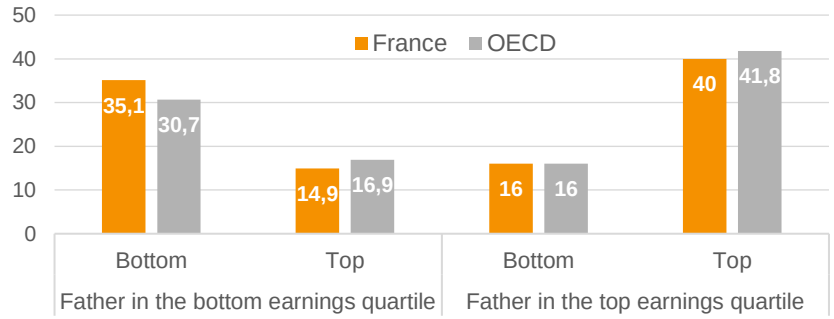
[2] CAE (2020), "Territories, well-being and public policy," by Algan, Y., Malgouyres, C. and C. Senik, note No. 55, January.

1.3. Social mobility

Social income mobility remains low in France. Computing statistics can prove challenging as there is only little data linking parents' incomes to that of their children. The OECD (2018a) study finds that, in France, 35% of sons with fathers in the bottom income quartile end up in the bottom income quartile themselves, compared to an OECD average of 31% (Figure 10). Only 15% of them end up in the top income quartile. France is part of the low intergenerational mobility countries for bottom quartile children, with only Luxembourg, Germany and the United States having lower mobility rates (Figure 11). France Stratégie (2018) finds that among the generations now aged between 30 and 45, the social origin is a strong predictor of income and risk of living in poverty.

As is the case for inequality, social mobility is also very different across *régions* and *départements* (Figure 12). *Régions* where children grow up have a strong impact on their future standards of living (France Stratégie, 2020f). For instance, median standard of living[1] for children of workers who grew up in Île-de-France is around €1,700, against €1,500 in Corsica (Figure 13). Interestingly, even if children come from poor neighbourhoods, but from the richer *régions*, they can expect to reach a higher standard of living than children from poorer *régions* having the same social background. For instance, blue-collar workers' children from Seine-Saint-Denis can expect to reach a median standard of living of €1,680 as compared to the median national standard of living of €1,600. Moreover, educational inequalities between *régions* reinforce social mobility disparities within French territory. For instance, in Paris the share of people who are in a better socio-professional category than their parents is above 45%, and the share of those with higher education is close to 35%. In Calvados, these shares are 25% and less than 20% respectively (Figure 14). In addition, children from disadvantaged backgrounds have lower geographical mobility and are therefore more affected by the conditions of the local labor market.

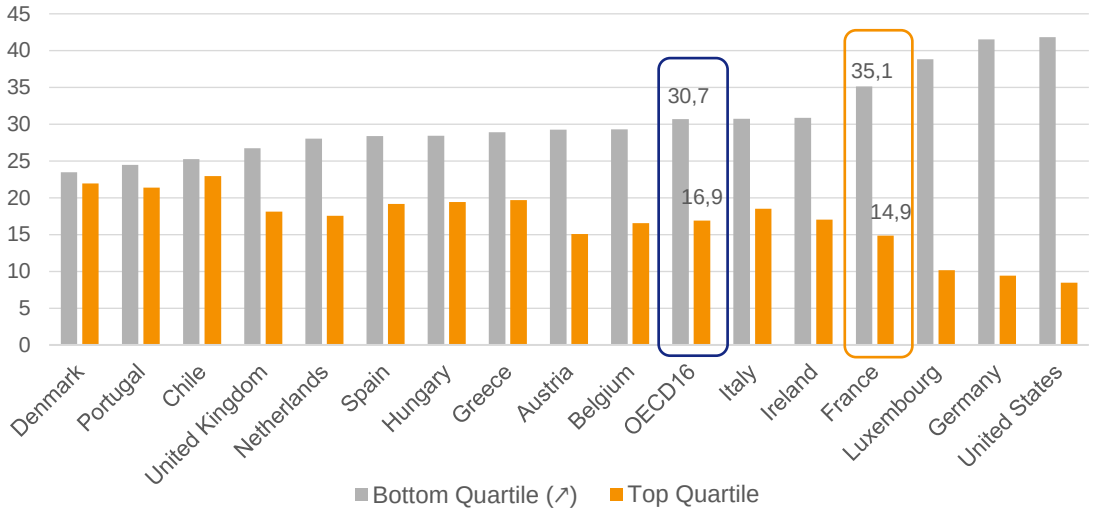
Figure 10 – Share of sons from bottom (top) income quartile ending up in bottom (top) income quartile in France against OECD average



Source: OECD (2018a)

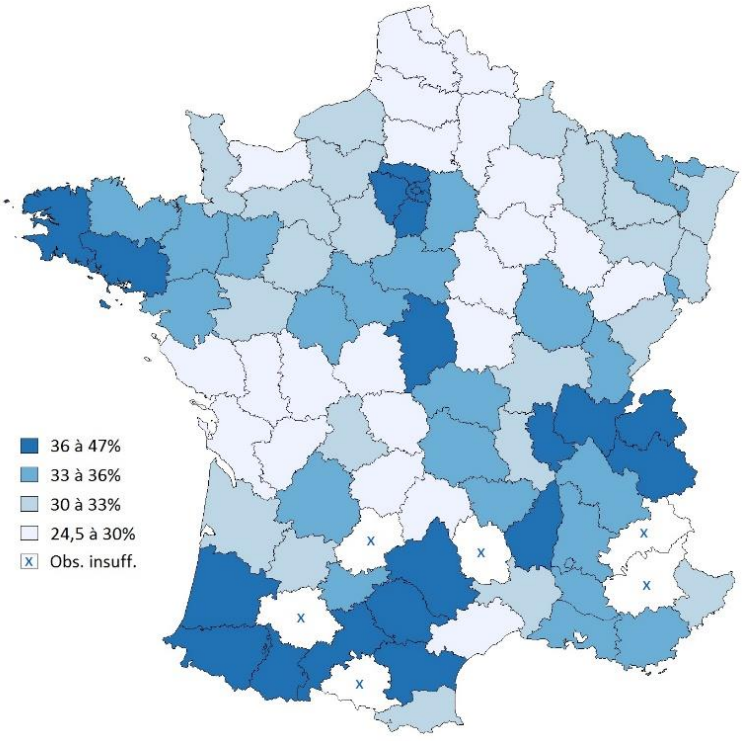
[1] Standards of living are defined as disposable income per unit of consumption.

Figure 11 – Comparison of sons from bottom income quartile ending up in bottom or top income quartile between OECD countries



Source: OECD (2018a)

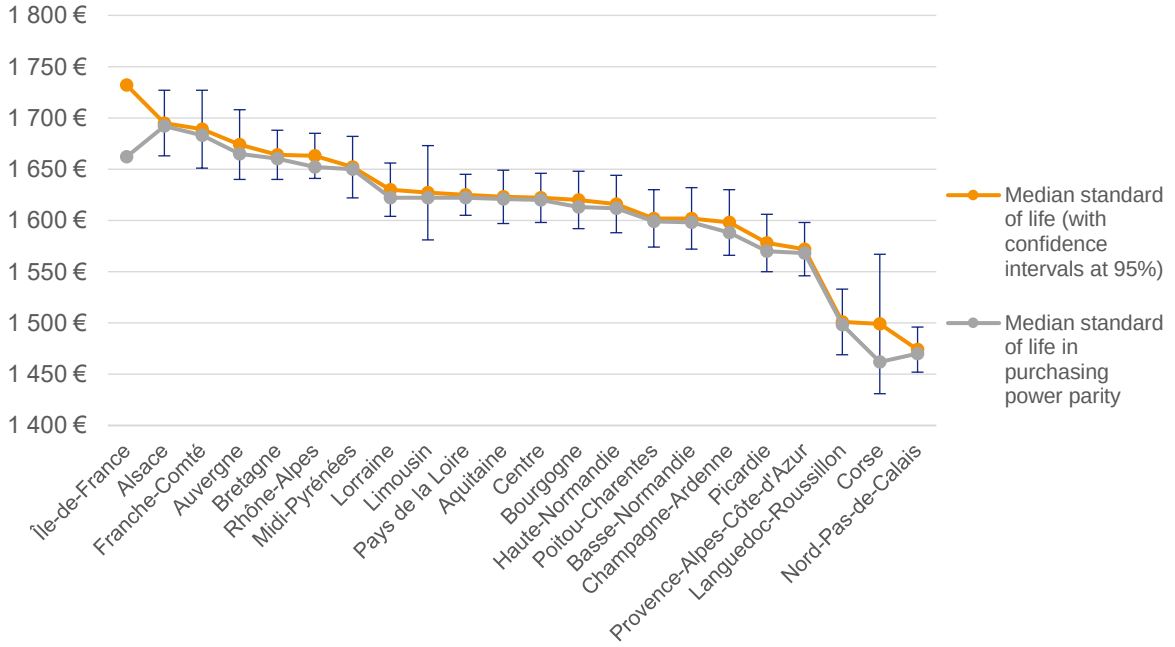
Figure 12 – Share of workers and employees' children that became executive or middle manager, depending on birth's department



Scope: population aged 30 to 45, born between 1965 and 1979.

Source: France Stratégie (2015), "La géographie de l'ascension sociale", by Dherbécourt, C., La Note d'analyse*, No. 36, November*

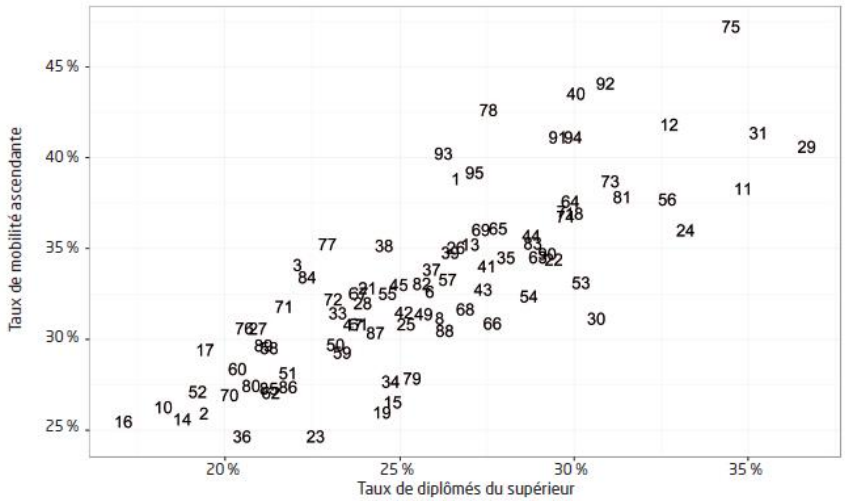
Figure 13 – Median standard of life of adult children of workers or employees, by regions of origin



Note: Standard of life is defined as the available income, per unit of consumption.

Source: France Stratégie (2020f), "Quelle influence du lieu d'origine sur le niveau de vie ?", by Dherbécourt, C. and G.Kenedi, La Note d'analyse*, No. 91, June*

Figure 14 – Rate of upward mobility and rate of higher degree among children from popular classes



Scope: persons born between 1965 and 1979.

Note: The x axis is for the rate of higher education while the y axis for the rate of upward mobility. This rate is the share of people who are in a better socio-professional category than their parents. Data points represents French *départements'* administrative codes.

Source: France Stratégie (2015), "La géographie de l'ascension sociale", op. cit.

1.4. Labor market polarization

France ranks among the large industrial countries with the strongest decline in manufacturing during the last decades. Since the 1980's, manufacturing has declined to only account for 10.3% of all employment and 13.4% of GDP (as compared to 25.5% in Germany, 19.7% in Italy, and 16.1% in Spain). Labor market polarization, unemployment, and lower quality jobs have to be considered against this backdrop of a sharp decline in manufacturing.

Labor market polarization is a major issue in France as in other developed countries. Yet, to compare across countries, one must be careful. Indeed, France is often seen as one of the EU countries with the most polarized labor market, but this has been argued by researchers at France Stratégie to be a statistical artefact due to different classifications, as well as changes in the definitions and data over time (see the analysis by France Stratégie in Box 2, at the end of this section). Undertaking an international comparison on level of skill or qualifications of jobs is very challenging. Professional qualifications depend on factors which might differ from one country to another, such as the level of education, collective bargaining, and "social status" which are not always reflected in wage levels.

If we use a more careful and consistent classification of jobs to diagnose polarization in France, we can see, as in other countries, a "hollowing out" of the middle. The share of the most qualified jobs is continuously increasing, as does the share of the workforce with higher education. By contrast, the share of medium-skill workers is declining. There is little to no increase in low-skilled jobs. The only growth observed within low-skilled jobs are that of workers in home care and some childcare sectors (see Box 2, end of section).

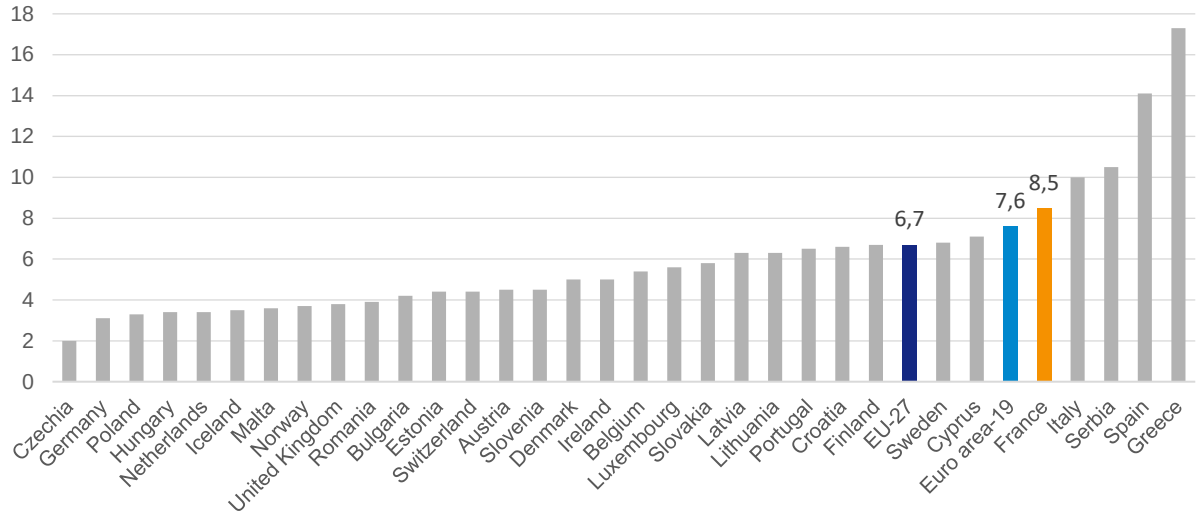
France has a somewhat higher unemployment rate than the EU27 or Euro Area averages – with in 2019 an average rate of 8.5% for the 15-74 years old against 7.6% for the Euro Area average and 6.7% for the EU27 (Figure 15) –, and the gap widens when focusing on French youth unemployment (almost 20% in 2019, as opposed to Euro area and EU27 averages close to 15%). The share of young people neither in employment nor in education and training (NEET), reaching 10.6% in 2019, also exceeds both Euro Area and EU27 averages (Figure 16 and 17).

Regarding additional indicators about labor market, France performance is mixed. On the one hand, the level of part-time work and the potential additional labor force – people who

[1] Between 1996 and 2015, medium-qualified jobs decreased (-16%) but the decline in low-skilled jobs was even greater (-19%). At the same time, the share of qualified jobs increased by 17% (Figure 15). The share of medium-qualified employment continued to decline after the crisis, particularly between 2007 and 2010 (-7%). After 2007, low-qualified employment ceases to decline and high-qualified employment continues to increase, reinforcing the hollowing out of medium-skilled jobs.

do not correspond to the ILO (International Labour Organization) definition of unemployment but whose situations are close to unemployment – are lower than the Euro Area and EU27 averages (Figure 18 and 19). On the other hand, temporary employment represents 13.3% of total employment in 2019 (above the Euro Area and EU27 averages), and, worse than that, France posts the lowest percentage of European countries in terms of transitions from temporary to long-term employment contracts, at slightly above 10% (Figure 20).

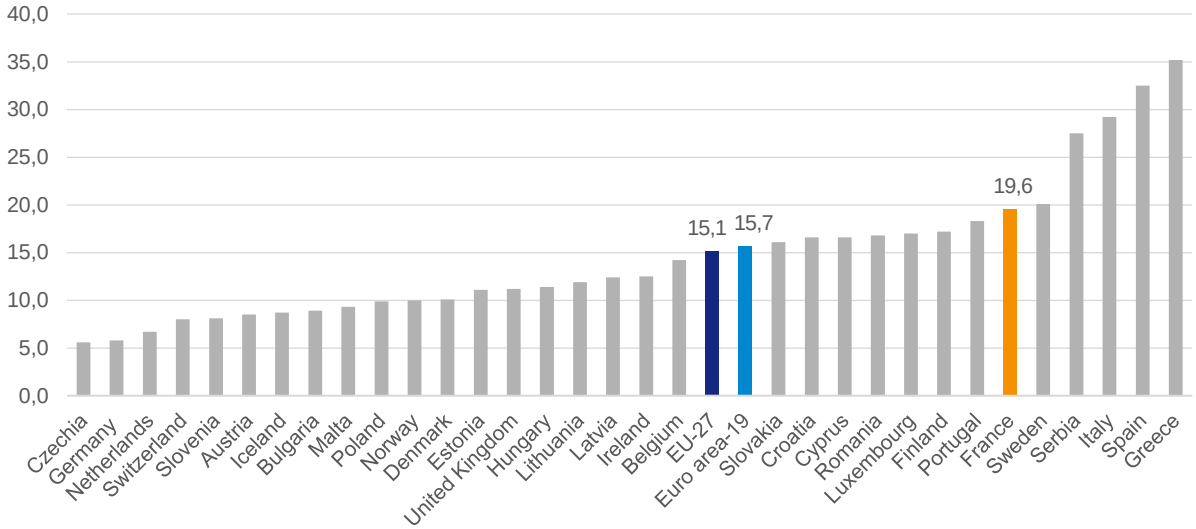
Figure 15 – Unemployment rate of 15-74-year-olds (2019)



Note: Those figures are based on the ILO definition of unemployment, that is unemployed people, available and actively looking for a job. This includes people until 74 years old to apply a homogenous definition of unemployment over different countries and thus allows for international comparisons.

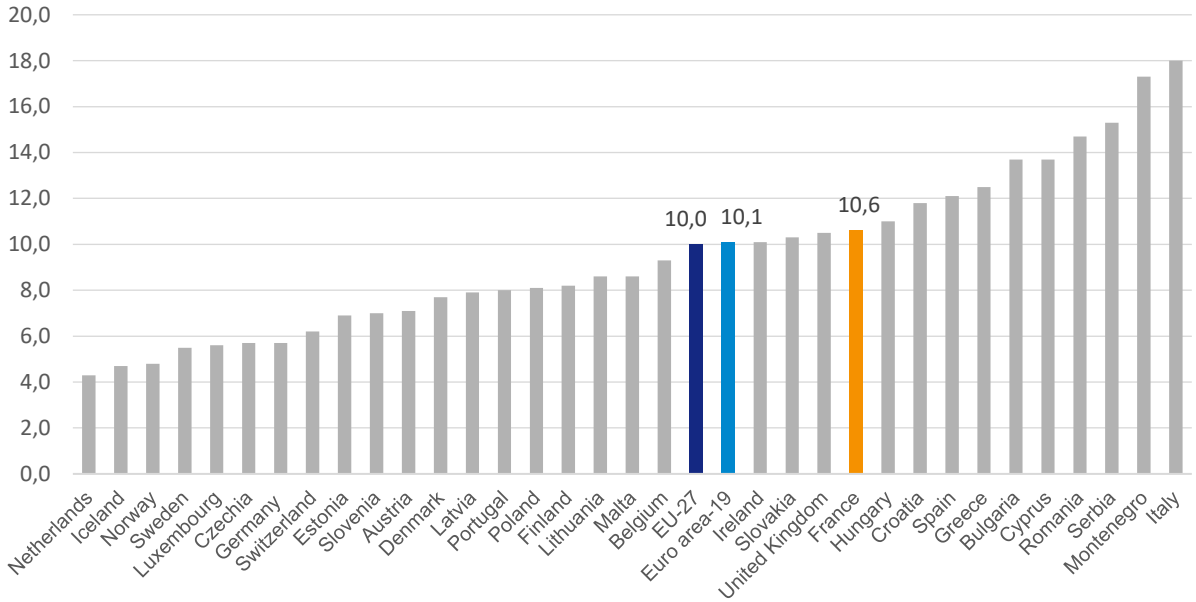
Source: Eurostat

Figure 16 – Youth unemployment rate (among 15-24-year-olds, 2019)



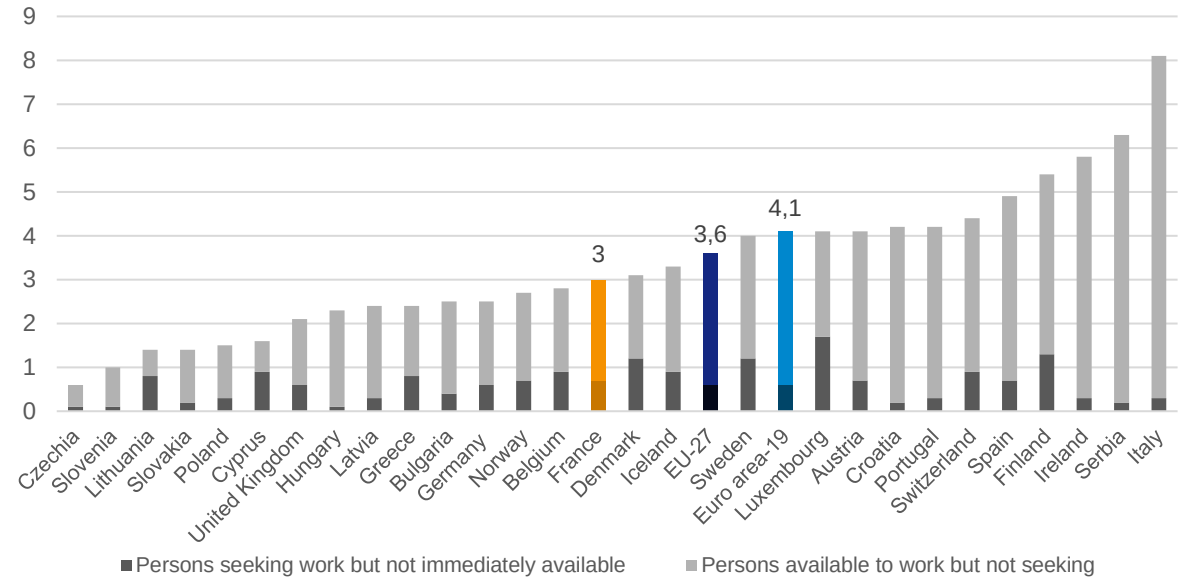
Source: Eurostat

Figure 17 – Share of young people aged 15-24 neither in employment nor in education and training (NEET), annual data for 2019



Source: Eurostat

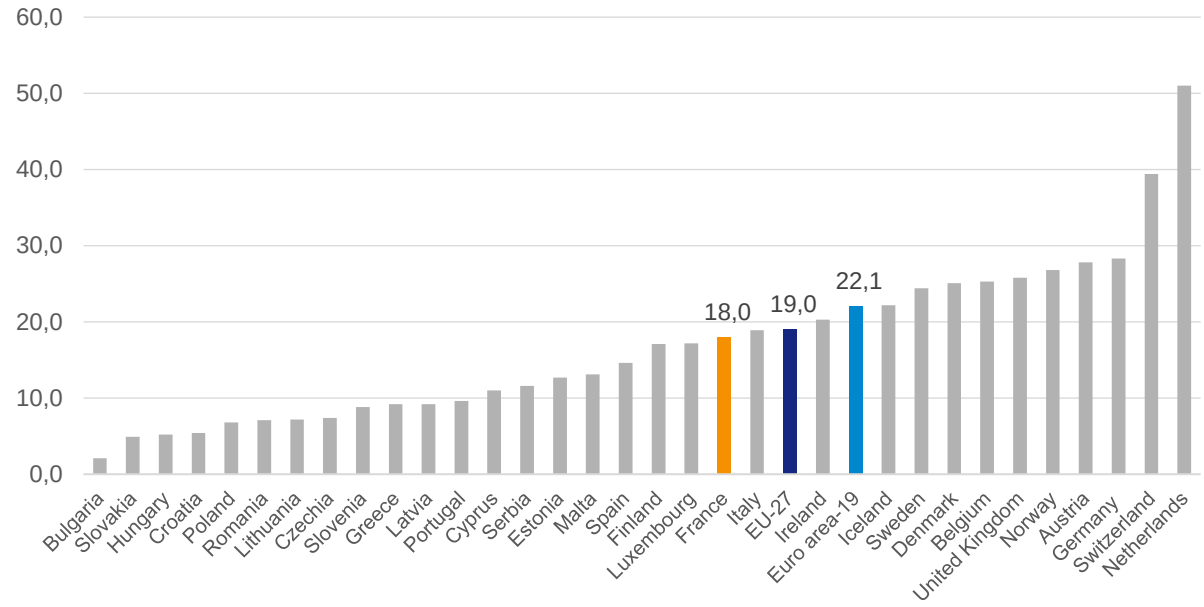
Figure 18 – Potential additional labor force (share of the 15-74-year-olds, 2019)



Note: Eurostat has defined potential additional labour force, to account for people who do not correspond to the ILO definition of unemployment but whose situations are close to unemployment. They defined two components of this halo: the first component includes the unemployed, actively looking for a job but not available for work within two weeks and the second component consists of the unemployed available for work within two weeks but not actively looking for a job.

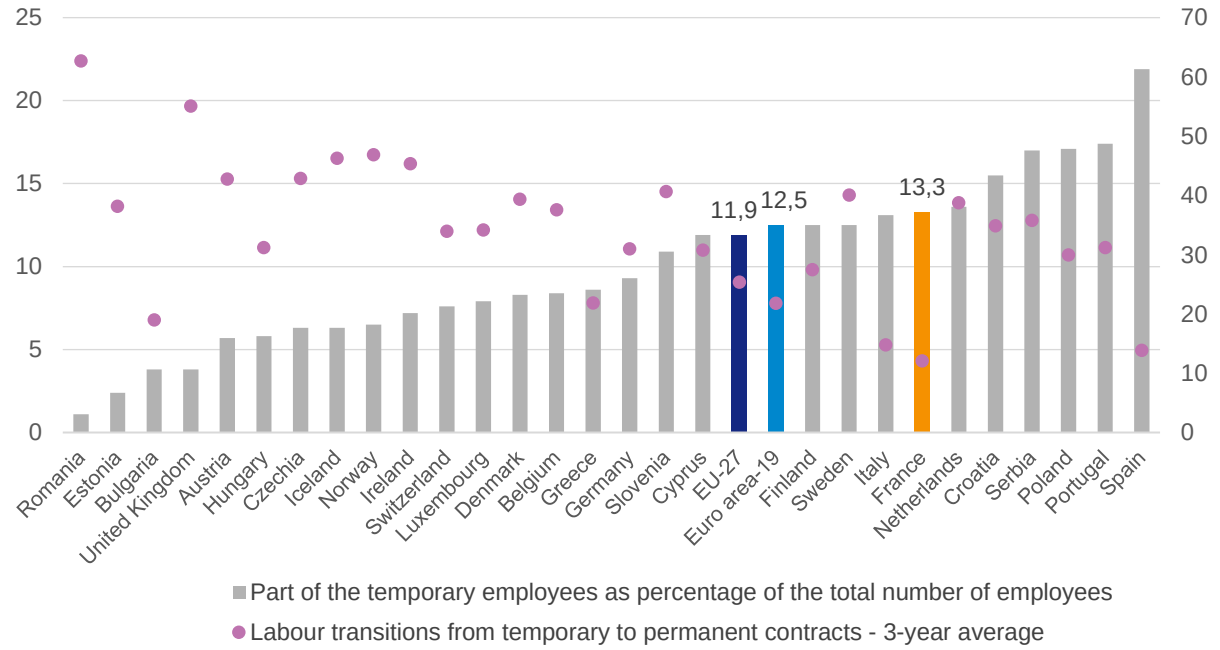
Source: Eurostat

Figure 19 – Part-time employment as a percentage of total employment (2019)



Source: Eurostat

Figure 20 – Share of temporary workers over total employees 15-64 (2019) and transition rate to permanent jobs, 3-year average (2018)



Note: France has 13.3% of temporary employees as a percentage of the total number of employees, and the rate of transition from temporary to permanent contracts amounts to 12.1% (this corresponds to persons having a temporary contract who moved to a permanent contract between two consecutive years – 3-year average).

Source: Eurostat

2. Attitudes and Views

In August and September 2020, we designed and ran two surveys on nationally representative samples of around 1,500 French respondents each. The *2020 Jobs, Inequality, and Insecurity Survey* asks people about their experience of the labor market, insecurity, and inequality and their views on various associated policies. The *2020 Taxes and Policy Survey* elicits respondents' knowledge, perceptions, and views of major tax and education policies covered in this report. We will draw from this data throughout the report and provide statistics on what people think about the various policies and issues we address. We have also pooled together a broad range of data from existing major cross-country surveys in order to draw a precise picture of French attitudes, as well as to compare them to those in other countries. Appendix 1 presents the detailed results of our own analysis of these existing cross-country surveys. We now present some key results that paint a picture of how people perceive their jobs, "good jobs," inequality and insecurity[1].

2.1. What are "good jobs" according to people?

To start, we ask people open-ended questions on what is, to them, a "good job" without priming them one way or the other. When performing text analysis on these answers, the terms that come up most frequently are "good salary," "well paid," "a good environment/good feeling," "good work conditions," and terms related to "private life" and "family life" to indicate a desire for work-life balance. A "bad job" features almost the exact opposite terms. When asked about what aspects of their own jobs are the best, respondents emphasize "work relationships" and the "good work environment," "flexible work hours" and "free time," "good pay" "short commutes," "good boss," and "work security." We also ask respondents what features of a job they would pay most attention to if they had to look for a new one. Important features appear to be pay, good relations with colleagues and with one's boss, the possibility to leverage one's skills, autonomy and creativity, career progression, interest and passion in the job, and safe work conditions. Next come the possibility for some work hour flexibility, reasonable work hours, and the feeling to be contributing to society. Just around 50% of respondents feel like their work is of higher quality than that of their parents at the same age. Only half of respondents believe there are good jobs available in their area.

On the major causes of lack of good jobs in France, 57% of respondents believe it is due to outsourcing and globalization; 28% that it is due to technology. Close to 60% of respondents believe that a major factor in determining access to good jobs is the region of residence, and the same share believe that family background is.

[1] All the Appendices are gathered in a second volume, also available online.

Using French data from the 2015 European Working Conditions Survey, we also find that job traits that are positively correlated with work satisfaction include higher working time quality (measured by the working time quality index), greater job prospects and opportunities for advancement (measured by the prospects index), better physical and social environments (measured respectively by the physical and social environment indices), and more opportunities to use one's skills and decide how and when to work (measured by the skills and discretion index). Being part of a union and having a more intense workplace are negatively correlated with worker satisfaction (Appendix 1).

2.2. What does and can the government do according to people?

When it comes to what the government can do, around 60% of people believe the government should put priority on creating good jobs that meet sufficient quality criteria, even if that implies fewer jobs overall. Thus, people side with quality rather than the sheer quantity of jobs. Between 60-70% of respondents believe the government should intervene in the labor market, by subsidizing continuous training, improving labor market regulations, and incentivizing firms to create quality jobs. Respondents are also very favorable to fostering dual education programs, improving job search assistance, especially those in partnership with local employers. Respondents are quite favorable to government intervention to help workers from a company that either relocates abroad or replaces labor with robots. Less than a third of people believe the government currently provides sufficient help to buffer moments of insecurity such as unemployment, old age, or poor health.

2.3. Attitudes on inequality, insecurity, and mobility

Overall, 73% of respondents believe that inequality in income is a serious or very serious problem. 62% believe that inequality in wealth is a serious or very serious problem. People in France are generally more pessimistic on social mobility than people in other EU countries. They tend to perceive lower chances of having access to quality higher education or to good jobs (Appendix 1). In our own survey sample, 70% of our sample believes that inequality in opportunity is a big issue, that children from poorer backgrounds receive an education of very different quality than children from higher-income backgrounds, and that the latter have much better chances of getting a good job, even conditional on similar education levels.

In line with the regional cleavages outlined above, if people are split according to their possibility of moving, groups with lower rates of geographic mobility report being unable to make ends meet more often than not, while the geographically mobile tend to be able to

afford their expenses.[1] All groups except the truly mobile ones agree that it is increasingly hard to find employment, and the more so if they feel more geographically constrained. Together, these facts indicate that those with low geographic mobility face limited employment opportunities, insofar as businesses close and are not replaced, and new firms are not being created in their area.

When it comes to feelings of economic insecurity, becoming ill or disabled, struggling to meet all expenses, and crime or violence are the top three most cited concerns among French respondents for the short and medium run. Workers in stable, longer-term jobs are more likely to be concerned with becoming ill or disabled but less likely to worry about job or income loss. Over the long-run, individuals report their main concerns to be financial security in old age and not attaining a high enough status or level of comfort for their children.

Having painted the landscape of the reality and attitudes on inequality, mobility and labor markets in France, we now turn to our proposed framework for good policy.

Box 2 – Polarization in France

An analysis by France Stratégie[2]

France is often identified in European comparisons as one of the most polarized countries in the Union, but this is a statistical artefact. ISCO is not designed to classify the occupations by socio-professional category or professional qualification. Within the low-qualified category, professions identified as moderately qualified within the French socio-professional categories and which create jobs can be found: this is the case of salespersons or transport agents, located at level 5 “Service workers and shop and market sales workers” in the ISCO nomenclature. Conversely, in the medium-qualified ISCO categories, low-qualified jobs are including who are in fact losing jobs (cashiers, at level 4 “clerks” of the ISCO nomenclature).

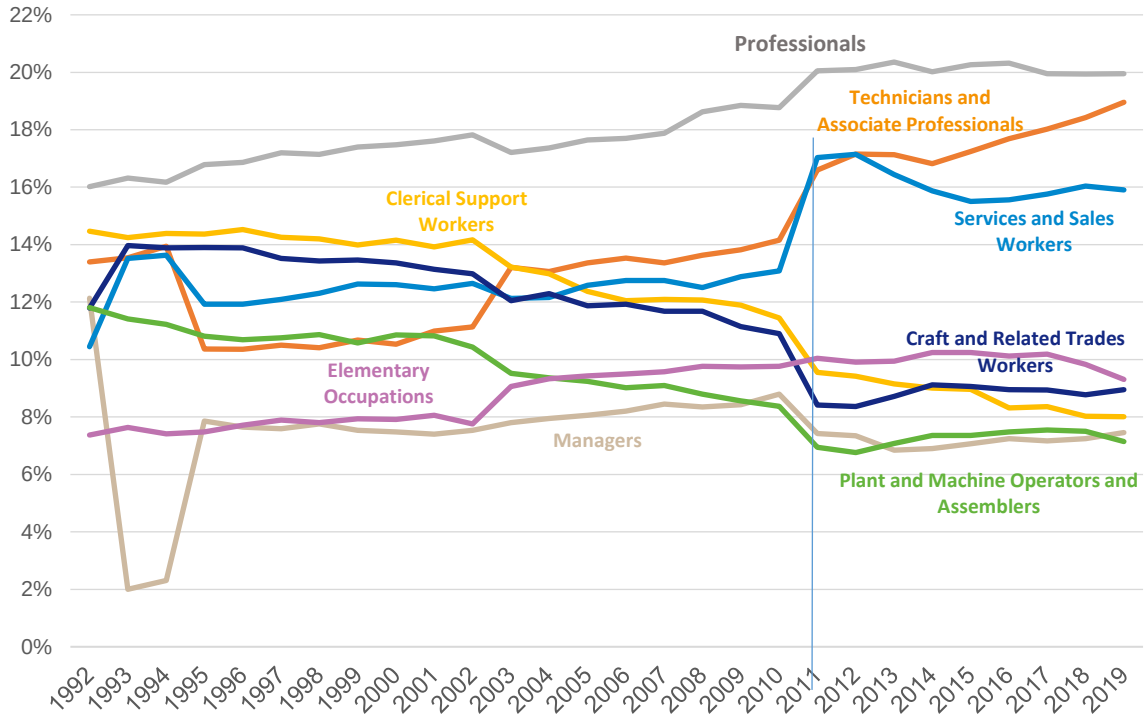
Another more serious methodological issue, the ISCO nomenclature suffered breaks in its history (in particular between 2010 and 2011, not including the breaks at national domestic levels) which were not back casted by Eurostat (Figure A). Data before and after this date therefore cannot be compared. In the case of France, the revisions led, after those of 2003 and 2008, to increase the

[1] The groups are the *Affranchis* who are free from geographic and social constraints, the *Enracinés* who could move but are attached to their geographic location, the *Assignés* who are socially and geographically constrained, and the *Sur le Fil* who have aspirations to move and pursue different opportunities but cannot free themselves from their socioeconomic and geographic background.

[2] France Stratégie (2020a), “Polarisation du marché du travail : y a-t-il davantage d’emplois peu qualifiés ?” by Jolly, C. and C. Dherbécourt, *La Note d’analyse*, No. 98, December.

number of jobs within personal services, which are precisely the only low-qualified occupations whose employment is increasing over time. This contributes to overestimating the increases in low-qualified jobs.

Figure A – Employment by occupations (1992-2014) according to ISCO, as a share of total employment



Scope: metropolitan France, people living in private households.

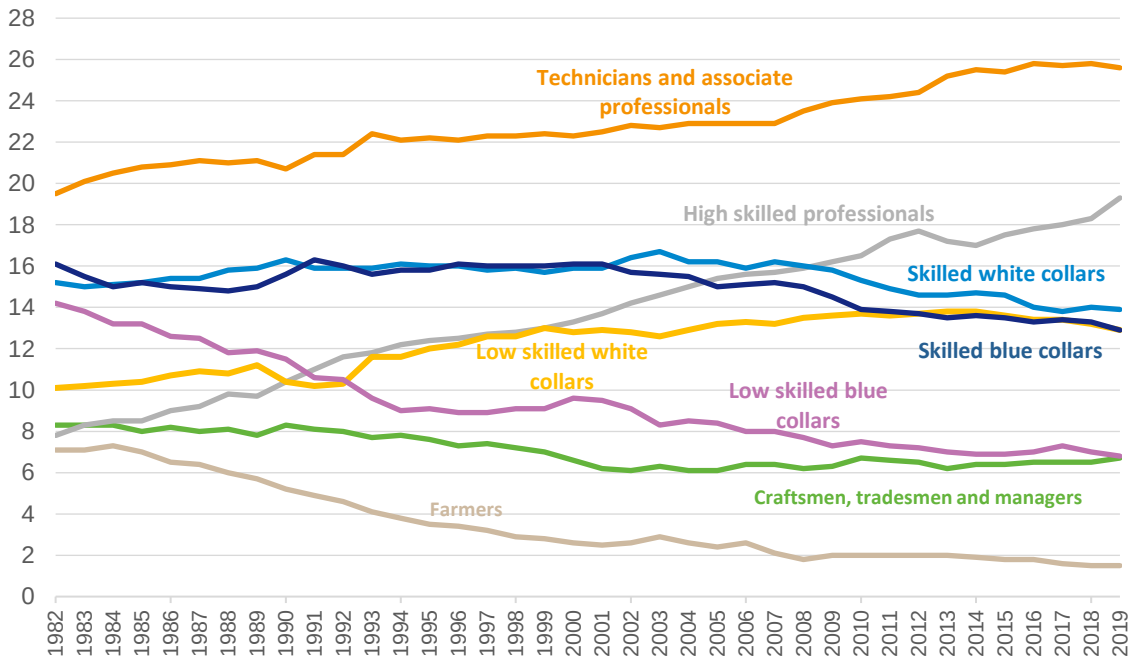
Lecture : the revision of the ISCO nomenclature in 2010-2011 implies an increase of 4 percentage points of the share in total employment of “personal services and sales workers”.

Source: Labor Force Survey, Eurostat

However, the real problem is that the international comparison on qualifications is very difficult. Professional qualifications depend on level of education, on social negotiations and “social status” and can be reflected by the level of wages (but not necessarily: some occupations are well paid and not so well considered by society; conversely, others are poorly paid but well considered particularly in the health sector in France). Therefore, professional qualifications are very specific and differ from one country to another. In most of European countries, especially in Eastern member States, drivers are considered as low-qualified workers. This not the case in France due to labor law and a collective agreement placing them amongst the most favorable in Europe for this occupation. Another example is the case of the caregivers in France and in the United States. In France, the caregivers are a regulated profession (accessible through competitive examination) that requires medical skills. In United States, they are akin to domestic helpers without any medical requirements. In France, the caregivers are defined as middle-qualified employees.

The diagnosis on polarization in France is different from what can be observed in the United States. The share of the most qualified is continuously increasing (composition effects of an economy specializing in high value-added services; socio-demographic effect with an increasing share of higher education graduates), while the share of medium-qualified workers (i.e. industry workers and qualified employees) is declining, both due to deindustrialization for the former and automation for the latter (but also due to the fall in public spending). On the other hand, there is little or no increase in the low-qualified jobs, these workers are even worse off than qualified workers and some low-skilled employees such as maintenance workers and cashiers are currently declining or stagnating. The only growth observed within low-qualified jobs are that of home-helpers and childminders. The Figure B below illustrates this.

Figure B – Proportion of professional qualifications in employment, 1982-2018



Scope: metropolitan France, people living in private households.

Source: Labor Force Survey, INSEE, back casted data

This diagnosis is a view shared by INSEE,[1] France Stratégie[2] and the Dares[3] and is robust to the use of salary as a proxy. Whilst salary can be used when estimating the polarization of employment, it poorly reflects the content of occupations and the skills required to perform them. However, it can

[1] Berger, E. and P. Pora (2017), "Y a-t-il eu polarisation de l'emploi salarié en France entre 1988 et 2014 ?" In: *France, portrait social. Édition 2017*, Paris: INSEE.

[2] France Stratégie (2015), "La polarisation des emplois : une réalité américaine plus qu'européenne ?" by C. Jolly, *Document de travail*, August.

[3] Ast, D. (2015), "En 30 ans, forte progression de l'emploi dans les métiers qualifiés et dans certains métiers peu qualifiés de services," *Dares Analyses*, No. 28, April.

facilitate international comparisons and brings job analysis closer to quality of life analysis. Job qualification is defined on the basis of the distribution of wages in the earliest period (here 1996).

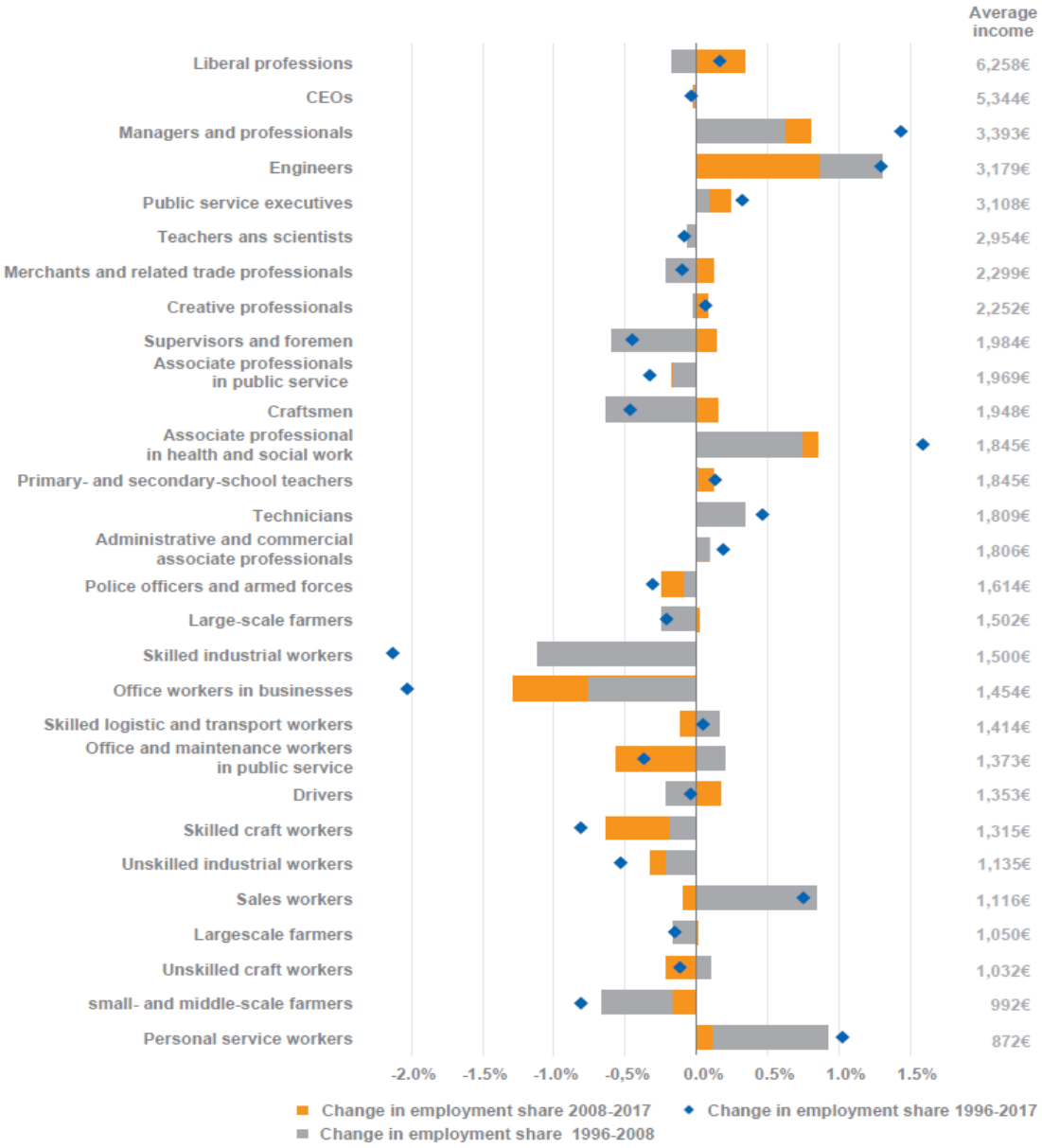
Using the method developed by M. Goos and A. Manning and then developed by David Autor, the average income per profession makes it possible to identify the level of qualification. The professions are thus classified according to their level of remuneration (here salaries or profits declared for income tax purposes). In order to limit possible variations in remuneration over time, the reference salary or activity income from which the trades are ordered is that of 2005, i.e. halfway through the observation period. To take account of working time, a full-time equivalent wage is reconstituted. Finally, the self-employed who represent 13% of employment are taken into account through their activity income. To avoid threshold effects, the changes in the share of occupations in employment according to the level of their earned income are represented occupation by occupation. The change in the share in employment of all occupations over time (1996-2017) is then observed to identify the polarization of employment.

Between 1996 and 2017, the share in employment of the lowest paid occupations, considered as low-skilled, stagnates (+0.2 percentage points), as the increase in personal services staff and commercial workers is offset by the decline in the employment of low-skilled industrial workers and small and medium-sized farmers. Unsurprisingly, the occupations that are declining most sharply are skilled industrial workers and administrative employees of companies in the middle of the wage distribution. The share of all medium-paid occupations (mainly skilled workers and employees) has declined by almost 6 percentage points in 20 years. Conversely, the occupations that are progressing very significantly are the best paid (company managers in particular), whose share has increased by almost 4 percentage points in 20 years, providing evidence of a rise in job qualifications. Among the intermediate professions, the most marked increase in employment is that of intermediate health and social work professions (nurses, educators, organisers, pharmaceutical assistants, etc.), whose dynamism is driven by the ageing of the population and the socialisation of health and social protection expenditure. The picture is more contrasted and less marked for the other intermediate professions: the share of intermediate professions in the private sector is increasing slightly, but that of foremen, who are more often employed in industry, is declining; in the civil service, the share of intermediate professions is eroding fairly sharply (increasingly qualified recruitment) except for teachers.

The distribution of employment by skill level estimated by the wage distribution of occupations is, however, not a uniform process over time and across all qualifications (see Figure C below). The rise in the low-skilled was thus particularly noticeable before 2008 (an increase of almost 1 percentage point up to 2008) but has stopped since then (-0.7 percentage points). The share of personal services personnel is ceasing to increase and that of commercial employees is declining as a result of digitalisation in commerce (e-commerce and cash register automation), while the share of low-skilled workers is declining even more sharply. On the other hand, the share of medium-skilled employment is declining steadily, particularly after 2008 (-3.7 percentage points). The 2008 crisis, which affected industrial and construction workers significantly, has therefore accentuated the erosion of median qualifications. In intermediate occupations, in contrast to the low-skilled, the post-2008 period saw a significant increase (+1.5 percentage points), with intermediate occupations in the private sector recovering after a pre-crisis decline, reflecting a form of “displacement” of qualifications in industry, construction or logistics (recruitment at a higher level

than that of skilled workers). Finally, despite a general upward trend in highly qualified employment over the last 20 years, this trend has been less marked since 2008 for engineers and managers whose activity in qualified business services or in industry is more sensitive to the economic downturn. The opposite is true for licensed professionals, whose share initially declined before recovering after 2008, while self-employment simultaneously rebounded.

Figure C – Change in the share of occupations by period, 1996-2008 and 2008-2017



Scope: Metropolitan France, persons in employment with a strictly positive salary or activity income living in a household with a positive or zero level of income declared to the tax authorities and where the reference person is not a student.

Source: INSEE-DGI, Retropolated Tax and Social Income Survey from 1996 to 2017

SECTION 2

WHAT CAN BE DONE?
A FRAMEWORK FOR GOOD POLICY

In order for economic opportunities to be widely distributed, a society needs institutional arrangements that ensure both an adequate supply of productive jobs and access to educational, financial, and other opportunities that prepare individuals for participation in the economy. These institutional arrangements must reflect societal preferences. They should also be open to revision on the basis of evidence and experience.

Our proposal for a "good jobs welfare state model" is therefore built on three components:

– an update of the traditional welfare state pillars with focus on education, labor market policies, social protection, and progressive taxation;

– a new focus on directly creating good jobs for all through labor market policies that partner with business and industrial/innovation strategies that target quality employment more explicitly;

– a new communication between governments (national, local, regional levels) and employers, and between the government and citizens.

Unlike the traditional approach which keeps the productive and distributional agendas of society distinct, with separate policy tools that address each respectively, our approach entails the joining of the two. Redistribution is important and can be carried out more effectively as we shall argue below. But it must be adequately complemented with the creation of productive employment opportunities for those at the middle and the bottom of the income scale. Expanding the circle of good jobs in turn also directly contributes to higher productivity and economic growth for the economy as a whole.

The *sine qua non* of a good job is an adequate level of labor productivity that enables appropriate wages and benefits to be paid out. The survey results above inform us about

what people expect from good jobs. The definition of a good job must remain necessarily elastic, depending on local circumstances (such as the cost of living) as well as job seekers' preferences (such as full-time versus flexible-hours employment). But essential features of a good job would include an after-tax earnings level that enables middle-class living standards, access to benefits (health, pensions, child care, etc.) and social protections (e.g., unemployment compensation) regardless of skills, gender, sector, or geographic location, and voice in the workplace.[1]

We shall develop these ideas in greater detail in later sections. But first we want to develop a general framework for thinking about policy that is useful to characterize both the range of policies one could employ (or that already exist) and to clarify the differences between our approach and prevailing strategies.

1. A Policy Taxonomy

We organize our discussion of policies around two questions. First, which income group do we care about when we talk about inequality or economic insecurity? Are we concerned mainly about the well-being of the poor, those at the very bottom of the income distribution? Are we concerned about the health of the middle classes, groups who have traditionally had access to good jobs but may now be facing an income/wealth squeeze and greater insecurity? Or are we worried about the concentration of economic power at the very top and the attendant political influence of wealthy individuals and large corporations? Our policy priorities will depend on whether we are targeting the bottom, middle, or top end of the income distribution.

The second question is: at what stage of the economy should we choose to intervene? A useful distinction, due to Hacker (2011), is between pre-distribution and redistribution policies. Redistributive policies are those such as government transfers that reshape income inequality ex post, after employment, investment, and innovation decisions have been made and markets have done their job. We will call such redistributive policies *post-production* policies.

Pre-distribution policies are those that directly influence how markets work and the outcomes they generate. We find it useful to further subdivide pre-distribution policies into two categories: *pre-production* and *production-stage* policies. Pre-production policies alter the endowments that individuals and households bring to market – educational opportunities, financial wealth, networks, and social capital. Production-stage policies are those that directly shape the employment, investment, and innovation decisions of firms.

[1] See Cohen (2020) for a broad, philosophical discussion of "good jobs." The notion extends from material conditions (wages and benefits) to having adequate voice in the workplace, to fulfillment and sense of purpose.

This leaves us with a three-fold distinction among pre-production, production, and post-production policies.

Our full taxonomy of policies can be presented in the form of a 3x3 policy matrix (Table 2). Each of the nine cells in the matrix refers to a set of policies targeting a certain income segment and a particular stage of the economy. We can fill the matrix with examples from contemporary policies in France and elsewhere, as is done in Table 2. Examples of pre-production policies for the bottom of the income distribution would be public spending on primary education and support to vocational training (top-left cell). Public spending on tertiary and adult education currently seems to supports for the most part the middle class (center-left cell). Income support programs such as the French RSA (*revenu de solidarité active*), which guarantee a minimum level of income, are post-production policies targeting the poor (top-right cell). Policies such as unemployment insurance and public pensions are also post-production transfers but cover a broader part of the income spectrum (center-right cell). Progressive income and wealth taxation target the rich (bottom-right cell). Among production-stage policies, minimum wages and apprenticeship programs affect the bottom of the distribution (center-top cell); industrial policies target broadly the middle of the employment distribution rather than the lowest paid workers or wealthy professionals (middle cell); and competition policies rein in large corporations (center-bottom cell).

Table 2 – A policy matrix

		At what stage of the economy does policy intervene?		
		Pre-production stage	**Production stage**	**Post-production stage**
Which income segment do we care about?	**Bottom incomes**	• Primary education and early-childhood programs • Vocational training	• Minimum wage • Apprenticeships • Reduced social security contributions by firms • In-work benefits	• Social transfers (housing, family, child benefits) • Guaranteed minimum income (RSA)
	Middle class	• Public higher education • Adult retraining programs	• Cluster policies (*pôles de compétitivité*) • SME support programs (BPI) • EU Structural and Investment Funds • Occupational licensing • On-the-job training • Collective bargaining and work councils • EU trade policies	• Unemployment insurance • Pensions
	Top incomes	• Inheritance and estate taxes	• R&D tax credits (*crédit d'impôt recherche*) EU competition policies	• Top income tax rates • Wealth taxes

Source: Authors

While it is possible to fill the entire matrix with existing policies, traditional welfare state arrangements rely mostly on the first and third columns: investments in education and training to prepare young people for successful entry into the labor market on the one hand, and transfers on pensions and social insurance to cover idiosyncratic risks (such as unemployment, illness, disability) on the other. Production-stage policies are typically not considered an integral part of the welfare state, though there are notable exceptions such as the minimum wage, collective bargaining regulations, and labor protections. Most production-stage policies are concerned instead with market competition, physical investment, and R&D. This reflects the traditional separation between social policies and economic policies, the former focusing on inequality and insecurity, and the latter focusing on productivity, innovation, and growth.

This separation makes sense in a world where good jobs are available to all with adequate education, and a middle-class standard of living is out of reach for only those who are hit with unfortunate shocks or have failed to save adequately for their old age. It works less well when the disappearance of middle-class jobs is a secular trend, driven by underlying forces of technological change and globalization. When such forces hollow out the middle of the employment distribution, we have a structural problem that exhibits itself in the form of permanent bad jobs and depressed regional labor markets. Traditional welfare state policies then become inadequate and can address at best only symptoms of the problem. We need a new strategy to accompany a modernized welfare state and that tackles the production stage and good-job creation directly. This supplemental strategy focuses in particular on the cell at the center of the table – i.e., policies to buttress the middle classes.

Our broader approach is rooted in the fact that inequality and insecurity have many sources. They result in part from the circumstances under which we are born. They are shaped by the risks we are exposed to and the decisions we make over the course of our lives. But they are also perpetuated – moderated or enlarged, as the case may be – in the course of innovation, employment, and investment decisions that firms make. When a firm invests, say, in a particular kind of technology or decides to outsource production, it has a major impact on the economic livelihoods of current and prospective employees – effects that it may not necessarily fully take into account. Those decisions are therefore an appropriate additional focus of policy attention for a truly inclusive economy.

2. Social Benefits of Good Jobs

In fact, employment, investment and innovation decisions regarding the quantity and quality of labor demand produce pervasive social and political benefits that go considerably beyond the workers immediately affected. Good jobs allow local communities and national polities to thrive; their absence or disappearance is a harbinger of social and political

trouble.[1] These broader benefits are analogous to environmental externalities or R&D externalities, two domains in which government action is readily accepted.

The central distinction in an externality is between private and social costs.[2] The private cost of labor is the wage that an employer pays to a worker, net of employment taxes (or subsidies). The social cost of labor is its social opportunity cost, which is normally taken to be the value of output forgone in the rest of the economy when the employer hires that worker. There are many things that could drive a wedge between the private and social costs. If the next best alternative for the worker is not to be employed at all, the social opportunity cost of labor could be small (essentially just the personal disutility associated with work). If the alternative is a less productive and hence lower-paying job, the social opportunity cost will be higher but still lower than the private cost to the employer.[3]

A broader conception of the social opportunity cost of labor would also take into account the social consequences of job creation (or destruction) for the local community and the polity. When employers create good jobs, they strengthen the social structures that underpin economic prosperity and social stability. This implies that the true social opportunity cost of such jobs could be very low (and even negative). When good jobs are lost, those structures are undermined.

Research has shown that communities where middle-class jobs have gone scarce suffer from severe social ailments. In the American context, sociologist William Julius Wilson (1996) has described in detail the social costs of the decline in manufacturing and blue-collar jobs, ranging from broken families to drug abuse and crime. Wilson's focus was on racial minorities living in inner-city ghetto neighborhoods in the U.S. More recently, Autor, Dorn, and Hanson (2019) have studied communities across the entire U.S., differentiating them by the degree to which they were affected by import competition with China. They found that communities where jobs came under greatest pressure from Chinese imports experienced an increase in "idleness" among young males and a rise in male mortality due to drug and alcohol abuse, HIV/AIDS, and homicide. There was also an increase in the fraction of mothers who are unwed, of children in single-headed households, and of children living in poverty. In their evocatively titled book *Deaths of*

[1] Rodrik and Sabel (2019) call these "good jobs externalities."

[2] The discussion that follows draws heavily on Rodrik and Sabel (2019).

[3] Austin et al. (2018) consider three sources of economic externalities from non-employment: fiscal costs on the state through the tax-transfer system, costs imposed on the family, and spillovers that encourage non-employment by others in the community. They reckon these costs range 0.21-0.36 times the wage of low-income workers. The broader social and political costs that we discuss here are at least as important, though harder to quantify.

Despair, Anne Case and Angus Deaton (2020) have described the consequences for disease and mortality when capitalism fails the local community.

While these studies have been carried out in the U.S., their arguments apply more broadly. They resonate with the experience of communities experiencing long-term de-industrialization in economically depressed regions in France and elsewhere in Europe. Recent social protests, such as the *Gilets jaunes*, have been linked to similar social and spatial divides. Such concerns are also relevant to outer suburbs of metropolitan centers with high concentration of recent migrants and non-native populations (such as North Africans) where good jobs have been scarce or not easily accessible to residents, while access to public services also proves more difficult.

The economic and social impacts of good jobs disappearing are compounded by the political consequences. There is now a considerable body of evidence that links the rise of nativist populist movements to job losses or economic insecurity associated with increased trade, automation, austerity, or labor market liberalization (see the overview by Rodrik, 2021). In the United States, for example, Autor et al. (2020) have shown that the China trade shock had a significant impact on political polarization; districts that experienced sharper increases in import competition were less likely to elect a “moderate” legislator in 2010. Interestingly, they find that labor market disruptions due to the China trade shock may have been directly responsible for Donald Trump’s electoral victory in 2016. According to their analysis, had the growth of Chinese import penetration been 50 percent lower than the realized rate over the 2002-2014 period, Hillary Clinton would have obtained an overall majority in the Electoral College and carried the Presidency.

Similar results have been reported for other European countries. As in the U.S., right-wing populist parties have generally been the primary beneficiaries of increased economic insecurity and anxiety.[1] Analyzing the political realignment behind Brexit, Colantone and Stanig (2018a) attribute a key role to the labor market impact of globalization. Using an Autor et al.-type China trade shock variable, they show regions with larger import penetration from China had a higher Leave vote share. They corroborate this finding with individual-level data from the British Election Survey that shows individuals in regions more affected by the import shock were more likely to vote for Leave, conditional on education and other characteristics. A second paper by Colantone and Stanig (2018c) undertakes a parallel analysis for 15 European countries over the 1988-2007 period. It finds that the China trade shock played a statistically (and quantitatively) significant role across regions and at the individual level. A larger import shock was associated with support for nationalist parties and a shift towards radical right-wing parties. Guiso et al. (2018) look at European survey data on individual voting behavior and find an important role for economic insecurity

[1] See Rodrik (2021) for a discussion of reasons.

– including exposure to competition from imports and immigrants – in driving populist parties' growth. Individuals who experience greater economic insecurity were also less likely to show up at the polls.

A paper on Sweden traces the consequences of labor market disruption produced directly by policy (Dal Bò et al., 2019). A conservative government undertook a series of reforms after 2006 that increased dualization in labor markets. These reforms reduced social insurance and transfer benefits while lowering taxes, thus increasing the disposable income gap between those with steady jobs (insiders) and those who were either unemployed or relied on temporary jobs (outsiders). The financial crisis and recession after 2008 further contributed to the gap. The main beneficiary appears to have been the right-wing, anti-immigrant Sweden Democrats party. The authors show that the insider-outsider income gaps and the share of vulnerable insiders are positively correlated with larger electoral gains by the Sweden Democrats at the local level. Interestingly, they find no relationship between exposure to immigrants and support for the farright. The fundamental cause of nativist politics in Sweden seems to be decline in secure, good jobs rather than cultural or xenophobic preferences per se.

The electoral consequences of automation have been studied by Anelli, Colantone, and Stanig (2019). They analyze the experience of 14 West European countries between 1993 and 2016, looking at individual or regional exposure to automation, where exposure is measured through ex ante industrial structure or occupation. They find greater exposure to robots increases support for right-wing populist parties, both among individuals and across regions.

Perhaps the most concerning aspect of the political consequences of adverse labor market shocks is that such shocks may weaken support for democracy and foster authoritarian attitudes. Economic crisis and income insecurity among the middle classes in interwar Europe were closely associated with the rise of fascism (Frieden, 2006). Benjamin Friedman (2005) has argued that stagnation or decline of middle-class incomes undermines the set of moral values and beliefs that sustain liberal democracy. There is evidence that some of the same tendencies are at play currently. Ballard-Rosa et al. (2018) have found that individuals located in local labor markets in the U.S. that were more substantially affected by imports from China appear to develop more authoritarian values. Similarly, Colantone and Stanig (2018b) report that individuals living in European regions that received more negative globalization shocks were systematically less supportive of democracy and liberal values and more in favor of authoritarian leaders.

In short, there are significant economic, social, and political costs of failure to generate good jobs. These costs drive a large wedge between the market wage and the social cost of labor. Bad jobs lead to lagging communities with poor social outcomes (health, education, crime)

and social and political strife (populist backlash, democratic malfunction). A private employer fails to take these costs into account, unless prompted to do so by the state.

3. Merging the Social and Productivity Agendas

We are certainly not the firsts to emphasize the importance of a good-jobs orientation. But prevailing policy approaches tend to stick too closely to the traditional welfare state model. A good example is the "good jobs" strategy laid out by the OECD (2018c). While the approach presents lots of good ideas, it still revolves around social protection, investments in skills and training, and what it calls a "growth-friendly environment." The links between good jobs and firms' choices, beyond encouraging growth, are weak, if they exist at all. Another strand of argument on "good jobs" focuses on management practices in the area of labor relations that may be beneficial ultimately to the firm itself. This is similar to the idea of efficiency wages in economics. For example, in her book *The Good Jobs Strategy*, Zeynep Ton (2014) argues that smart companies can boost profits by investing in their employees. But the evidence that profit maximizing firms can benefit from "high road" employment practices remains limited (Osterman, 2018).

In general firms that face higher labor costs try to economize on the use of labor and to adopt technologies that replace workers. From a society's standpoint, this produces an undesirable trade-off between good jobs and the level of employment. Too often, today's economies manage this trade-off by allowing dualistic labor markets to become entrenched (Temin, 2017): islands of productive, high-wage activities exist in a sea of poor jobs and pockets of unemployment. Labor market and social policies generally determine the distance between working conditions in the two sectors. But it is feared that a higher floor on economy-wide working conditions would come at the expense of higher unemployment and lower labor hours.

In countries where minimum wages and labor regulations prevent the bottom of the labor market from dropping too low, such as France, the cost is youth unemployment and more difficult entry into the labor market by new jobseekers.

The only way these tensions can be alleviated is by increasing the supply of productive, good jobs for those who would otherwise be excluded. Historically, this was achieved through an economy-wide rise in productivity, which narrows the gap between opportunities available for insiders and outsiders of the labor market. For example, the mechanization of agriculture during the 19th and early 20th centuries created a surplus of labor in the countryside. But the workers who flooded into urban centers were largely absorbed into manufacturing activities (and related services) where productivity and wages tended to be higher. De-industrialization during the second half of the 20thvcentury led to a similar but more challenging situation. Rapid labor productivity growth in manufacturing

(and import competition) resulted in a loss of production jobs and a shift to employment in services, where wages and employment conditions were often inferior.

Today's technological trends – automation, the knowledge economy, digital technologies – are leading to a significant exacerbation of the problem. The productivity effects of these new technologies remain bottled in a limited number of sectors and metropolitan locations, generating relatively small numbers of good jobs, while the rest of the economy remains stagnant (Remes et al., 2018). AI and other new technologies seem to offer revolutionary breakthroughs, yet aggregate productivity growth remains sluggish. Part of the explanation is that the advanced techniques are not spreading sufficiently rapidly throughout the economy. The productivity gap between the best performing firms and the laggards has been increasing in most countries, and in services as well as manufacturing (Andrews et al., 2016; Akcigit and Ates, 2021).

The dualism exhibits itself in labor markets as well as productivity differences. Good firms produce good jobs – and possibly vice versa. Recent work by Criscuolo et al. (2020) covering 14 OECD countries show that around half of the rise in wage inequality since the 1990s is accounted for by differences in pay across firms for similar workers. In other words, earnings are determined not only by workers' skills and earning capacity but also by the characteristics and performance of the firms in which they are employed. Criscuolo et al. (2020) speculate that successful firms share their rents with workers. But these pay differentials may be also due to what Aghion et al. (2019) call "the innovation premium to soft skills." Aghion et al. (2019) find in UK data that more innovative firms pay higher wages to observationally similar workers, and that this is especially the case for low-skilled workers. They interpret this result as evidence of returns to certain soft skills – such as reliability of work, capacity for teamwork – that are complementary to innovative firms' assets. Workers with these soft skills get rewarded in R&D intensive firms even if their educational and other "hard" skills are at the lower end of the distribution (see also Mas et al, 2020, and Duhautois et al., 2020 on the French evidence).

This complementarity between good jobs and good firms provides yet another argument for policies targeting the production stage. Improving productivity in low-wage firms far from the frontier is required to increase the supply of good jobs. As Criscuolo et al. (2020) note, "worker-centered policies, such as education and training, may need to be complemented by *firm-centered policies* that promote productivity in low-wage firms to effectively address concerns around high inequality and low productivity growth" (emphasis added). If we want better employment prospects, we need to work not only on the training side of the equation but also with firms to upgrade their capabilities. There is a complementarity between active labor market policies targeting workers and industrial/innovation policies targeting firms.

When successful, this approach would enhance aggregate productivity growth as well. The most direct way to reduce the economy-wide productivity drag that technological dualism

induces is to facilitate a greater number of workers and firms to be absorbed into the more productive segments of the economy. If successful, the good jobs approach would help spread the productivity benefits of more advanced production techniques throughout wider segments of the economy. This would kill two birds with one stone: higher economic growth *and* better distribution. In other words, a production-stage based approach enlarges the overlap between the equity/inclusion agenda and the growth/productivity agenda.

Another way of looking at what we are proposing is to consider what it entails for existing policies. On the one hand, there is a wide range of industrial and innovation policies that France and other EU countries already pursue. These focus on advanced technologies, productivity at the frontier, and global competitiveness. While employment creation regularly features as one of the objectives of such policies, they are not crafted with good job considerations in mind – especially for those at the low and middle ranges of the skills distribution. Social policies and training/skills policies, on the other hand, are typically conducted independently from firms' investment and innovation decisions. They are not well integrated with the productive agenda of employers. We argue that these largely separate tracks have to merge to some extent. We need employment policies that look more like innovation and industrial policies, and industrial and innovation policies that look more like labor market policies. And trade policies have to explicitly take into account fairness concerns around the employment consequences of international trade and outsourcing.

We strongly emphasize that the production-stage policies we will discuss later in the report are certainly not a substitute for education, progressive taxation, or social protection policies. They would *complement* updated welfare state policies, especially with regard to education and progressive taxation which we will also discuss in some detail. They would target more directly the inequality and insecurity that arise in the course of production. They would ease the burden on overstretched social spending budgets. And in view of the limited public appetite for expanded transfers and more redistributive policies, they would open a valuable additional margin for policy.

We summarize the key elements of our approach in Table 3, using the policy matrix we discussed earlier. The rest of the report will elaborate on the specific policies included in the matrix, covering pre-production, production, and post-production stage policies in turn.

We conclude this overview by making one final comment about our approach in the report. When offering policy advice, economists like to stick to recommendations for which there is solid evidence showing they work in practice. Emphasizing "evidence-based policy" is often the responsible approach. But, by construction, it does entail a certain degree of policy conservatism. Policies for which we have good evidence are necessarily those that are already in place. A categorical and unflinching insistence on this principle would unnecessarily restrict policy innovation – engaging in new directions for policy with

unproven benefits but potential upsides in principle. When the challenges we face are ordinary and we already possess a large arsenal of proven policies to tackle them with, the conservative approach may not be too costly. But when the challenges are both significant and (as in the case of new technologies) novel, a certain boldness may not be out of place. This is the case for the challenges we face at present. We cannot know if new policies work without first appropriately trying and evaluating them.

Table 3 – Our approach: The good-jobs welfare state agenda

		At what stage of the economy does policy intervene?		
		Pre-production stage	**Production stage**	**Post-production stage**
Which income segment do we care about?	**Bottom incomes**	Enhanced education policies		
	Middle class	Enhanced education policies	• Employer-focused active labor market policies • Business incentives with good-jobs focus • Labor-friendly innovation policies • Trade policies that address fairness	Measures to increase productivity/monitoring of public expenditure
	Top incomes	Inheritance & gift taxation		• Reducing fiscal leakages • Broader, more effective taxation of capital & automatic exchange of info • EU tax coordination for high-income earners • Improved multinational firm taxation

Source: Authors

Our report reflects this tension between policy conservatism and policy innovation, without giving up one for the other. We will advance both recommendations that are based on good evidence and best-practice and those that are explicitly of a more experimental nature. Where we can, we will offer detailed and specific policy guidance. But we will not shy from proposing broad policy directions that are substantially new as well. In the latter areas, we shall emphasize that a lot of the policy detail will have to develop over time, relying on careful, strict, and appropriate monitoring and evaluation.

SECTION 3

PRE-PRODUCTION POLICIES

In this section, we outline our proposals for the two main pre-production policies: inheritance taxation and education policies.

1. Inheritance Taxation

A small source of revenues that is projected to increase

In principle, a tax on transfers of property between generations, either beneficiary-based (like the inheritance tax) or donor-based (like the estate tax in the U.S. and the UK) is an important type of tax to improve intergenerational mobility and to go some ways towards leveling the playing field between people from different backgrounds. Of course, even a well-functioning inheritance tax system is no magic bullet against wealth inequality, but it is an important tool in the arsenal. As in other countries, transfers of property are relatively concentrated, which is directly related to wealth concentration more generally. In recent years, they have also tended to occur at later ages of the recipients than before (see Appendix 2)[1]. In the current practice, inheritance taxes raise little revenues, but according to the OECD, these revenues can be expected to rise as private wealth and its concentration increase, even if countries put in place a relatively high tax-free allowance. In France, a study from France Stratégie (Dherbécourt, 2017b) predicts a boom in inheritances due to demographic factors and estimates that the share of property transfers (gifts and inheritances) in the disposable income of households will go from 19% today to more than 25% in 2050. Fiscal revenues from the gift and inheritance taxes in France have

[1] All the Appendices are gathered in a second volume, also available online.

been multiplied by five in the last four decades, reaching €12.5 billion in 2015 (going from 0.22% of GDP in 1980 to 0.56% in 2015).

A misunderstood tax

Across countries, the inheritance tax is typically both poorly understood and highly unpopular. In our *2020 Tax and Policy Survey*, we find that people tend to overestimate the tax rate that applies to inheritances – including by direct transfer to one's children, underestimate the exemption threshold, and show poor understanding of the fact that there is a progressive rate system in place (relative to the amount of the transfer) (see Appendix 2). In line with our survey results, a survey study from France Stratégie (Grégoire-Marchand, 2018) also finds that respondents tend to overestimate inheritance taxes. For instance, they believe that the tax rate for transfers between spouses is 22%, when those transfers are in fact tax exempt.

An unpopular tax

Inheritance taxation did not encounter much support in our sample. When asked whether an inheritance tax should exist at all only 31% of respondents said yes. In fact, only 25% of respondents support an increase on inheritance taxes for wealthy people. The above study from France Stratégie finds that the inheritance tax is among the least popular taxes and that support for it is waning with 12% more people today (87% of all respondents) relative to six years ago considering that inheritance taxes should decrease to allow parents to pass their wealth on to their children.

However, in line with our proposition below, 54% of respondents either agree or strongly agree with the idea that inheritance taxes should be made more progressive. The lack of support for the estate tax could be stemming in part from misconceptions, in part from disagreement with what enters its base (i.e., what is actually taxed), and in part from fairness concerns, to which we turn now.

Thorny ethical issues related to property transfer taxes

The unpopularity of taxes on transfer of property in many countries, including France, rests in part on ethical considerations. Research has found that people consider transfer taxes as "double taxes" and perceive it as unfair that the income transmitted has already been taxed (Stantcheva, 2020). People are also deeply worried about the unfairness of people facing liquidity issues, namely having to sell the family business or the family home in order to pay the tax.

There are fundamentally some quite thorny ethical issues related to transfer of property taxes. When thinking of the estate tax, the difficulty is that from the point of view of the parents, being able to pass on wealth to their children seems relatively fair, as it seems fair

to allow people to purchase other types of goods with their money. However, from the point of view of the children, many people would feel it is unfair that children receive very different wealth transfers from their parents through no fault or merit of their own. This is an "equality of opportunity" argument that finds a lot of support, but directly conflicts with the fairness concerns from the perspective of the parents. How do French citizens trade off these thorny ethical issues?

In our sample, close to 80% of respondents find it unfair that the estate of parents who have "worked hard" in order to save money for their children is subject to inheritance tax. This share is reduced to 70% (still a very large number) if respondents are asked to consider parents who did not necessarily work hard themselves but have inherited wealth from their own parents. On the other hand, from the perspective of heirs, 85% of respondents believe it is not fair that children born in wealthy families have access to better amenities than children from less wealthy families. When faced with the explicit trade-off, 52% of respondents on balance believe that it is better to let wealthy parents transmit all their estate tax-free to their children, even if that means that some children will start with very unequal opportunities in life, than to tax the estate of parents who have worked and saved for their children's sake so that the playing field for children from different backgrounds can be levelled.

Issues with the current system

The major issue with the current inheritance tax system is that it is myopic: transfers that date from more than 15 years ago are "forgotten" by the tax authority. Furthermore, there is no accounting for the fact that the same person can receive transfers from more than one person. As a result, people can end up paying very different tax rates on the same total amount received or, conversely, identical tax rates on very different total receipts. An example of the first case would be individual A who receives €200,000 from both their father and their mother and individual B who receives €200,000 only from their mother and nothing from their father: both will pay the same tax rate. On the other hand, individual C who receives €400,000 from only their father will pay a higher tax rate than individual A, despite receiving the same total amount. In addition, current exemptions that are given for inter-vivo transfers, such as the allowance to transmit wealth tax-free that renews every fixed interval of years, are likely to mostly benefit wealthy households. Indeed, for those relatively high thresholds to be binding every few years, household wealth needs to be significant. They also require advance planning that implies that a household is sufficiently wealthy to have the need to optimize such transfers. This is why we need to be careful that the wish to make transfers happen earlier in the life of heirs by itself should not lead to regressivity. More generally, because the tax system is myopic and not beneficiary-based, it is very difficult to make it truly progressive and to gear exemption levels towards lower

wealth and middle-class families. Finally, there are loopholes in the inheritance tax base that provide opportunities to shelter wealth from the tax authorities.

A major reform direction

It is important to keep in mind that large and significant inheritances are very concentrated. Many other issues such as the age at which transfers are received are at the moment secondary to this issue (which may change if in the future transfers become less concentrated). Any adopted reform needs to be careful not to introduce unintended regressivity (e.g., giving exemptions or preferential rates for transfer of property to younger heirs, which in the currently concentrated system is likely to simply benefit higher-wealth families).

A major reform that is worth thinking about and that we recommend evaluating further would involve restructuring the taxation of transfers to make it beneficiary-based and progressive in the cumulative amount received by each beneficiary. Thus, instead of taxing transfers at each death, the new system would tax the total transfers (gifts, inheritances, from all sources) received by the heir, so that those who receive more will be taxed at higher rates. It would still be possible to have preferential and reduced rates based on the relation between the donor and the heir. In addition, it is possible to take into account the age at which transfers are received. This tax needs to be very broad-based, covering all or most assets.

Much more quantitative evaluation is needed to estimate the effects of such a reform and determine the right parameters. So far, such a type of tax has only been implemented in Ireland. The Irish “Capital acquisitions tax” is a tax on the total of all the gifts or inheritances received throughout lifetime. The rate there is 33%, with a tax-free threshold of €335,000 for transfers from parents to children. There is no conclusive evaluation of it, as the effects of that particular tax are hard to disentangle from all the other differences between various countries (see Nolan et al., 2020, and Appendix 2).

If such a reform is indeed considered and carefully studied, we provide two further pieces of advice. First, there is no need to penalize middle-class households, and the exemption threshold on total donations could start relatively high. A move to a beneficiary-based progressive system would allow to strengthen overall progressivity. High total transfers could be taxed at increasing rates, while still allowing many middle-class parents with more modest wealth to pass on their estates tax-free to their children. This should foster political support as it would reduce the perception that it is a double tax on the savings of hard-working parents who wish to help their children – which is one of the main perceptions that make the current tax so unpopular. It can also go some way towards addressing the fundamental ethical dilemma citizens feel between being fair to parents versus children outlined above based on the survey evidence. It is worth noting that such a progressivity

is much more challenging to achieve if the system continues to be myopic as outlined above. Any increase in the exemption thresholds (for gifts or inheritances) is bound to strongly benefit large estates.

Second, exemptions from the tax base need to be strongly limited (i.e., the inheritance and gifts tax bases need to be as broad as possible). Limiting exemptions can also be a goal even in a more partial reform approach outlined next. But in a beneficiary-based progressive system, necessary exemptions could be targeted properly towards lower-wealth families. To the contrary, exemptions that are given for specific assets in the current system that is myopic and are capped at some amount of transfer (rather than of lifetime wealth received) benefit higher-wealth households to the same degree for every euro of gift or inheritance.

Challenges for such a reform could be the higher complexity of such a scheme relative to a myopic one, as well as the possibility of tax-induced mobility. On the latter, there is little empirical evidence on whether French taxpayers move or expatriate in order to avoid inheritance taxes, and, hence, it is not possible to know whether these effects are expected to be large or small. The complexity and tax-induced mobility issues would have to be carefully considered and perhaps regulated. Before we can recommend such a new and quite different system, more quantitative work is needed in order to estimate properly its costs and benefits.

Possible improvements today

Even without a major reform, there are several possible improvements that can be made to the existent system. First, there are too many loopholes in the inheritance tax as implemented today. One of the most vivid ones is the exemption of "*assurances-vie*" capped at 150,000 and the generally preferential rates that apply to it even above that threshold. The preferential rate becomes particularly attractive for large inheritances and when the inheritance is not in direct line (see Appendix 2). This exemption and the underlying reasoning for subsidizing this type of asset over others (in particular other safer, long-term investments) should be reconsidered. Current estimates suggest that revenues would be 20% higher without this exemption (France Stratégie, 2017b). This is a politically contentious issue as the size of the life insurance sector – in part propped up thanks to this tax advantage – was worth €1.8 billion in December 2019 (before the Covid-19 crisis).

There is currently also a large exemption for passing on family businesses. While this may be considered fair by people for modest-sized businesses, it is more dubious when it comes to the very large family businesses held by wealthy families in France that benefit from these exemptions. It makes sense to impose a cap on this exemption so that it is truly limited to small or medium-sized businesses that may be more liquidity constrained. On the liquidity issue and how high the exemption cap should be, two things are worth considering.

First, if the tax base for inheritances is broad enough in a reformed system, the tax rate itself need not be high, especially at the levels relevant for small family businesses, so liquidity issues may not be as important. Second, one can imagine the government or the *Banque publique d'investissement* (BPI, public investment bank) to provide credit to bridge the liquidity issues.

A final avenue that could be explored is that of using the revenues from the inheritance tax specifically to improve equality of opportunity for children from different backgrounds. This could be done in at least two ways. First, revenues could be used to finance expanded investments in early childhood and education. Second, they could be used towards a universal grant to every child (e.g., at age 18), a suggestion made by Atkinson (2015) and taken up again by France Stratégie (Dherbécourt, 2017b). The rationale for this proposition is to improve the wealth distribution not only by taxing the transfers of large amounts of wealth, but also by directly helping children from lower income families start building wealth. At the moment, this is at the conceptual stage only, and an actual implementation requires more work on the optimal level, financing, and conditions of use of such a grant.

2. Education Policy

2.1. Introduction

Education is the major first-order policy for social mobility: a well-designed education system starting from the earliest ages can reduce the extent to which the inequalities of one generation carry over to the next generation. And indeed, despite a lower-than-average income inequality among OECD countries, France also has relatively low social mobility ("A Broken Social Elevator? How to Promote Social Mobility," OECD 2018).[1]

Education remains very important for making it in the labor market, highlighting the need to continue efforts to ensure access to high-quality education for all children in France. Youth unemployment is high in France, as it is in other countries. Against this backdrop, a college degree is correlated with better prospects, although it is not a guarantee for success. In France, 75% of those aged 25-34 with a high-school degree are employed, and 87% of those with a college degree are (the corresponding numbers for the OECD average are 78% and 85%). A college degree also confers an earnings advantage (the "college premium") which is 46% for those aged 25-64 with any college degree (as compared to 54% for the OECD average). A bachelor-equivalent degree grants a 36%

[1] Dherbécourt in "Social mobility in France: what do we really know?" (France Stratégie, 2020e) shows that although France does not rank among countries with the best performance in terms social mobility, there is no clear consensus on its international position.

(OECD average 43%) earnings premium, while a master program grants an 84% one (OECD average 89%), according to the OECD report *Education at a Glance 2020*.

In our survey, around 70% of our sample believes that inequality in opportunity is a big issue and that children from different backgrounds receive an education of very different quality than children from good backgrounds and that the latter have much better chances of getting a good job, even conditional on similar education levels.

The French education landscape is one of excellent aspects co-existing with less-than-stellar ones. France has a very high formal schooling rate, which is a great achievement. The system is excellent for some students, who perform very well and go on to make great contributions to science, business, and society. Yet, it is a very unequal system. Success in school is too often still highly linked to family background, and opportunities remain very unequal. For instance, while average PISA (Programme for International Student Assessment) scores for 15-year-olds in France are slightly above the average of the OECD, five times more students from low socio-economic backgrounds do not meet the minimal level for reading. They are also overrepresented in vocational training rather than in the academic training tracks in high school: 87% of those in vocational training have parents without college education. The same is true of only 51% of students in the general academic tracks ("Perspectives des politiques de l'éducation," OECD 2020). The influence of families' socio-economic background on educational attainments as measured by PISA scores seems very pronounced in France (see Figure 2 in Appendix 5).

The policy issues in education we address in this report are not new. In fact, they have been identified for a long time and a lot of progress has been made in recent years in these directions, with many initiatives. They center around providing better access to schooling from early ages on for low socio-economic background children, improving outcomes for schools in difficult and disadvantaged areas, rethinking and making more attractive the profession of teachers, giving more responsibilities and autonomy to school administrations, boosting vocational and dual vocational-academic tracks, and improving the transition from school to the labor market. Giving equal opportunities for access to high quality education to all students and ensuring their smooth transition into the labor market is and should remain the goal of the French education system.

2.2. Financing education: Reorienting spending towards disadvantaged schools and students

It is worth noting from the outset that France spends more on education overall than the average OECD country. Spending per student per year ($11,364) is 8% above the average of the OECD. A large share of that spending is public spending; private spending on education in France is below the OECD average and comes mostly from (relatively low)

tuition and fees. Yet, spending is concentrated at the secondary and higher education levels and is 10% below average for primary schooling (*Education Policy Outlook*, OECD 2020).

There are large geographical variations in this spending. To take but one example, in a recent survey (TALIS, 2018), 2 out of 5 school directors in France complained of insufficient internet access in school, which hampers the school's capacity to provide quality education. Close to 60% also lament a lack of computer hardware and software. These gaps in resources appear mostly in disadvantaged zones.

A push, thus, has to be made to direct more funds towards the worse-off schools and disadvantaged zones, where the marginal value of public spending could be highest.[1] Spending should also be rebalanced between the secondary and the primary levels. In fact, this has been the intention of the legislation in the "*loi pour la refondation de l'école de la République*" (2013) and the "*loi pour une école de la confiance*" (2019).

It is worth noting, however, that in our survey, despite respondents' concerns with unequal access to good education, only 37% of them are in favor of directing more funds to disadvantaged zones. This suggests a wish for equity in inputs that may stand in conflict with the desire to provide more equal opportunities. Perhaps support for more investment in difficult areas and for lower-socio economic background children could be generated by showing to people the gaps in achievements and the gaps in quality of education for these students (which could be reduced with more public investment). To the contrary, respondents are in favor of rebalancing spending towards primary schools (as well as universities).

2.3. Pre-K schooling

Rates of enrollment of pre-elementary schooling in France are among the highest in the world, with essentially 100% of children between 3 and 6 enrolled in "*maternelles*" which are compulsory after age 3. There are larger gaps in enrollment at the level of the "*crèches*" for children below 3 years of age. Perhaps because the *crèches* are operated by localities ("*communes*"), the availability of slots is very disparate in different areas. It has also been reported that parents from low socio-economic backgrounds sometimes lack trust in these institutions. The education of children younger than three is thus dealt with by different authorities than for children older than three years, and there is sometimes a lack of coordination. Given how critical the ages from 0 to 6 are, coordination would have high value-added. Any lag that occurs at these young ages gets compounded at later ages.

[1] The third Chapter of this report, dedicated to demographic change, considers the problem of school segregation and the disadvantaged access to good schooling for children from minority or immigrant families.

The class size in France for pre-K education remains higher than other countries. This is an issue, as a higher educator/children ratio for those early ages has been shown to be a predictor of the quality of education (see Appendix 5 and the OECD report *Education at a Glance 2020*). In France, the number of children per educator is 23, while the OECD average is 14. Yet, France also makes more use of "assistants" who are civil servants specialized in early education, which brings the ratio down to 16 children per *adult* (relative to the average of 11 for the OECD), according to the report *Education at a Glance 2020*.

A major challenge for the education of below 6 years old is the shortage of qualified educators and the heterogenous educators' training for these institutions. Thus, training educators for this age group has been and should continue to be a priority. Involving parents more by fostering communication between these young age schools and families also seems important for fostering trust.

2.4. Elementary and secondary schooling

School administrations

A first challenge encountered by French primary and secondary schools is school administration. Primary schools in France are often run by teachers, who are sometimes still teaching part-time ("school directors"). This system is different for secondary education, where it is civil servants, called "establishment directors," who are in charge of school administration. Such managerial positions require a distinct set of skills that is not easily acquired as a former teacher. The OECD points out that there is too little training on actual management of schools and pedagogy for establishment directors. Within OECD countries, France has the lowest share of establishment directors who have followed trainings on teaching methods or other pedagogical tools (TALIS, 2018).

The autonomy and roles of school directors and establishment directors are limited, even though establishment directors have a higher status. School directors have very little autonomy and less responsibilities. This is reflected in a very large pay gap between the school directors and establishment directors (the largest in the OECD). There needs to be a proper status, with responsibilities and more autonomy for school directors in elementary schools. The example of Finland covered in Appendix 5 can be particularly informative here.

Compensating for unequal and "missing" family inputs

A second challenge is that children from different backgrounds are not benefitting to the same extent from a given schooling input due to "missing family inputs." Good initiatives try to level the playing field by substituting for what may be missing due to children's family backgrounds. Such initiatives should be expanded and fostered. In France, since 2017,

the program "*Devoirs faits*" ("Doing Homework") offers children a time to do homework with supervision and help, in their own school. It is free and available based on students' needs, so as to reduce inequalities in the help that children can expect to get from their families at home. Such inputs could be expanded beyond homework to cover other training and skills, as well as extracurricular activities that children from different backgrounds have unequal access to.

In addition, unequal access to the internet, to computers, and to the learnings opportunities they offer is still a big issue. Schools could thus also do more to provide access to quiet study spaces, with computers and internet for children who lack such access at home. Unfortunately, this may only be implemented at scale post-Covid-19, even though it is particularly urgently needed now.

There are interesting good practices from other countries, too. Some explicitly try to leverage the internet to equalize access to educational inputs. The "Cyber Home Learning System" is a widely used K12 self-study platform launched by the South Korean government in the mid-2000's. The goal is to reduce inequalities in access to extra-curricular education between urban students and students from remote regions and/or low-income backgrounds, in the context of South Korea's highly competitive education system. For such a system to be productive, for example, in France, it will require inputs in terms of hardware (computers) and internet connections. The latter could be provided in schools too, as just outlined above.

Also leveraging online learning, the *Cognitive Tutor* program in the United States is a way of teaching math topics (e.g., algebra or geometry), in which a personalized tutoring software complements a textbook. Half a million students have used it in total so far, and studies have found significantly positive impacts on algebra learning.

Finally, the UK's *Shireland Learning Gateway* is a portal developed by Shireland Collegiate Academy in cooperation with Microsoft to allow students and parents, many of which are from low socio-economic backgrounds, to track student performance and behavior, improve communication with the school, and access extra-curricular materials. To improve access, this portal is also available in community settings (such as libraries) in the spirit of our recommendation above.

2.5. Teachers: Boosting training, lifelong learning, and pay

Teacher training

OECD studies point out that, as compared to other OECD countries, French teachers enter their professions with high formal education degrees but less well prepared on the pedagogical aspects and receive much less training related to in-class pedagogy (TALIS,

2018). There have also been gaps pointed out in training to use Information and Computer Technologies (ICT).

The most recent reforms in France have been explicitly aimed at improving teachers' training (both their initial education and their lifelong training). The newly renamed "*Instituts nationaux supérieurs du professorat et de l'éducation*" (INSPÉ) have the mission of harmonizing teacher training. "*Pré-professionalisation*" initiatives have been launched to help future teachers get exposure to schools (with financial support), before taking their teachers' exams. Lifelong training became required for all teachers, and young teachers can receive additional support following graduation to help them adapt to the unique characteristics of the school and the area they are assigned to.

Despite these very positive developments, French teachers currently themselves declare engaging much less in "high-impact" training activities, such as peer-to-peer coaching, than other countries (TALIS, 2018). They also say they feel less socially valued than teachers in other countries. An interesting example on this front comes from the Czech Republic's "Repository of Digital Learning Objects" which is a peer-to-peer portal for teachers launched by the Ministry of Education. Teachers can post learning materials to help other teachers and share best practices with one another.

A final important aspect of teacher training in France will be knowledge of digital tools. The Covid-19 pandemic has starkly shown how important digital technologies can be for teaching. Recent reforms in 2019 in France, geared towards teaching more IT skills in secondary education, will also require that teachers are helped to become proficient in new technologies.

Teacher salaries and career progression

Teacher salaries are an issue, as in many other countries. This is reflected in the fact that average salaries for teachers with 10-15 years of experience is around 18% lower than the OECD average. This gap is largest for mid-career teachers, due to a low growth in salary for young teachers with little experience, according to a recent OECD study (*Education at a Glance 2020*).

An issue for teachers, especially young ones without much experience, is the assignment to difficult zones and schools in disadvantaged areas. France has recently tried adding a bonus, but there needs to be more work into studying the adequate compensation and other support for teachers working in difficult areas. An example to study may be South Korea, where going to teach in more difficult areas is highly valued and incentivized. This is hopefully a situation that could at least partially improve organically as there are more investments made in difficult zones as advocated above.

Involving teachers in policy design

Serious, regular, and detailed evaluations of those recent reforms on the teachers' side and in education more generally in France will be very important. Gaining insights both at a macroscopic level (by gathering data) and microscopic level (by listening to teachers' feedback and experiences) would allow education policy makers in France to be aware of what worked and what could be improved in the future. Teachers need to be fundamentally involved in policy design and feedback, in line with the communication we advocate for in Section 6.

2.6. Transition from school to work

Providing a smooth school-to-work transition is an essential part of education policy and for the functioning of labor markets. Being jobless in one's early career can have very detrimental and long-lasting effects on both career and earnings prospects. France is plagued by a severe youth unemployment problem (see Section 1). We see two important issues to address in regard to a better transition into the labor market: improving vocational education and training and providing better guidance to students on their choice of higher education.

Vocational education and training

Vocational training can be extremely beneficial. But in France it is still considered to be a second-tier track for those who cannot succeed on the academic track. There are fortunately several reforms underway to restore the luster of the vocational tracks and to improve their quality. This is commendable and should continue. In particular, there is an effort to reorient vocational tracks towards the current needs of the labor market (e.g., personal and home care services, sustainable development) and also in high-tech areas such as digital technologies.

But dual tracks that combine work and study programs are still scarce. Only 1 out of 4 students in vocational training is also working at the same time (*Education at a Glance 2020*). Yet, such tracks have been shown to be extremely successful for inserting young people into the labor market in other countries, such as Germany. There are new initiatives in France though to foster the cooperation between regional administrations, businesses, and school campuses in order to create "excellence campuses" anchored in each *région* and locality. A good practice and example would be the Netherland's *Katapult* system that is a network of public-private partnerships which group businesses, R&D centers, and schools to train (mostly) Vocational Education and Training (VET) students and share innovative practices. In our survey, around 60% of respondents are favorable to more dual training programs.

Orientation and guidance for choosing a higher education track

A major challenge for students is to choose a proper higher education track. There still are a significant share of drop-outs and delays in degree completion in France at the higher education level. A new initiative called "*Parcours Sup*" goes in the right direction and should be expanded. It is an online platform to provide information on possible higher education paths. Degrees and study tracks are presented in detail in terms of content, skill requirements, and academic background needed. One way in which this good initiative can be improved is with additional information on labor market outcomes for these tracks, as well as with feedback and input from current and former students' experiences.

There is also not much current support and guidance for students who would prefer to start work after high school. An interesting initiative here is Japan's "*Hello Work for New Graduates*." It is a partnership between the Japanese Public Employment Service and high schools, aimed at improving job placements of young Japanese – including high-school students. Students who express the wish to find a job straight out of high school receive help and advice from teachers-counsellors and from the Japanese Public Employment Service at each stage of the job search. The program is extremely successful, with a job placement rate of 98% (70% at 6 months before graduation), and no evidence of job instability down the road, according to the report *Investing in Youth: Japan* from OECD (2017).

Another interesting initiative to help high-school students choose their orientation is the "graduate tracking" program launched in the Netherlands in 2018. It is a partnership between the Dutch Public Employment Services, a research institute from Amsterdam University, and the Central Bureau of Statistics. As part of the project, data about more than 100,000 young professionals' career trajectories is analyzed (using variables such as time required to find a job, gross hourly wage, annual income, share of people who are permanent employees) and linked to the degree chosen by those professionals. The data is made available to prospective students at the time they are choosing their field of higher education study, so they can make a well-informed decision on employment outcome of each academic track. Such a program could potentially increase labor market transparency and better match the supply and demand for young people. It could both reduce youth unemployment and improve opportunities for recent graduates.

2.7. A push for coherent policy evaluations

The evaluation of establishments and schools is compulsory in France, but it takes different forms based on the geographical area. The tradition of evaluation is a positive aspect to be leveraged and expanded. Indeed, relative to the OECD average, school evaluations are actually less frequent. The system would also benefit from a better coordination between the different evaluation modes and actors. Teachers should provide input on how they think

evaluations should be done to be most useful. There should be more sharing of information between schools and at a national level to identify common problems, discuss solutions, and come up with best practices. It could also be beneficial to solicit some feedback from students themselves, since they have concerns and insights that would be valuable and important to take into account.

More generally, education is an area in which impact evaluation is done in many other countries. For instance, Singapore's "Future Schools" features a network of a dozen pilot schools that experimented incorporating information and computer technology (ICT) in K12 education, in partnership with researchers and private ICT providers.

Education policy is also an area where it is critical to pay attention to the actors on the ground, to listen to them, and to generate an iterative feedback loop with policymakers (very much in the spirit of both Sections 5 and 6 below). Policy design and evaluation will require giving platforms to students, teachers, and school or establishment directors and administrations to express concerns, ideas, and provide feedback. Ideally, these inputs should be diffused at a national level to contribute to the common knowledge and best practice pool.

The French Ministry of Education is currently holding a *Grenelle de l'Éducation*, to discuss various topics such as "*revalorisation, formation, parcours professionnels, numérique éducatif, RH de proximité, santé au travail*."[1] It will be interesting to see whether the measures that arise out of this initiative echo some of the ones we described here.[2]

[1] See the site of the French Ministry of Education.

[2] This report was drafted before the *Grenelle de l'Éducation* is held.

SECTION 4

PRODUCTION-STAGE POLICIES

1. Employer-Focused Active Labor Market Policies

In this section, we first review briefly active labor market policies and their effectiveness. We then hone in on examples of successful employer-focused training programs, in the U.S. and in Europe. We then comment on French policies and propose a new direction that entails greater collaboration and cooperation with employers.[1]

1.1. Active labor market policies

Active labor market policies are defined as "all social expenditure (other than education) which is aimed at the improvement of the beneficiaries' prospect of finding gainful employment or to otherwise increase their earnings capacity" (EU – Factsheet on ALMPs, note 1). There is a wide array of such policies in Europe. They include skills training and certification, employment subsidies, public sector work programs, and assistance with job search and matching with employers. Many of the services are delivered through Public Employment Services (PES). Participation in such programs is typically a condition for receiving unemployment insurance benefits. As Table 4 shows, ALMPs cost less than one percentage point of GDP and cover around 20-40 percent of people looking for employment.

[1] We relegate a discussion of specific labor market regulations outside the scope of this section to Appendix 6.

Table 4 – Active Labor Market Policies in Europe

	Austria	Germany	France	Italy	Netherlands	Poland	Sweden
Passive measures expenditure (% GDP)	**1,41**	**0,75**	**1,97**	**1,29**	**1,51**	**0,20**	**0,53**
Active measures expenditure (% GDP)	**0,59**	**0,26**	**0,64**	**0,41**	**0,42**	**0,34**	**0,97**
Training, excluding apprenticeship	*0,38*	*0,17*	*0,24*	*0,06*	*0,04*	*0,01*	*0,13*
Support for apprenticeship	*0,06*	*0,01*	*0,04*	*0,11*	*0,03*		
Recruitment incentives	*0,07*	*0,03*	*0,04*	*0,23*	*0,04*	*0,10*	*0,48*
Sheltered and supported employment	*0,02*		*0,07*		*0,28*	*0,16*	*0,22*
Rehabilitation		*0,02*	*0,01*				*0,02*
Direct job creation	*0,06*	*0,01*	*0,20*		*0,01*	*0,02*	
Start-up incentives	*0,01*	*0,01*	*0,02*			*0,04*	*0,12*
Participation in ALMP per 100 persons wanting to work (2017)	**25,7**	**21,5**	**40,5**	**35,4**	**34,6**	**28,5**	**41,3**
Training	*17,6*	*14,6*	*12,2*	*9,0*	*13,9*	*0,2*	*6,1*
Sheltered employment/ Rehabilitation	*2,6*	*0,7*	*3,7*	*0,4*	*12,8*	*17,3*	*9,9*
Employment incentives	*3,7*	*2,7*	*11,8*	*25,8*	*7,9*	*8,0*	*25,0*
Direct job creation	*1,3*	*2,8*	*8,0*	*0,2*	*0,0*	*1,2*	*0,0*
Start-up incentives	*0,5*	*0,7*	*4,7*	*0,0*	*0,0*	*1,8*	*0,3*

Source: OECD and Eurostat via France Stratégie

The evidence on the impacts of ALMPs has been mixed. Multiple surveys and meta-analyses have found that training programs, particularly for youth, produce uncertain benefits (Heckman et al., 1999; Kluve and Schmidt, 2002; Kluve, 2010; Card et al., 2010; Caliendo and Schmidl, 2016). Employment subsidies and public work programs are not particularly effective either.

In the words of a recent survey: “Overall, the findings with respect to employment outcomes [of ALMPs] are only partly promising. While job search assistance (with and without monitoring) results in overwhelmingly positive effects, we find more mixed effects for training and wage subsidies, whereas the effects for public work programs are clearly negative.” (Caliendo and Schmidl, 2016). In other words, the programs on which the bulk of ALMP resources are spent have a weak track record.

The good news is that a particular approach to skills training, called sectoral training programs in the U.S., has been yielding much more encouraging results.[1] These programs are different from general training courses in that they are oriented towards the need of particular employers and entail greater cooperation with them. Exemplified by Project Quest in San Antonio, Texas, they are typically managed by non-governmental groups such as community organizations or private agencies. They usually entail training in soft skills as well for specific occupations or industry, partnerships with community colleges and employers, follow-up services in addition to job placement, and a dual-customer approach that involves employers as well as job seekers (MDRC, 2016; MIT, 2019, p. 38).

Table 5 summarizes the evidence on some of the successful sectoral training programs in the U.S. Project Quest is the oldest of these and focuses on healthcare and IT. It has been evaluated repeatedly through randomized methods and has been shown to produce significant and sustained gains for participants from the earliest evaluations onwards. Increased earnings produced by these programs are of the order of 20 percent and compare very favorably to program costs – annual gains of $3,500-$6,300 versus cost per participant in the range of $5,000-$10,000.

Table 5 – Sectoral Training Programs

	Project Quest	Per Scholas	Madison Strategies Group	Jewish Vocational Services	Wisconsin Regional Training Partnership
Location	San Antonio, TX	Bronx, NY	Tulsa, OK	Boston, MA	Milwaukee, WI
Target sector	Healthcare; business services/IT	Information technology	Transportation; manufacturing	Healthcare	Construction; manufacturing; healthcare
Target population	Low-income adult population	Young males, predominantly foreign born	Low income-workers, mostly male	Refugees; immigrants; welfare recipients	African American youths
Evaluation results	Year 9 earnings up by $5,490 (20%)	Year 3 earnings up by $4,829 (27%)	Year 3 earnings up by $3,603 for the late cohort, w/ fading effects for earlier cohorts	Year 2 earnings up by 21%	Earnings up by $6,255 (24%) over 24 months

Sources: Maguire et al. (2010), Roder and Elliott (2019), Schaberg (2017)

[1] We note in passing the view that preschool and early childhood interventions are systematically more cost-effective than adult interventions later in life, including workforce training programs. Recent evidence has thrown this conclusion in doubt: there does not seem to be a clear relationship between cost effectiveness and the age at which social programs are targeted (see Rea and Burton, 2020, and Gellman, 2020, "Heckman curve update update," August 12).

As we discuss below, there are some initiatives in Europe that are similar to these sectoral training programs. But there is much more that could be done to ensure that ALMPs connect more directly with employers. We shall outline an approach along these lines below.

1.2. How sectoral training programs succeed

In Nicholas Mathieu's book on a fictional French community during the 1990's ravaged by deindustrialization and job losses, a young unemployed man of Moroccan descent shows up at the local employment office.[1] He has an appointment with the counselor who has been assigned to him, a young woman with a degree in employment law. The woman scrutinizes his resume, asking questions about his hobbies, travel, and computer skills. The youngster gets increasingly frustrated:

> "But what about the job?" said Hacine. "Do you have a thing or not?"
>
> "What do you mean?"
>
> "I don't know, my dad told me to come to City Hall. He said you had jobs."
>
> "Oh no, not at all. Your father came to the mayor's office, but I don't know what they told him. We just do orientation here. We help people get back into the workforce."
>
> "So there's no job, actually."
>
> "There must have been a misunderstanding. Our role is to help people put themselves across well, regain their self-confidence. We help them write their resumes and get training. We can also do coaching."

Later, as Hacine leaves the office, the woman goes out with him for a smoke. Out on the sidewalk, she suddenly turns to him:

> "I forgot to ask. Do you give high fives?"
>
> At first, Hacine didn't understand. "You know," she said. "This sort of thing." She was holding her palm out, so he was forced to slap it.
>
> "Because I met some employers the other day, they were super put off by that. They have young people who high-five people at work, with everybody. It just doesn't look good, see?"

The young jobseeker wonders if the counselor is making fun of him. Apparently not. That is the extent of advice he will receive to become more employable.

[1] Mathieu, N. (2018), *And Their Children After Them*, Translated by William Rodarmor. Arles: Actes Sud, pp. 48-49.

It's a pithy story that nicely captures not just the distance between the youth and the counselor but also the gap between the counselor and employers. This is not an uncommon situation with employment services as they traditionally operate. The distinctive feature of successful sectoral training programs, on the other hand, is that they establish strong links with employers, not only to understand their needs but potentially also to shape them. As one review puts it,

> "a training provider that trains in a specific field but does not have strong relationships with employers or industry associations in that field would not be considered a sectoral provider under this definition. To qualify as a sector program, an initiative must bring together multiple employers in a given field to collaborate on developing a qualified workforce. Many training programs focus more on the participants and work with employers only during the job placement phase. A sector program works with employers at every stage of programming and often invites employers on-site for mock interviews, to consult about curriculum design, or even to provide hands-on training." (MDRC, 2016, p. 2)

Sectoral employment programs target specific industries or occupations where they see the potential of local employment creation. For example, Project Quest, Per Scholas, and WTRP targeted healthcare, information technology, and construction, respectively. Program staff work closely with employers, and the firms themselves may serve on the programs' boards. Training courses are designed in close association with prospective employers. Specific courses may be added or removed depending on feedback from employers. Strong links with labor unions and local governments can help too, as these provide additional vehicles through which workers can be placed.[1]

As the relationship develops, employers start to see these programs as an important asset. Since firms benefit from the training, they are willing to cooperate with the program and sometimes even adjust their hiring practices. Rademacher et al. (2001) report that "a growing number of San Antonio employers think of QUEST as a valuable extension of their human resource capabilities" with the result that in some cases "QUEST's occupational

[1] A study of the Wisconsin Regional Training Partnership (WRTP) reports: "[G]etting a job in Milwaukee's construction industry requires a specific understanding of the skills and aptitudes needed for jobs in the various building trades, their individual hiring processes and their relationships with key actors in the industry. WRTP's strong union and industry networks meant that employers often notified the organization about upcoming hiring, and staff were able to respond by sending appropriate candidates. Staff could also walk participants through the different union processes so that they knew how to get their name on a hiring list, register for an exam or do whatever might be needed for a particular trade. In addition, major publicly funded construction projects often include employment goals that encourage local hiring or greater diversity within the sector. With its connections to the community, WRTP was able to help employers meet such goals" (Maguire et al. 2010, p. 49).

analysis has helped employers restructure positions to make them more attractive to local workers."

For example, a company had difficulty filling its openings for qualified electrician helpers. Project Quest not only collaborated with the company to design a customized training course, it also convinced the firm to modify its hiring criteria so as to enlarge the pool of prospective employees.[1] In a second example, a major medical employer asked Project Quest to train medical records clerks but was offering wages below Quest's standard for a "living wage." Project Quest staff worked with the employer to enhance the positions with added responsibilities so that "the potential employee would be more productive and thus earn a higher wage" (Rademacher et al., 2001, p. 37). Eventually, the firm chose to combine two separate functions into a higher-paying job. These are illustrative of how increased trust between employers and training agencies can pay off in the form of higher productivity for the firm as well as increased labor market opportunities for job seekers. Training partnerships with firms can not only enable job seekers to get better jobs, they can also help firms become more productive through better workers.

Conversely, when links with employers do not develop, sectoral employment programs tend not to work as well. One evaluation has found that the worse performing sectoral training programs were the ones that were least employer-focused (MDRC, 2016). The proactive approach with employers requires an explicit reorientation, and traditional training programs may have difficulties in building the requisite bureaucratic capacity and relationships. Or employment opportunities may evaporate when a targeted sector hits a rough patch.[2]

In addition to the close connection to employers, there are other features of successful sectoral training programs worth noting. First, screening does play a role to ensure the career-readiness of prospective participants. Second, training is customized not only to employers' preferences but also to participants' needs. For example, participants who

[1] "Bexar required applicants to have a 12th-grade reading level. QUEST staff inquired about the true reading level needed – do entry-level employees need to be able to read technical documents, or do they need to be able to read the newspaper? Through this line of questioning, QUEST staff members were able to determine that a reading comprehension level of ninth grade or better would be sufficient for the job, and convinced Bexar to alter its requirements accordingly. Similarly, QUEST showed Bexar how requiring participants to have their own cars was an unnecessary barrier for entry-level employees, and this requirement was dropped." (Rademacher et al., 2001, pp. 36-37).

[2] For example, "the St. Nicks Alliance WorkAdvance program confronted numerous difficulties in adapting its more traditional vocational training program to the WorkAdvance model, which may explain why impacts have not emerged, at least through this report's follow-up period. St. Nicks Alliance is a highly experienced community-based multiservice provider with a relatively small workforce division. The WorkAdvance program at St. Nicks Alliance experienced a collapse in the demand for environmental remediation work early in the program period and faced challenges in responding to these changes. A more effective response would have required a more proactive approach with employers than St. Nicks had previously used" (MDRC, 2016, ES-14).

require childcare or specific kinds of remedial education receive assistance with those. Third, organizational capacity, including capacity to learn and adjust, are important. Finally, as the studies summarized in Table 5 indicate, these programs exhibit a commitment to rigorous evaluation of results (Maguire et al., 2010; Roder and Elliott, 2018, 2019).

1.3. European experiments

Public Employment Services (PES) are the closest European analogue to the entities just discussed managing sectoral training programs. They are the central agency that administer ALMPs. PES are responsible for providing a wide variety of services to job seekers, including counselling, information, assessment of skills and qualifications, job placement, and matching with employers. But there are large differences as well. First, unlike organizations such as Project Quest or Per Scholas, they are public bodies (though with a tripartite governance). That gives them not only an administrative nature but also additional responsibilities, such as processing unemployment benefits according to each country's regulations. It also means that they are much larger. Within the French PES, Pôle emploi, one of the main bodies, employs nearly 50,000 staff and aims to serve job seekers that number in the millions. Second, they are not directly involved in the design of training programs, which are provided by separate agencies, even though they may play a role in certifying them for job seekers and in administering training incentives. Third, their links to employers tend to be weak. PES staff do not engage with employers at the level of detail we have seen the most successful sectoral training programs do. In fact, in the most recent European Commission report on PES, none of the 12 specific PES duties discussed relate to relationships with employers (EU, *Assessment Report on PES Capacity*, 2019, p. 13).

Their scale and governmental nature may make PES less nimble and adaptable, but there have been encouraging trends recently. In general, experimentation has been encouraged, decentralization has sometimes taken place, and there has been greater focus on providing individualized services to job seekers. There are a number of ongoing experiments in Europe that connect job placement services more closely to employers. According to a recent EU report,

> "PES are developing comprehensive employer engagement strategies, defining different approaches as to employer segmentation and organisation of employer services. Most Public Employment Services have set up central coordination levels of employer services though they also do provide services for employers at regional and local level." (EU *Youth Guarantee Report*, 2019, p. 123)

While these have not been formally evaluated like the programs we discussed previously, they are encouraging and provide a proof of concept in the European setting.

In Germany, PES have become more employer-oriented. PES agencies are mandated to spend at least 20 percent of all placement counsellors' working time to services for employers (PES "Mutual learning programme", 2010, p. 9). Local *Jobcenters* are governed jointly by municipalities and the German Federal Employment Agency. Municipal administrations have considerable discretion in the local labor-market services they provide and can respond to the particularities of their own conditions. *Jobcenters* are intended as one-stop shops, where job seekers can obtain individualized help for substance abuse or financial planning, for example, in addition to employment services (Shore and Tosun, 2019).

According to the European Commission staff analysis, *Jobcenters* are increasingly in direct contact with employers, proactively approaching and sensitizing them. This is done by different formats – via networking activities with employers' associations, with regular meetings at the mayor's premise, speed-dating formats and proactive engagement on the basis of job portal announcements. Also, case managers increasingly involve employers in the consulting process, via joint phone calls with the long term unemployed or organizing interviews. In some projects, certain staff act as "employer acquirers", who intensively support the long-term unemployed during the recruiting process. In some instances, these acquirers even accompany them to the job interview.[1]

Jobcenters case workers can sometimes work as intensively with employers as they do with jobseekers. Preliminary evaluations suggest that such "intensive and personal contact" with employers can be effective.[2] Moreover, *Jobcenters* are supposed to provide coaching and other support for up to six months after a worker is placed in a job.

Sweden has also moved in the same direction. According to the same European Commission staff analysis, some PES staff are especially dedicated to work with employers, and targets have been established to ensure quality service delivery to employers as well. A specific Unit for Business Collaboration has been established by the Stockholm Labor Market Administration that connects with employers in sectors with job shortages. The collaboration is based on employer commitments to provide internships or apprenticeships for unemployed workers and students. "A 'Coaching and Mentoring in the Workplace' tool is used to support employers and involves social clauses".[3] Denmark has formed a partnership between the Danish PES and employers to track how many internships/traineeships end up in regular, full time employment. The Traineeship

[1] See "Commission staff working document, Case study – Germany, accompanying the document *Report from the Commission to the Council on the evaluation of the Council Recommendation on the integration of the long-term unemployed into the labour market*", April 2019.

[2] "Commission staff working document. Evaluation accompanying the report from the Commission to the Council on the integration of the long-term unemployed into the labour market", April 2019.

[3] *Ibid.*

Assessment mechanism benchmarks outcomes so employers can evaluate the usefulness of their internships, and job counsellors can direct jobseekers to high-quality internships. Further, since 2016, Denmark's PES has become entirely decentralized, with municipalities now directly responsible for implementing labor market services.

There are also somewhat more ambitious programs that are directly centered on and at least co-managed by employers. A particularly interesting initiative is the Digital Skills Bridge program in Luxembourg. This is a publicly funded program that aims to pro-actively identify jobs that might be at risk due to firms' adoption of new technologies and to upskill the workforce in anticipation of the disruption. It is an initiative of the Luxembourg Public Employment service (ADEM) and is managed by a tripartite body (government, unions, employers' representations). It is open to all firms that want to take part in it.

In a reversal of the traditional approach to ALMP, firms are considered the primary target of the program, and employees are only a secondary target. According to the program brief, companies "do not know the full range of their employees' skills nor their real abilities to take up new positions in the company." Skills Bridge aims to fill the void. Participating firms undergo an evaluation of the skills their workforce might need in the future and of the workforce skills available at present. The requisite training is provided through subcontractors. For example, training in IT is organized by PwC. The program covers 90 percent of the employees' salary during training (up to 2.5x the minimum wage). Firms also receive a subsidy on their training costs, on a graduated scale depending on the expected mobility of the workers. Firms are ultimately expected to benefit through a better trained workforce, less disruption, a better external image, and a more positive internal atmosphere.

Results from early pilot studies suggest a high take-up rate by firms as well as significant retention and redeployment of workers within firms (instead of layoffs and displacement). The Digital Skills Bridge is a good example of the opportunity that employer-centered programs present: they allow an emphasis simultaneously on employment and productivity. It is an employment-focused program that is also an enabler of productivity enhancement.

A more long-standing example is provided by Switzerland's vocational training associations (*Lehrbetriebsverbünde*). These are voluntary groupings of firms that share apprentices and the associated financial/administrative burdens. They receive public funding for the first few years and then are expected to be self-sufficient. Two or more employers are required to create an association; some associations have more than 100 members grouped into sub-categories. A "lead" firm or an over-arching organization takes responsibility for the group, signs the contract, represents the association externally, and is legally responsible for the quality of the training of the apprentice. Employers provide training to apprentices on a rotating basis. Since apprentices are

shared, the system enables not only the employees to benefit from the training, but it also allows best practices in technology and training to disseminate from the larger or more advanced firms to the smaller firms. Participating companies are able to benefit from the knowledge that other companies have transmitted to the apprentice. According to one study, the majority of small businesses would not have had apprentices if these associations did not exist (OPET, 2008). The system appears to generate both more productive firms and more skilled workers.

Sweden's Job Security Councils (JSC) represent an example where the objective is to facilitate workers finding new jobs when their current jobs might be threatened. These are entities based on collective agreements between employer and employee organizations. They run in parallel to the PES, and the government is not directly involved. The distinctiveness of the scheme is that it is triggered early, as soon as a company is facing a potential restructuring, and before layoffs actually occur. Workers have access to highly personalized training, transition services, and financial support (in addition to unemployment benefits). The support typically covers 6-8 months, though some agreements provide for up to 5 years. The system is financed by premiums paid into a fund by individual companies. JSCs seem to be successful as a vast majority of participants in the program are reported to find jobs within 7-8 months at pay equal or above their previous one. However, there is considerable heterogeneity in outcomes, since the services received by blue-collar workers tend to be of lower and much more variable quality (OECD, 2015).

Hence, there are already multiple models in Europe where job placement and training services are closely integrated with employers. It would seem desirable to encourage more decentralized experimentation with such business-partnered training programs, either through the PES or through alternative organizations.

1.4. The French case

Boosting training to improve labor market opportunities of both young and older workers is one of the stated priorities of the Macron administration. To that end, the government has instituted a two-pillared approach. The first pillar is a personal training account (*compte personnel de formation*, CPF) that is intended to empower workers by allowing them to invest in their own training and to enhance their professional trajectory and mobility.[1] Workers choose the training courses on a mobile app and have access to this account over their working lives.

[1] In 2019, the limits were €500-€800/year depending on pre-existing qualification, with a maximum of €8,000 over the workers' lifetimes for low-skilled workers or low-skilled jobseekers.

The second pillar focuses specifically on low-skilled workers and young job seekers. The government launched a €15 billion plan for investment in skills over five years targeting the enrolment of 1 million low-skilled jobseekers (*Plan d'investissement dans les compétences*, PIC), as well as 1 million young people neither in employment nor in education or training (NEETs). A new body was created in 2018 to coordinate vocational training (France Compétences). According to the European Commission 2019 Education and Training, "key features of the reform on apprenticeships involve new incentives for apprentices and companies, the apprenticeship premium for SMEs and first qualification levels, and joint development of vocational courses by the state and professional branches." One of the objectives is to encourage "innovative experimentation," with successful pilot programs to be scaled up. In the aftermath of Covid-19, the government has announced further measures to increase spending on skills training and hiring additional staff for Pôle emploi.[1]

These are important initiatives that could potentially produce quite significant effects. We draw on evidence on workforce development programs we have reviewed previously to suggest some policy orientations that we think would increase the effectiveness of the new resources being deployed on training and skill upgrading. Our recommendations involve some new (or enhanced) roles for the Pôle emploi, requiring more intensive engagement with employers. These would reinforce measures that have already been taken in that direction.

At present, the French PES focus mainly on providing individualized guidance, counseling and job-search assistance to job seekers, and on the administration of unemployment benefits. A recent evaluation of the Pôle emploi notes that there has been a notable increase in the share of staff devoted to counseling, at the expense of staff dealing with unemployment benefits (Cour des comptes, 2020). Importantly, an additional 1,000 counselors were hired or deployed in 2019 focusing specifically on employers, though the report mentions this might be re-evaluated in light of Covid-19 (Cour des comptes, 2020, p. 16). The services presently offered to employers include "support in managing job offers," "support in selecting candidates' profile," "general info about labor markets," and "advice to smoothen the hiring process." Key performance indicators revolve around measures of employer satisfaction. Firms' levels of satisfaction with Pôle emploi services correlate strongly with firm size: larger firms tend to be more satisfied, and the smallest employers are the least satisfied (Cour des comptes, 2020, p. 122).

[1] Reported post-Covid plans entail €200-300 million additional spending on training and the hiring of 3,000-5,000 new counselors over two years for Pôle emploi. See *Les Échos* (2020), « Plan de relance : un effort massif pour moderniser la formation professionnelle, » by A. Ruello, August 20th, and *Les Échos* (2020), « Plan de relance : Pôle emploi va recruter des milliers de CDD pour aider les chômeurs, » by A. Ruello, August 23rd.

Engagement with employers can be enhanced in several ways. First, Pôle emploi can play a larger role in ascertaining employers' skill needs and ensuring that local training providers are offering the appropriate courses. This would require working closely with France Compétences, the new body in charge of ensuring training providers' quality through certification and continuous assessment.

As we have seen, successful sectoral training programs in the U.S. actively solicit participation of targeted employers in the design of training programs. We also mentioned evidence previously that suggests "soft skills" might be an important asset for low-qualified workers (Aghion et al., 2019). Hence, available training may need to cover both "hard" and "soft" skills. Moreover, while larger firms may be in a good position to articulate their skill needs to private training providers, smaller firms may be less capable to do so. Here Pôle emploi can play a useful role by coordinating and aggregating those smaller employers' needs and ensuring they are met.

Currently, Pôle emploi are consulted by regional councils in order to build regional training plans. Acting as an intermediary between (groups of) employers and private training providers – and doing so in a flexible and timely manner – to ensure a tighter match between the demand and supply sides of skills seems to us to be an important function for the PES to fill.

To enhance firms' own incentives to invest in skill upgrading, exemptions from social security contributions for low-wage earners could be made conditional on the provision of firm-based training. The Pôle emploi can also help smooth out some of the potential wrinkles with the new personal training accounts (CPF). Workers may lack adequate information on which types of courses best fit their professional needs and desired trajectories. Employers may regard them as a nuisance since they take workers away from the job and may not directly benefit them. The Pôle emploi can act as an honest broker and provide guidance to both workers and companies. For example, employers may be encouraged to top up funds for the types of training that are more likely to support in-company transitions.

Second, Pôle emploi can be more proactive in assisting currently employed workers whose positions might be at risk due to company reorganizations. When companies plan to restructure their operations – because of outsourcing or the introduction of new technologies or new products – some workers may be displaced while others will need new skills. As we have seen, successful programs anticipate such changes and work closely with employers to ensure as much compatibility between employment and productivity objectives as possible. Beyond simply being notified by companies of prospective layoffs, this requires the PES to be in close contact with employers on a continuous basis. It also means Pôle emploi may need to offer a broader range of services, including those that we

discussed previously in connection with Luxembourg's Digital Skills Bridge program (e.g., company specific skills evaluation programs and training).

There are some employer-based arrangements for larger firms in France that are designed to serve similar functions. The "anticipatory management of employment and competencies" (GPEC) requirement obligates firms with more than 300 employees to launch negotiations on corporate strategy and its foreseeable effects on employment and skills every three years. The resulting plans are expected to provide guidelines for future employment and skill needs and lay out the implications for current work force. The "*contrat de générations*" are company-level agreements that set conditions for the employment of young workers and retention of older staff.[1] While these arrangements look good on paper, we have the impression that they have turned into routine HR functions with not much real impact. They could be folded into PES's workstream and reinvigorated through more public support – in particular greater coordination with training/job matching – instead of being viewed purely as part of job retention/collective bargaining arrangements.

Third, there is the possibility that such schemes can move beyond providing better services to firms or cushioning the shocks of company restructuring to actually shaping the employment decisions of firms on an ongoing basis. There are hints in the U.S. evidence from sectoral training programs as well as from some European programs (e.g., Luxembourg's Digital Skills Bridge) that well-designed partnerships can serve both the needs of workers and the productivity challenge of firms. The availability of PES services may induce employers to produce more good jobs.

For example, Pôle emploi can help with the development of skills that are strong complements to firms' other assets, for those who are at the bottom of the earnings distribution. This would enable employees to achieve more productive career progression paths within firms. Those are also likely to be jobs that are typically not outsourced (Aghion et al., 2019). The right approach here might be the provision of specific firm-based qualification training. Local knowledge of which firms and industries are most likely to respond well to such efforts would be essential to good policy implementation.[2]

This kind of longer-term engagement with employers can be an important direction for Pôle emploi. But it is also the most challenging. Experience elsewhere indicates that moving beyond placement to productivity and job trajectories requires not just the right institutional designs but also a process of building trust among social partners – employers, workers'

[1] Companies can combine the negotiation on GPEC with the *contrat de générations*. According to France Stratégie, 9 agreements have been signed at the sectoral level since June 2013 and some 200 GPEC initiatives exist at territorial level.

[2] We are grateful to Richard Blundell for suggestions on this topic.

organization, and public agencies such as the PES. Developing the requisite social capital will necessarily take time.

Such arrangements can help businesses produce more of the social benefits associated with good jobs. But they will result in the full *quid pro quo* – more good jobs in return for more good workers – only when businesses recognize the benefits of the services provided to them by public sector training and placement agencies. Other public programs – in particular, investment incentives and innovation programs – obviously need to play a complementary role here, insofar as the productivity agenda goes beyond worker skills. We will turn to those complementary programs in the next sections.

Finally, in view of the uncertainty about what might work in the French context, we would encourage a certain amount of decentralized experimentation by local PES offices, coupled with evaluation – both of which are features of successful sectoral training programs. This will require granting local offices a degree of autonomy that they may not presently possess. Such experiments can be evaluated in the short term on the basis of intermediate targets such as number of participants or degree of employer satisfaction. Longer-term evaluations can track numbers of new jobs created, earnings trajectories of participants, and productivity impacts for firms participating more intensively in PES programs.

2. Business Incentives with Good-Jobs Focus

Economists tend to be cautious, if not downright hostile, towards industrial policies. The attitude derives less from economic theory than from practical considerations. The externalities and market failures that industrial policy aims to fix – learning spillovers, coordination failures, agglomeration effects, and, increasingly, the social benefits of good jobs we have emphasized here – are widely understood to be widespread in contemporary economies. The concern is that governments lack the knowledge to identify accurately where these market failures are ("governments cannot pick winners") or that they will be subject to political lobbying and capture once they put themselves in a position to select industries to support.

Despite economists' aversion, industrial policies have always been part of most governments' arsenals, simply changing shape and focus (and, sometimes, names) as economic priorities and fashions evolved. In the U.S., the practice of industrial policy has a long history, even if the term has carried a note of disrepute until very recently. It has taken a wide range of forms – from the Defense Advanced Research Projects Agency (DARPA) to Small Business Administration programs, to widespread state-level business incentives. In France, policy has always been more self-consciously activist; Buigues and Cohen (2020) provide an account of the many phases of postwar French industrial policy.

France Stratégie (2020c) outlines the industrial policies in which France has engaged recently, even though they have not always explicitly been labelled as such, and explains the renewed appetite as well as need for more intentional and explicit such policies.

In recent years, policy makers have articulated the need for industrial policy more explicitly and forcefully. The challenges of transition to a green economy, geographic divides, digitalization, and, increasingly, the perceived threat of Chinese competition in high-tech industries have highlighted the urgency of public action to stimulate investment and innovation in particular industries and regions. The European Union acknowledged the importance of industrial strategy explicitly in the Juncker Plan of 2014. The European Commission's Horizon 2020 Report targeted an increase in the manufacturing share of GDP in the European Union from 16% to 20% (a target that was missed). The EU is already a massive provider of business incentives through a variety of funds. While the bulk of the EU's structural and cohesion funds are invested in infrastructure, about 10% takes the form of direct grants to firms, which makes the program "one of the largest enterprise subsidy schemes in the world" (Murakosy et al., 2020, p. 3).

In France, business incentives center on three schemes. First, there are tax credits for R&D spending (*Crédit d'impôt recherche*), the stated objective of which is to increase the competitiveness of the country through innovation. Second, there is investment support for SMEs (through the Banque publique d'investissement, BPI), which channels government and EU funds to support investment and innovation through various financial instruments (credits, credit guarantees, or buying shares). The BPI works closely with client firms through the life cycle of projects, providing counseling and management training. Third, there are publicly funded "competitiveness poles" (*pôles de compétitivité*). These are designed to promote clusters in specific regions or industries – bringing together small and large firms, training organizations, and research labs – through financial support and tax incentives.

We will address incentives specifically directed to innovation in point 3 of this Section. Focusing on the other incentives, it is fair to say that while employment is almost always a subsidiary goal of these programs, they are rarely designed with employment as the key objective.[1] In the main, they target increased productivity and global competitiveness and try to foster new digital and green industries. In the EU Industrial Strategy Package (2020), for example, high-quality jobs and employment are occasionally referenced, but the emphasis is clearly on digital innovation and green tech. Employment is generally viewed as part of the social agenda, distinct from the productivity and economic growth agendas.

[1] This is a general feature of business promotion schemes. In a global review of such programs, Robalino et al. (2020) write: "In practice, projects are seldom selected for public support based on the jobs impacts the investments are likely to generate (…) Often, the beneficiaries of demand-side programs are selected, subject to the size of the firm, on a first-come-first-serve basis."

In view of the broader benefits of good jobs we have discussed previously, this orientation may need a second look. In particular, there is a need to connect business incentives more tightly with the kind of labor market and training programs discussed previously. While labor market interventions may do a good job of preparing jobseekers for good jobs, their effects will remain limited if there is not a corresponding increase in the supply of good jobs on the part of firms. Accordingly, we shall propose an approach that prioritizes good jobs more directly.

Another consideration is that business incentives work best when they are customized and targeted to specific needs of firms, and when they are part of an iterative dialog between firms and government agencies. The traditional conception of industrial policy is represented by the East Asian caricature: bureaucrats independently choose a set of economic activities to be promoted, select pre-determined incentives (tax rebates or subsidized credit), and then impose hard conditionality on the receiving firms (they either perform or else). This type of policy hardly works well, and in fact was never quite how industrial policy was actually implemented in Japan, Taiwan, South Korea, or China. Successful programs tend to revolve around a process of strategic collaboration in which firms' needs, market opportunities, and appropriate remedies are discovered over time, with policies revised as learning takes place. Our proposal will be in line with this newer understanding of business incentives.

As we discussed at the beginning of the report, territorial and spatial inequalities remain large in France. A key objective of the policies we propose here is to enhance productive employment opportunities in lagging regions through what we will call Regional Business Bureaus (though the same functions can be performed under existing institutional structures). While we do not cast business incentives explicitly as "place-based policies," their operation would be similar to successful place-based policies elsewhere.

2.1. Do business incentives work?

Evaluating the full efficiency consequences of business incentives requires either direct knowledge of the magnitude of the externalities being addressed or making assumptions about them. Empirical evaluations typically fall short of providing estimates of the externalities. They tend to focus on the narrower question of effectiveness: did the incentives alter the recipients' behavior on relevant dimensions (e.g., capacity, employment, investment in technology, exports, level of productivity)? Such studies are still informative, because they speak to the ability of government agencies to achieve the immediate intended effects of their interventions. There has been a number of high-quality recent studies, which we briefly summarize below. They tend to show that business incentives do help create employment. They also suggest, however, that these incentives

can be targeted and deployed in more effective manner. While these studies typically focus on jobs overall, rather than good jobs per se, they provide important lessons.

One of the best studies of industrial policy is the recent paper by Criscuolo et al. (2019), which analyzes the effects of the Regional Selective Assistance (RSA) program in Britain. The RSA is a system of discretionary subsidies designed to maintain and expand employment in low-income, high-unemployment areas, with the bulk of the payments going to manufacturing. The RSA operates in designated geographic regions.[1] In these areas, firms can apply to the government with specific investment plans, either to finance new capital equipment or to modernize existing plants. The government reviews the plans and, if approved, finances up to 35 percent of the investment. According to Criscuolo et al. (2019), "the formal criteria stipulated that the project: (a) should be expected to lead to the creation of new employment or directly protect jobs of existing workers which would otherwise be lost and (b) would not have occurred in the absence of the government funding ('additionality')." Hence the scheme, unlike so many others, directly targeted employment. However, and this is more typical, it subsidized spending on physical capital and not other kinds of spending which may have had a more direct impact on jobs.

Nevertheless, the authors find a quantitatively significant effect on employment: "a 10 percentage point increase in an area's rate of maximum investment subsidy causes about a 9% increase in manufacturing employment and a 4% decrease in aggregate unemployment."[2] Interestingly, they find that these positive employment effects were confined to relatively smaller firms, with under 50 workers. They speculate that the reason may have to do with the ability of larger firms to "game" the rules, by receiving the subsidy and not changing their behavior. Their finding is especially impressive in light of its being confined to smaller firms. Their estimate of the program cost per job saved/created turns out to be very low ($3,683 at 2010 prices).

Another recent study looks at grants made to Hungarian firms under the European Union's Structural Funds and Cohesion policies (Murakosy et al., 2020). The objective was to support the growth of SMEs. The grants appear to have been administered in a completely non-discretionary manner, and also without many precautions against abuse. There was a simple check list for eligibility. "Firms which satisfied a set of simple criteria (e.g., were at least 2 years old or had at least 5 employees) and submitted a formally complete application were awarded grants at a first-come, first-served basis." There does not appear to have been much monitoring or follow-up checks on the part of government. Nevertheless, the authors

[1] As we emphasized earlier, the definition of a good job depends on context. Ordinary assembly-line work in a depressed region can be considered a good job in light of the alternatives.

[2] Criscuolo et al. (2019) exploit a change in EU-wide rules regarding which regions can qualify for the subsidies, arguing that the change was exogenous to specific local circumstances, and hence can be used to identify the causal effects of a policy change without being confounded by the latter.

find significant effects on employment, as well as the capital stock, capital intensity, and labor productivity (but only marginally significant effects on total factor productivity). Wages seem to have been boosted by the program, but more for skilled workers (6-9%) than for lower skilled employees (4%). Ehrlich and Overman (2020) provide an overview of results under European cohesion funding.

We are not aware of many rigorous recent evaluations of business incentives in France. One study conducted a diff-in-diff analysis of firms that benefit from incentives and participate in R&D projects under the Competitiveness Poles program (Chaudey and Dessertin, 2018). They identify 643 establishments that took part in the program between 2004 and 2010. Even though the program does not directly target employment, the authors find positive overall effects on employment, with an increase of 10 percent on average. However, there seems to be considerable variance in outcomes across firms and these results are not highly significant statistically. Mayer et al. (2017) and Briant et al. (2015) report positive employment effects for urban enterprise zones (*zone franche urbaine*).

In the United States, individual states provide significant tax incentives to attract businesses from abroad or other states. These totaled $47 billion in 2015 (Bartik 2020). In a recent survey, Slattery and Zidar (2020) summarize such incentives under three headings: state corporate taxes, state tax credits, and firm-specific incentives. On average, the recipients of these incentives tend to be large firms in manufacturing, technology, and high-skilled service industries. The average discretionary subsidy is $160 million for a promise of 1,500 new jobs. The value of these incentives ranges from 20% (California) to 150% (West Virginia) as a percent of corporate tax revenues. Slattery and Zidar (2020) report that they “find some evidence of direct employment gains from attracting a firm” but conclude that there is no “strong evidence that firm-specific tax incentives increase broader economic growth at the state and local level.” U.S. Empowerment Zones (EZ) are a federal program, which provides tax incentives and block grants (to be used for infrastructure, business assistance, and so on) to designated jurisdictions. Using rejected and future applicants to the EZ program as controls, Busso et al. (2013) find that EZ designation substantially increases employment in zone neighborhoods (by 12-21%) as well as wage levels for local workers (by 8-13%). They find no increase in population levels or the local cost of living, indicating the efficiency costs, if any, were small. Tuzel and Zhang (2019) look at state-level adoption of a federal tax incentive for investment and conclude that the effects on workers were heterogenous. When states expanded investment incentives, firms increased physical equipment and employment of skilled workers. After a couple of years, however, less skilled, routine-task employees took a hit. It appears that the new investment was heavily biased towards skill-intensive technologies. Overall, the employment effects were insignificant, reflecting the mix between positive and negative effects on different segments of the workforce. This is a particularly interesting study as it

highlights how the consequences of poorly targeted business incentives can be adverse for those workers who are particularly at risk.

Business incentives that subsidize physical investment and new technologies are clearly not the most effective ways of helping workers. As Bartik (2020) notes, “cash incentives to encourage local job creation have high costs per job created because it takes a lot of cash to tip a business location or expansion decision.” Available studies indicate the fiscal costs per job saved or created, even when there are positive employment effects, can be quite high. Criscuolo’s estimate of $3,683 (at 2010 prices) for the RSA represents the low end. Other studies produce cost per job estimates that range from $18,000 for Empowerment Zones in the U.S. to more than $68,000 for investment subsidies in the Mezzogiorno in Italy (Criscuolo, 2019, Table A21; all figures are in 2010 prices).

Tim Bartik of the Upjohn Institute has been a long-term observer of business incentives in the United States, and his synthesis of the evidence provides a valuable perspective that applies equally well to Europe as well (Bartik, 2019, 2020). In summary: public policy focusing on job growth in distressed areas can be effective and generate persistent gains in employment-to-population ratios, but current systems are not very effective. They are based on significant tax breaks that often go to large corporations and are not properly targeted or designed. He makes several recommendations. First, business incentives should focus on areas that are distressed – that is, areas that truly need them. Second, the incentives should focus on sectors or firms that are likely to have high job creation multipliers. Third, public assistance should focus less on tax incentives (and encouraging physical investment) and more on specific public services needed by firms, such as customized business services, zoning or infrastructure policies, local amenities, and skills training. Fourth, business assistance should be viewed as a portfolio of services rather than a particular incentive, with the actual mix attuned to local conditions. The second, third, and fourth of these recommendations are especially relevant to France (and Europe more broadly).

Bartik’s recommendations echo ideas that have developed over the last couple of decades into a new conception of industrial policy (Evans, 1995; Hausmann et al., 2008; Rodrik, 2007, 2008; Sabel 2007; Fernández-Arias et al., 2016; Ghezzi, 2017). Under this conception, the government is not presumed to know where the market failures are beforehand and, therefore, does not determine ex ante what the specific policy instruments are. Industrial strategy consists of a collaborative process of “discovery” involving business and agencies of the state, where the objective is to identify the constraints and opportunities over time, and to design interventions appropriately. As learning takes place, policies are revised, refined, and sometimes reversed.

The classic conception of industrial policy is defined by clear sectoral priorities and a clear set of incentives, while the private sector is held at arm’s length by government agencies.

The "modern" version is distinguished by an iterative process of dialog between government agencies and private firms, taking place in multiple institutional settings such as sectoral roundtables, supplier networks, or clusters. The focus is less on subsidies or incentives and more on removing specific impediments or providing needed public services to speed up the creation of good jobs. We know such practices are feasible because they already exist in a number of policy domains; Rodrik and Sabel (2020) discuss water-quality regulation in Europe and promotion of high-tech innovation through DARPA in the United States, while Ghezzi (2017) discusses their application to modern agriculture in Peru. The question is what such a regime might look like in the specific context of France.

2.2. Towards new institutional arrangements for business incentives

We propose the setting up of regional business promotion agencies that operate alongside the PES (Pôle emploi) and cover the same territories. We call them "regional business bureaus" (RBB). We sketch below how they might operate. The main thrust of our proposals is to create a structure for job-enhancing productivity assistance to firms that runs in parallel (and in cooperation) with the worker-oriented Pôle emploi.

We are aware of the risk of adding complexity to an already crowded institutional landscape in France. It is possible that the tasks we describe below could be handled or absorbed into existing agencies that deal with firms. Our focus is on the functional responsibilities that need to be discharged rather than their institutional location. In general, it would be desirable to streamline rather than add to bureaucratic procedures. Perhaps the coordinating functions we propose below can be performed better by reducing the number of agencies that are already engaged in providing support to firms.

The goal of RBBs (or their equivalent) would be to provide a portfolio of services to local firms or prospective investors with the overarching goal of assisting them to increase productivity while creating good jobs.[1] Many of these services would normally be administered by other agencies, in which case the role of the RBBs would be mainly to coordinate those agencies and help firms navigate through them. For example, RBBs may cooperate with the BPI (Banque publique d'investissement) to help SMEs get access to financing or business advice. They may coordinate with the local PES to identify suitable workers and help recruit them. They may organize training providers to ensure the requisite skills are built up. They may help with infrastructure needs of SMEs, for example with respect to internet and cloud services where pooling of fixed costs could be an advantage.

[1] One question is whether EU state aid rules are sufficiently flexible to permit the kind of scheme we describe below. We note that those rules allow a substantial number of exceptions, particularly with respect to smaller enterprises, funding of innovation, and disadvantaged regions. "Disadvantaged" regions presently cover about a quarter of the French population. See *Guidelines on regional state aid for 2014-2020* on EUR-Lex.

They may also act as a go-between with the local bureaucracy as regards local regulations such as zoning. And they could be provided with additional resources to provide other services as well, as the needs reveal themselves. In general, RBBs would be in a position to assist with the financing (through their own or other agencies' resources) of any productivity and employment increasing spending or reorganization on the part of firms. Investment subsidies would not be prioritized over other incentives.

The RBBs would take a customized, individualized approach to their relationship with firms, in the understanding that different firms/sectors have different needs. They would maintain an open-ended relationship with them, trying to understand their problems and opportunities.

Firms would make proposals to the RBB for use of one or more particular services, say a training program or purchase of a particular advanced technology system. In return, they would make commitments on specific quantities of jobs they will create at different qualification levels (i.e., low salaried employees, medium-salaried employees, etc). Firms would be encouraged to pool proposals when they make use of common inputs – as would be the case for workers with particular skills or infrastructure.

It is particularly important that the process of soliciting proposal be open to new or young firms. In particular, new firms may be deterred by regulations or sectoral agreements that act as entry barriers. In addition to encouraging proposals from such firms, RBBs might also be empowered to grant young firms certain temporary exemptions from sectoral regulations or agreements in order to ease business formation. This would obviously have to be done in exchange for good-job conditionalities and in agreement with social partners. Failing agreement with social partners, new firms might be provided with financial incentives that compensate for the cost of the relevant regulations.

Bureaus would then screen proposals for suitability. They would evaluate the overall desirability of the proposed project, paying attention to the quality of the project, its feasibility and plausibility, the additionality of the jobs that are to be created, and the likelihood that the RBB can deliver the services needed on the timescale required. Larger, more expensive proposals might be evaluated by outside consultants. At this stage, the RBB might also negotiate additional requirements with the firm. For example, the firm might be asked to work with its local suppliers to improve their management or technological capabilities. Or a firm that is considering outsourcing part of its production to a foreign county may be asked to delay doing so for a number of years, in case productivity improvements at home may render those plans unnecessary. The firm may be required to arrange for additional training for some of its employees. The project would then be given an overall score, to compare with others on a single scale.

Once projects are approved and launched, there would be periodic audits designed to check whether firms are making sufficient progress towards their commitments – especially on employment. It would be understood that there is a certain provisionality – inevitable in light of uncertainty and unforeseen circumstances – to both the targets and the package of assistance being deployed. The audits would reveal that some projects are clearly not working out. Those would be terminated. Some other projects may turn out to underperform because of unanticipated changes but may still be salvageable with existing (or revised) supports. Those would continue to receive support. In other words, the audits would be as much an opportunity to revise policies and targets as they would be an occasion to make binary, up-or-down decisions.

To the extent possible, the proceedings of the RBB would be open and transparent. Packages of support as well as targets agreed to by firms would be public information. Any revision of supports or targets would also be carried out in a transparent fashion, with firms' justifications for revising targets open to public scrutiny. Transparency over these matters would be essential both to limit public corruption and to ensure firms have limited ability to game the bureaus.

Finally, at the end of the first five years (and each subsequent five years) a certain number of RBBs would be subject to rigorous evaluation. The objective would be to see whether the bureaus are achieving their central objective: creation of productive job opportunities. If the bureaus were being phased in over time gradually, such evaluations could be carried out initially using randomization or synthetic-control (comparing each *région* with a synthetic control group) methods. Subsequently, evaluations could be carried out within *régions* using regression discontinuity (comparing firms just below and above the cutoffs on the overall score).

We note that much of the resources which the bureaus would help coordinate and direct are already allocated in other programs, such as the BPI, Pôle emploi, or municipal budgets. Additional resources may well be needed for new initiatives along the lines we have suggested.

2.3. Governance considerations for RBBs

It is worth saying a bit more about the regulatory model that underlies our approach, since it differs from the standard, arm's length regulation model of economists.[1] In the conventional regulatory approach to the mitigation of externalities, firms have to meet clear guidelines, and consultation between the regulator and firms is limited typically to resolving differences. The costs of mitigation are known to firms but not to the regulator. Firms use

[1] The discussion here follows closely Rodrik and Sabel (2019).

this informational edge to minimize their costs of adjustment while regulators devise ways of eliciting the cost information without being captured by the firms. There are fixed limits on permissible behavior and a schedule of fines for violating them.

This model does not apply well to the present context because the objective itself ("good jobs") is imprecise and multi-dimensional; it needs to be operationalized in a way that is both evolving and context-dependent. Furthermore, creating good jobs depends on a wide array of decisions on investment, technological choice, and business organization, the consequences of which are unknowable ex ante. Technological and operational possibilities are highly uncertain, and neither firms nor government agencies have the information needed to devise concrete behavioral schedules from the outset. Hence the interaction between RBBs and firms must take as its starting point the provisionality of ends and means and the need for disciplined review and revision. Targets and instruments for good-job creation must remain provisional, to be revised as new information comes in. The task of governance is to establish an information exchange regime that induces firms to cooperate with RBBs and adjust their strategies in the desired direction in a context of extreme uncertainty.

Instead of defining precisely each party's obligations, our proposed governance system would establish broad goals and a regime for evaluating their achievement. Such practices have become established in industries as diverse as biotechnology, IT and advanced manufacturing, as well as in policy regimes such as food safety, water quality, civil aviation, and the promotion of advanced technologies (Gilson, Sabel and Scott, 2009; Rodrik and Sabel, 2019). They entail

> "regular, joint reviews of progress towards interim targets or milestones, procedures for deciding whether and with what exact aim to proceed or not, and mechanisms for resolving disagreements. The information exchanged under such a regime allows the parties to develop a more and more precise idea of the shared goal while allowing each to assess with increasingly reliability the capacities and good faith of the other: to observe if the capable stranger can become a reliable partner and the long-trusted partner is capable of innovative tasks. As collaboration progresses, each party comes to rely increasingly on the capacities of the other, deterring opportunistic defection and generating or activating norms of reciprocity. Joint regular review and deliberate consideration of the interim results thus create the conditions in which informal norms and self-interested calculations bind the parties to continue promising collaboration in good faith. Trust and mutual reliance are the result of agreement to collaborate, not its precondition, just as the precise aims of cooperation are the outcome, not the starting point of joint efforts." (Rodrik and Sabel, 2019)

In our specific context, the RBBs would consult local firms extensively and then establish an ambitious, open-ended outcome: "good jobs," as measured by a number of metrics that reflect community preferences as well as national standards. Firms would be encouraged

to enter into partnerships with the RBB to gain access to RBB services (of the type discussed previously) customized to their needs. In return, they would be obligated to make plans to achieve "good job" targets and to regularly report their results. RBB benefits would continue as long as firms report their progress (or lack thereof) accurately and they make certifiable good-faith efforts to meet their targets. Targets would remain soft, and failure to meet them would not necessarily call for withdrawal of support during the early stages, as long as there are demonstrable progress and good faith efforts. The objective of the regime would be to incentivize cooperation, information revelation, and ongoing revision of instruments and targets. In the words of Rodrik and Sabel (2019), "fostering good jobs is likely to depend on solving highly idiosyncratic, place-specific problems: failures of coordination between local firms and training institutions; between firms and their (potential) supply-chain partners; and the managerial breakdowns or skill gaps within individual firms and institutions to which the coordination problems point." With enough success on some of these dimensions, more firms could be drawn into such schemes, generating a virtuous cycle of new production practices and learning spillovers.

Beyond these broad governance principles, there is no "how-to manual" that can guide government officials in this work. Discretion on the part of government bureaucrats remains an integral part of such incentive regimes. But it is disciplined, on one side, by requirements of transparency and professional norms and, on the other, by the demands and needs of firms. Since experimentation by RBBs can add value, local autonomy is useful and can spur learning across regions. Ultimately, success depends on the development of organization cultures that internalize the behavioral norms of this type of governance.

Like all public policies, the proposed scheme may fail or turn out to be ineffective. However, it is important to be clear that key elements of what we have sketched out already exist in the public policy arsenal. For example, the BPI already has considerable experience of working closely with SMEs, using a wide range of instruments (loans, guarantees, equity participation, export credits, training, management counseling, access to technology and networks). The Bank has the capacity to screen firms, monitor their progress, and intervene at various stages of their lifecycle. Effectively, the BPI acts as a public equivalent of venture capital. The proposed RBBs could leverage this capacity with additional instruments and resources, and in a more employment-friendly manner.

Or consider the RSA, which we have discussed previously. Even though this is a non-French example, it is indicative of both how effective incentive programs work and the feasibility of establishing such programs in the real world. To qualify for subsidies under RSA, firms

> "completed an application form, in which they needed to prove additionality, to provide business plans, accounts and reasons for wanting the grant. They then submitted this to the local office of the Department of Business. During the period analyzed, the lag between

> submission and decision was normally between 35 and 60 days for standard grants, and 100 days or more for grants above £2 million. The lag depended on the amount applied for, the time needed to ensure that all of the criteria were met and on negotiations between the government agency and the firm. If the application was successful, the firm was paid the minimum necessary to get the project going. Additional payments started only after jobs were created/safeguarded and capital expenditure defrayed and were based on agreed targets. The payments were given in instalments – between two and seven and usually spread across more than one financial year." (Criscuolo *et al.*, 2019; Appendix 7)

Importantly, Criscuolo et al. (2019) report that the government agency monitored the project closely and visited the operation once a year, and more frequently for projects judged to be riskier than normal. In other words, the RSA was a fairly discretionary program, requiring significant monitoring and ongoing negotiations between a government agency and private firms.

In sum, what we have proposed does not entail a significant augmentation of capacity compared to institutional arrangements that have already proved feasible in other, similar contexts. The novelty, to the extent there is any, lies in the focus and orientation of the business promotion program we are proposing: a closer coordination of business incentives with labor market/training policies, more customized business services instead of ex ante tax incentives, explicit targets for employment and job upgrading ("good jobs"), greater room for revision in light of changing circumstances, and more intensive evaluation.

3. Labor-Friendly Innovation Policies

In 2016 Elon Musk announced that Tesla's Model 3 would be built in a new, fully automated car factory. Codenamed "Alien Dreadnought," with obvious connotations of science fiction and hyper-advanced technology far beyond current practice, the project would enable essentially worker-less production. Complete automation would allow the factory to operate beyond human speed: "raw materials would go in one end and finished cars would roll out the other. In between, robots would do everything, a very high speed — speeds too dangerous to risk around frail human bodies."[1] Only a few human experts would be needed to ensure everything was running smoothly.

The factory was supposed to become fully operational by the end of 2018. But the plans proved hard to implement, and by mid-2018 it was clear that production bottlenecks would not be solved easily. The operation was experiencing "production hell" and was "within single-digit weeks of death," in Musk's words. The dire situation forced the company to

[1] DeBord, M. (2017), "Tesla's future is completely inhuman – and we shouldn't be surprised," *Business Insider*, May 20.

launch a new assembly line inside a sprung structure (what Musk described as a "tent") on the grounds of the factory. Built in three weeks, the new assembly line increased production by 50 percent and returned the company back to financial health.

When CBS News correspondent Leslie Stahl visited the "tent" sometime later accompanied by Musk, she observed that the new Model 3 factory was in fact full of human workers. Musk laughed, responding "people are way better at dealing with unexpected circumstances than robots."[1] "Yes, excessive automation at Tesla was a mistake… Humans are under-rated," he conceded on Twitter.

Tesla's automation mistake is revealing for several reasons. First, it highlights how production techniques relying on human labor can still dominate automation when it is impossible to fully account for uncertainty and routinize all tasks. Second, it is indicative of the excessive faith many business leaders often place on new technologies. Third, it reminds us that technology adoption is a choice: businesses face a range of options about what kind of innovations to use and deploy – choices that have significant implications for the workforce, which are typically not internalized in the decision-making process.

In his magisterial book *Inequality*, the late Anthony Atkinson stressed that there are three reasons why the direction of technological change cannot be left to firms and innovators alone (Atkinson, 2015, pp. 115-118). First, technology choices have distributional implications – the share of capital in value added and the level of wages – to which society may not be indifferent. Second, the replacement of labor with robots and other modes of automation typically entails the substitution for a joint product – a human service alongside manual labor, and there is no guarantee that laissez-faire is efficient in the presence of joint supply. Third, today's innovations have long-range implications for the future and may foreclose technological paths that are more friendly to human workers. The social benefits of good jobs we have already discussed can be considered a fourth broad reason.

3.1. Changing the narrative: Technology for good jobs

Technological change is probably the single most important force that has been driving the polarization of labor markets. As automation, AI, and other new technologies alter the type and composition of skills demanded in labor markets, workers with skills that are in less demand face significant challenges.

The usual discussion around the labor market implications of new technologies is curiously one-sided. The direction of technological change – whether it augments or replaces labor – is taken to be essentially exogenous and out of our control. All the adjustment, therefore,

[1] Alvarez, S. (2018), "Inside Tesla's 'Tent'-Based Model 3 Line That Set a Path to Profitability," *Teslarati*, December 10.

falls on the labor force. Typical statements exhort workers to acquire better education and training to ensure they have the skills required by new technologies. Here is, for example, how a recent McKinsey Global Institute report on the future of work in Europe puts it:

> "Automation will require all workers to acquire new skills. About 94 million workers may not need to change occupations but will especially need retraining, as technology handles 20 percent of their current activities. While some workers in declining occupations may be able to find similar types of work, 21 million may need to change occupations by 2030. Most of them lack tertiary education. Newly created jobs will require more sophisticated skills that are already scarce today" (MGI, 2020, p. iv).

What is striking in such statements is the degree of technological determinism. It is as if technological innovations and their likely impacts on future jobs are completely exogenous, shaped by forces outside the economy, institutional arrangements, and government policy.

In reality, the kind of innovations that are fostered depend on several conditions that may be amenable to control.

First and most directly, government-funded and directed innovation programs make decisions about what kind of innovations to promote. Those priorities are often shaped by considerations about which activities are the industries of the future (e.g., *Programme d'investissements d'avenir* in France) or what specific societal goals need to be fulfilled (e.g., green technologies in the context of the European Green Deal, or defense-related technologies at the national level). These priorities in turn determine what kind of research projects are funded and developed. Employment-friendly technologies – those that augment rather than replace labor – could be part of those priorities, though they are not at present.

Second, private sector innovation incentives can be skewed because of prevailing financing methods or policies. Venture capital, for example, plays a relatively important role in financing innovation in the United States. Venture capital naturally seeks areas where the returns can be capitalized relatively quickly by investors. As Lerner and Nanda (2020) point out, this may exclude innovations where the gains are longer term or reaped by society at large. There are also many policies that indirectly shape private-sector technological investments because of the market incentives they generate. For example, most advanced economies subsidize capital formation (through depreciation allowances and various incentives of the type we discussed previously) and tax labor (through personal income taxes and labor charges). An unintended consequence of the tax system is to induce firms to economize on labor by investing in machinery, to an extent that may be socially suboptimal. In a paper titled "Does the U.S. Tax Code Favor Automation?" Acemoglu et al. (2020) find that a shift to an "optimal" system of factor taxation would increase U.S. employment by nearly 6 percent. There is no reason why such indirect and

unintended consequences on the direction of technical change could not be taken into account if tax (and other) policies were subject to a fuller evaluation.

Third, beyond the economic incentives they face, there is an informal set of norms that guide innovators' decisions. The high-tech community often operates under a shared set of values and expectations with respect to what is a desirable direction for technological change. In the U.S., groupthink is aggravated by the very high concentration of venture capital funding in a small number of firms and cities (such as San Francisco, Boston, and New York City). "Venture firms based in other cities might have chosen very different firms to invest in given their perspectives on their local economies," write Lerner and Nanda (2020).[1] Automation and replacing human labor or ingenuity can be prized beyond the true economic value. Elon Musk's misplaced confidence on the benefits of full automation was perhaps a reflection of such values. Such norms might be amenable to change as society begins to attach specific value to employment-friendly technologies. An analogy might be drawn here with the growing ecological consciousness households and firms have exhibited in recent decades, as the climate change challenge has become part of the everyday consciousness.

Finally, the direction of technological change also depends on the balance of power between employers and employees. When workers have a say in the workplace, management has to get buy-in from them before major technologies are deployed and work is restructured. This can reflect itself in a modern version of Luddism – aversion to any kind of innovation that appears to threaten jobs. But it can also be a useful counterweight to adverse incentives in the system encouraging too much automation or the adoption of what Acemoglu and Restrepo (2019) call "so-so technologies". For example, businesses that take stakeholders' interests into account are more likely to deploy new technologies in a manner that empowers workers rather than replace them or reduce them to mechanical, routine work. Sophisticated technologies can allow managers to monitor their workers' every movement and measure their efficiency, enabling companies to set ever-demanding standards of productivity, at some cost to workers' physical and mental health. Alternatively, new technologies can empower workers to increase their autonomy and control their work environment.

[1] Those who finance innovation are very unrepresentative of societies in which they live. Lerner and Nanda (2020) report about top venture firms: "Eighty percent of partners are male; among the set of partners with at least one board seat, 91 percent are male. Three-quarters of partners with at least one board seat attended either an Ivy League school, or one of Caltech, MIT, or Stanford; moreover, nearly 30 percent of these individuals are graduates of just Harvard Business School or the Stanford Graduate School of Business. In terms of location, 69 percent are based in the Bay Area alone and over 90 percent are based in either the Bay Area, Greater Boston, or New York."

This is a point that is emphasized in the Villani (2018) report on artificial intelligence, which notes that AI can sometimes be used to enhance "the development of general cognitive skills and creativity" but can also at times "increase the routine nature of tasks and reduce capacity for personal initiative and thinking." It cites the example of "major retail logistics warehouses [where] the automation of processes may lead to employees solely following orders from a machine." Relying solely on businesses to make the choices about how AI should be implemented is therefore not optimal: "There must be a broad dialogue on the definition of this form [of complementarity between AI and humans], first and foremost among employees. The aim will particularly be to reconcile the desire to build individuals' room for maneuver and the potentially negative effects of calls for creativity, which can be problematic for many individuals." (Villani, 2018, pp. 91-92)

In short, there are reasons to believe that the direction of technical change, in addition to its rate, depends on a wide range of factors, many of which could be influenced by societal and governmental decision-making. And if so, it may be possible to direct technology to better serve the existing workforce's needs, in addition to preparing the workforce to match the requirements of technology. As France Stratégie (2020g) notes, France has lagged behind some other advanced economies in the adoption of AI by firms. This can be turned into an advantage by encouraging future deployment of AI tools that are in line with good-jobs objectives.

3.2. Margins of technological choice

Historically, technological innovation has created more (and better) jobs than it has destroyed. Even when it takes the form of automation that directly substitutes for workers, the indirect effects have predominated. The increased productivity generates greater aggregate demand and enables more output (and hence employment). Innovation also creates new products and tasks, increasing the demand for labor through occupational and industrial diversification. At the dawn of the Industrial Revolution, increases in agricultural productivity enabled the expansion of urban manufacturing. As manufacturing became more automated, new industries and services were created, absorbing the labor that would be displaced.

However, even if there is full employment and the *average* level of wages rise, there is no guarantee that the process benefits all segments of the labor force. When technology displaces production workers and medium-skilled sales and clerical workers – as it has in recent decades – while increasing demand for highly skilled professionals (as well as personal services at the bottom of the distribution), it will produce adverse distributional consequences for the former groups and labor market polarization. Furthermore, aggregate productivity growth has slowed down in all major economies since the mid-2000s, despite the ubiquity of new technologies such as AI, robotics, biotech, and so on.

Acemoglu and Restrepo (2019) draw attention to a double jeopardy in cases where automation is designed to increase capital share with only minimal effects on total factor productivity: "there is a displacement effect, taking tasks away from labor, but no powerful productivity gains redressing some of the decline in labor demand generated by the displacement effects." New technologies' impact on labor therefore remains an important concern.[1]

Firms faced with the challenge of upgrading productivity face all kinds of decisions they need to make. Their options may range from installing robots (which kind?) to modernizing existing capital equipment, to using advanced analytics to optimize performance. The technology that will work best is unclear ex ante, and rarely comes in ready-made, off-the-shelf form. These choices create the margins around which better or worse decisions can be made.

Technology choices that firms make are closely linked to the organization of production and the degree to which employees benefit from autonomy and a learning environment. Under Taylorist production, workers perform repetitive tasks on the assembly line: jobs may be plenty, but they are hardly satisfying. Under lean production, machines replace routine human labor, but work remains under hierarchical control and offers little autonomy.

In "learning organizations," by contrast, workers take part in decision-making, have considerable autonomy, and are engaged in problem-solving and continuous learning. The learning mode of production not only increases worker satisfaction, it is also more conducive to increased productivity and dissemination of innovations over time.[2] In particular, the introduction of new technologies along with organizational changes can allow less skilled workers such as shop floor operators to identify productivity improvements and engage in appropriate actions. There are plenty of examples of firms, including French ones, that have made a conscious choice to move towards this learning form of organization.[3]

[1] The evidence to date on the effects of automation on French labor markets is mixed. Acemoglu et al. (2020) find robot adoption leads to a decline in production workers and labor share. Robot adopters increase overall employment, but the effects for industry as a whole is negative, as their competitors' employment losses outweigh their gains. Aghion et al. (2020) use a proxy for automation and report that it leads to increases in employment at both firm and industry level, including for low-skilled workers. They attribute the result to increased international competitiveness due to automation, an effect that may not be operative for service industries that are less tradable and where the bulk of employment will have to be generated.

[2] Based on data from European Conditions of Work Surveys (EWCS), France Stratégie (2020g) reports highest levels of job satisfaction in "learning organizations." Also, rates of innovation seem to be correlated with proportion of learning firms at the national level.

[3] A joint program between McKinsey and the World Economic Forum focuses on "lighthouses," firms that are introducing new technologies that have the potential to revolutionize production in a human-centered way, empowering workers and giving them greater agency in the process of introducing innovations. Studying these

Firms will have diverse motives in choosing among these modes: management capacity, organizational culture, relations with workers, and not least imagination. Technological features themselves are rarely the sole determinant. In a recent study, France Stratégie (2020g) notes that learning organizations have become common in Nordic countries but are still scarce in France.[1] It highlights the need for public policies that pay attention to how firms make choices over production modes, instead of treating firms' organization as a black box.

Moreover, different technologies can survive side-by-side. In her study of small and medium-sized manufacturers in Ohio, Waldman-Brown (2020) found her respondents took two different approaches to the competitive challenges they were facing. One approach was to build new greenfield plants that were fully automated, typically in a different country, with the intention of phasing out existing operations. In her sample, one company was building a plant in Mexico and another in Romania. This strategy naturally resulted in job losses in Ohio (and did not create many new jobs in the outsourced countries in view of the extent of automation). But a second group of firms were engaged with "ongoing tinkering with existing plants," and this did not seem to result in much job losses. The retrofitting and modernization of existing plants seemed to be a profitable strategy for

lighthouses provides many valuable insights. For example, the French company Schneider Electric "is implementing, testing and rolling out ideas for innovation in an organized approach in a 'Smart Factory Program.' A strong focus on workforce engagement ensures that the changes and new technologies are supported by employees and therefore adopted quickly. For instance, at the company's Le Vaudreuil site in France, it has created a 3D virtual reality model of the entire factory to use in testing and validating innovative ideas. This is then used to engage operators so they can see how their day-to-day work will change (…)" (World Economic Forum [2019], "Fourth Industrial Revolution: Beacons of technology and innovation in manufacturing," White Paper, January, pp. 35-36.) In another example, "a large manufacturer had deployed autonomous mobile robots (AMRs) for a point-to-point material transfer workflow moving parts from kitting stations to an assembly cell. Workers in another cell noted that their colleagues experienced fewer delays waiting for parts, and they also noticed that the robots would wait in an idle queue between tasks. They approached the floor supervisor and requested that the robots also be assigned to support their cell (…) As a result of their independent and collaborative action, the workers and local staff were able to increase their productivity and also increase the utilization of the robot, making it a win for all involved." (World Economic Forum, *op. cit.*, p. 28). In the words of a machine operator at Foxconn, "my role has changed from loading and other manual tasks to monitoring, diagnostics and problem-solving." (World Economic Forum [2019], "Global Lighthouse Network: Insights from the forefront of the Fourth Industrial Revolution," White Paper, December, p. 27.)

[1] The report cites a rare French example, Favi – an automotive subcontractor: "As early as the mid-1980s, [Favi] chose to focus its strategy on product quality and the use of innovative technologies, with a focus on the health and safety of its employees. It also focused on the autonomy of its employees – especially the workers – by creating "self-organized units," i.e. mini-plants of 5 to 25 employees, each taking charge of a production line in a customer/supplier approach. As at Volvo, employees developed their own methodological tools for monitoring and improving production processes. The operators themselves made contact with customers instead of the sales staff, thus acquiring greater control over their work and a cross-functional view of the production line" (France Stratégie, 2020g, p. 2).

those firms that took this path. The majority of the SMEs Waldman-Brown (2020) interviewed "claimed to have found robust competitive niches" and "very few of these legacy firms seemed to be laggards." Firms pursuing the tinkering strategy "were constantly on the lookout for new technologies that could meet their demands for affordability and versatility, and most were not concerned about being out-competed by automation at home or cheaper labor abroad." Such studies suggest the possibility of different technological paths to firm success, with sharply varying consequences for labor.

An important series of papers by Acemoglu and Restrepo (2018, 2019) argues that it is possible to countervail present technological trends and push innovation in a direction that creates new, labor-absorbing tasks. They cite three areas. First, they suggest AI could be used in *education* in order to create more specialized tasks for teachers, personalize instruction for students, and increase effectiveness of schooling in the process. They note that individual students have different learning styles, which requires teaching to be adapted to their specific needs. By generating real-time information on learning and making recommendations, AI tools can enable customized, smaller-group teaching. They can also allow instruction to respond more rapidly to evolving technologies and labor market needs. Such tools are unlikely to replace teachers; they might in fact increase the demand for teachers (as well as redefine their roles) by enhancing the return to individual or small group instruction.

Second, Acemoglu and Restrepo (2019) note a similar potential in *healthcare*, which is perhaps closer to realization. AI tools can significantly enhance the diagnostic and treatment capabilities of nurses, physicians' aides, and other medical technicians. They can, in effect, allow "less skilled" practitioners to perform tasks that only physicians with many more years of professional education have traditionally undertaken. The same logic also applies to other areas to boost job opportunities for those without the most advanced skills. For example, AI systems already enable the drawing up of simple contracts (such as wills) and the provision of many other services without the actual involvement of lawyers. To date, such systems have replaced primarily paralegals rather than lawyers themselves, but more advanced systems could enable paralegals to perform more advanced tasks, such as document review, due diligence, and document drafting (Remus and Levy, 2016). Machine learning and neural networks can enable mid-level finance professionals to do financial risk assessment, loan underwriting, and fraud detection tasks that would otherwise be undertaken by more senior professionals (MGI, 2018).

Third, Acemoglu and Restrepo (2019) mention the use of augmented and virtual reality technologies in manufacturing, enabling humans and robots to work together in performing precision tasks (rather than the latter replacing the former). Such technologies are based on smaller, more nimble robots that also enable greater customization of production in response to specific customer needs. "This will not just help workers keep some of the

tasks that might have otherwise been automated; it could also create new tasks in which humans, augmented by digital technology and sensors, can be employed and contribute to productivity" (Acemoglu and Restrepo, 2019). More broadly, shop floor apps augment relatively unskilled labor by allowing them to undertake operations that more skilled employees typically perform. Linder (2019) notes that such apps "enable manufacturers to bridge the skill gap." Real-time performance feedback and guidance through manufacturing analytics allow "experienced and new operators [to] work side by side with manufacturing apps" (Linder, 2019).

Product customization is one of the imperatives that have pushed some car companies to moderate their ambitions with respect to automation. Beyond Tesla, companies such as BMW and Mercedes are building their automation plans around human work which they have found allows both greater reliability and more customization in production. The McKinsey Global Institute reports:

> "after years of building robotic factories, BMW in South Carolina is ramping up hiring of human workers. [BMW] says that combining people with machines on its automotive assembly lines increases the flexibility to build multiple models in smaller batches and thus respond to shifting customer demands more quickly." (MGI 2018, 44)

In new BMW factories, lightweight robots ("cobots") that do not have to be physically separated from workers allow humans and machines to perform complementary tasks. For example, to install the insulation inside a door, a worker may first put in place the foil with the adhesive bead, and then the robot applies the heavy pressure needed to seal it.[1] Similarly Mercedes-Benz has replaced some of its older generation robots with AI-enabled cobots, redesigning its processes around human-machine collaboration. This allows the company to build more customized S-class sedans, something that older systems could not do as well. In the plant, human workers customize cars on the fly using hand-held tablets, with the automated work being performed by the light-weight robots (Wilson and Daugherty, 2018). In general, lightweight robots have opened up new potential for human tasks that cannot be routinized.

In sum, there are many margins of technological choice. First, the kind of automation that amounts to replacement of labor, pure and simple, is far from destiny. Second, investing in "learning organizations" can pay off in terms of both worker satisfaction and productivity. Third, many AI systems have the potential of complementing low and middle skill labor instead of high skills. Fourth, appropriately steered innovation can lead to an increase in labor-requiring tasks through greater customization in manufacturing and individualization of services. Some of the examples we have provided suggest that firms can make

[1] BMW Group (2013), "Innovative human-robot cooperation in BMW Group Production", Press release, September 10.

innovation decisions that are simultaneously labor-friendly and profitable. But the mix of incentives they face is distorted by existing policies as well as by their lack of internalization of the social benefits of good jobs.

3.3. Is there a role for policy?

“The direction of technological change should be an explicit concern of policy-makers, encouraging innovation in a form that increases the employability of workers and emphasizes the human dimension of service provision,” wrote Atkinson (2015, pp. 118-119). The question is what this implies for specific policies.

In other areas we have covered, we were able to build on existing research to suggest certain new directions. When it comes to policy to redirect technological change in a more employment-friendly manner, we are less able to rely on empirical evidence since this is not a question that has received much attention from researchers. The conceptual grounds for believing technology can be steered in particular directions is strong. It is not unrealistic to assume that innovators respond to expected profitability. Moreover, we are not short of examples of directed innovation in other spheres of policy. Indeed, much government innovation policy – promoting digitalization, say, or green technologies – is predicated on that assumption. Similarly, government investments in and support for military technologies provide a clear example of innovation being given a specific direction. But we are largely in the dark about which instruments might work and how much can be achieved with respect to worker-friendly technologies. Hence, this part of our proposals is by necessity more speculative and suggestive rather than definitive. Given the importance of technological change to the future of work, however, we believe it is appropriate for governments to experiment with a variety of approaches – always standing ready to review and revise policies in light of accumulating evidence.

We suggest some broad directions for policy here to show that there is a range of tools that is available.

First, it would be useful to review the prevailing fiscal regime in France with a view to ascertaining whether there are excessive incentives for investment in automation (as appears to be the case in the U.S.; Acemoglu et al., 2020). If the answer is yes, corrective instruments may need to be put in place. Possibilities would include an increase in the taxation of capital that directly substitutes for labor (e.g., robots), providing tax preferences for cobots over traditional robots, and, of course, reducing labor charges. We discuss the taxation of capital further in Section 5 (point 2).

Second, it may be possible to incorporate employment considerations directly in the existing regime of tax incentives for R&D. In the presence of a good-job objective, traditional R&D externalities have to be modified to take into account the likely employment

effects of innovations. The selection criteria could revolve around the margins of choice we discussed previously: innovations such as automation that directly replace labor would be favored the least, and innovations that augment labor of low and medium skills and create new, labor-absorbing tasks would be favored the most.

While it may be difficult to ascertain those employment consequences, especially of different types of work, existing research does provide some rough guidelines. For example, Webb (2020) provides a mapping from different kind of research in AI (measured through patents) to the employment structure. This kind of work could guide policy makers in providing a more differentiated structure of R&D incentives, favoring the kind of R&D that is more labor-friendly. Acemoglu (2020) suggests policy makers should look at the labor share of value added. None of the existing methods are likely to be particularly reliable at the outset. The expectation is that paying attention to employment in this context might lead eventually to the development of better measurement frameworks regarding labor market implications.[1]

Third, and in a similar vein, governments could apply a "prospective employment test" when determining their public spending priorities for innovation. At the EU level, for example, employment considerations appear to play virtually no direct role in the construction of the innovation portfolio. Horizon Europe has identified five specific research and innovation missions for the 2021-2027 period: adaptation to climate change; cancer; climate-neutral and smart cities; healthy oceans, seas, coastal and inland waters; soil health and food.[2] No doubt each of these areas is important. But encouraging labor-friendly innovations is no less important. Its absence from the list reflects an unwarranted determinism about the direction of technological change.[3]

[1] Acemoglu (2020) asks: "How do you distinguish an automation application of AI from one that leads to new tasks and activities for humans? For government policy to redirect research, these guidelines need to be in place before the research is undertaken and before technologies are adopted. This calls for a better measurement framework — a tall order, but not a hopeless task. Existing theoretical and empirical work on the effects of automation and new tasks shows that they have very distinct effects on the labor share of value added (meaning how much of the value added created by a firm or industry goes to labor). Greater automation reduces the labor share, while new tasks increase it. Measuring the sum of the work-related consequences of new AI technologies via their impact on the labor share is therefore one promising avenue. Based on this measurement framework, policy can support technologies that tend to increase the labor share ahead of those that reduce the labor share."

[2] See "Horizon Europe structure and the first calls".

[3] Atkinson (2015, p. 120) provides another example: "Did the European-based Eureka consortium [in autonomous vehicles] consider the distributional issues when launching PROMETHEUS (Programme for a European Traffic System with Highest Efficiency and Unprecedented Safety)? The fact that 'efficiency' is picked out in its title suggests that 'equity' was not at the forefront."

The European Fund for Strategic Investments (EFSI) partners with the European Investment Bank (EIB) to finance investment in innovation. The areas it lists as priorities are "infrastructure, energy efficiency and renewable energy, research and innovation, environment, agriculture, digital technology, education, health and social projects." It also provides risk finance to small businesses to help them innovate. One possibility would be to devote a portion of EFSI funds experimentally to developing labor-friendly technologies – just as in the case of green technologies.

The European Green Deal (EGD) provides a more specific opportunity for making employment a focus of innovation. The social component of EGD consists almost entirely of "compensation," the idea being that those regions and groups of workers that are adversely affected by investments in decarbonization should be made whole in some way.[1] An equally important strategy might be to take good job considerations explicitly into account in selecting investment priorities within EGD. In particular, different decarbonization strategies may have different implications for labor markets. Some programs such as retrofitting building and transport systems, waste management, and public transportation tend to be much more labor friendly than others, such as carbon capture and storage (CCS) or nuclear energy. Employment considerations may yield a different portfolio of innovations and investments within the EGD than would be selected in their absence. We discuss the employment implications of EGD further in Appendix 8.

Fourth, the government can directly encourage the introduction and dissemination in the private sector of learning organizations that empower workers. The goal would be for such organizational forms – based on teamwork, development of cognitive, social, and soft skills, workers' autonomy and continuous learning – to replace Taylorist or lean organizational models where feasible. Along these lines, the authors of a recent France Stratégie report recommend the creation of a national program for managerial and organizational innovation to raise awareness of firms and to assist in the implementation of the requisite organizational changes (France Stratégie, 2020g). Since the requisite investments may require both public assistance and skills training, it would be natural for such a program to work together with the Public Employment Services and the regional business bureaus we discussed previously.

Finally, public policy can play a role in shaping public consciousness about the social and employment consequences of innovation. A public that is more aware about the choices we have is likely to expect more from innovators. Acemoglu (2020) draws an analogy with environmental consciousness and concerns about nuclear weapons: "in the same way that

[1] The EGD includes a Just Transition Mechanism to raise and transfer funds to regions dependent on coal, lignite, oil shale and peat, and greenhouse gas-intensive industries. Region-specific "territorial just transition plans" are contemplated for reskilling, development, and regional rehabilitation needs, though plans remain vague at present.

millions of employees demand that their companies reduce their carbon footprint and in the same way that many nuclear physicists would not be willing to work on developing nuclear weapons, AI researchers should become more aware and more sensitive to the social consequences of their actions." One might also add to these examples the increasing concerns about privacy that digital innovations have created. The requisite change in public norms will have to come from within society at large. But the government can play an important role as well in articulating the appropriate narrative on the need for labor-friendly innovation.

The public narrative we might need is one that qualifies the single-minded focus on the imperative of adjustment by workers and their skills to new technologies. This is an oddly one-sided remedy. As a matter of logic, the gap between skills and technology can be closed in one of two ways: either by increasing education to match the demands of new technologies, or by redirecting innovation to match the skills of the current (and prospective) labor force. The second strategy, which gets practically no attention in policy discussions, might be worth a shot too.

4. Trade Policies that Address Fairness

As our survey results indicate, there is an outsized concern among the French public on the adverse job consequences of international trade. Part of the policy response to this has to be the dissemination of more accurate information about the diverse causes of de-industrialization and job losses in declining industrial regions, particularly technological changes and demand shifts. However, policy must also address the possibility that certain kinds of imports, from countries with weak social standards and exploitative working conditions for labor, can undermine conceptions of fair competition and good jobs policies at home. Policies of the sort we have discussed previously that induce domestic firms to expand good jobs can be self-defeating if the result is a loss in competitiveness and imports taking over.[1]

We argue that trade policy must incorporate an explicit mechanism for addressing imports that pose such problems, while shielding from protectionism the bulk of trade that takes place under conditions of competition that differ little from domestic markets. We will describe an anti-social dumping procedure designed to achieve that objective.

The objective is twofold. First, we want a more robust safeguard mechanism to underpin the trade regime. Explicit "safety valves" allowing countries to raise trade barriers under

[1] This is less of a concern when the policies are conducive to productivity gains, as they are intended to be. Even so, the threat of imports might dissuade companies from investing in good jobs strategies that might be viewed as risky at the outset.

certain conditions is a means for enhancing the legitimacy of international trade and outsourcing in general. This is a principle already embodied in “fair trade” provisions of trade agreements. Second, we want to ensure that international trade does not serve – nor is perceived to serve – as a vehicle for undermining high labor and social standards in France and the European Union. Rather than being a restriction on trade, our proposal aims to legitimize the open economy without sacrificing the hard-achieved social rights of workers in countries like France.

We emphasize that our proposal would require a reform at the level of the European Union. Since the EU has a common trade policy, France can of course not engage in unilateral trade policy actions. Furthermore, making it fully compatible with world trade rules will require the EU to negotiate a WTO agreement with trade partners. We believe this is an opportunity for France (and the EU) to act as leaders on the global stage in favor of a trade regime more compatible with domestic social goals.

4.1. Trade and distribution

One of the remarkable implications of the theory of comparative advantage is that sharp distributional consequences are generically the flip side of the gains from trade. This point was first formalized in the famous Stolper-Samuelson (1944) theorem, which demonstrated that one of the factors of production would always be left worse off in absolute terms as a consequence of opening up to trade. In a country where skilled labor is relatively abundant (compared to trade partners) and which has comparative advantage in skill-intensive goods, the loser would be unskilled labor. Even though the Stolper-Samuelson theorem is built on very specific assumptions, the result is remarkably robust and generalizes very broadly. Under competitive conditions, and as long a country does not fully specialize – i.e., as long as it continues to produce close substitutes for importable products – opening up to trade must leave at least one factor of production worse off in absolute terms (Rodrik, 2018). The result that openness to trade creates losers is not a special case; it is the implication of a very large variety of trade models.

Early research by trade economists looked for effects across the skill divide, and the effects there were not that large. Trade seemed to account for perhaps 10-20 percent of the rise in the skill premium. More recent work has focused on differences in labor markets across different geographical regions and has uncovered much larger effects. Workers are apparently not very mobile spatially, and communities that compete with imported goods can be hurt very badly by rising import competition (Autor, Dorn, and Hanson, 2013; Hakobyan and McLaren, 2016).

In Europe, where safety nets are stronger, local labor market shocks arising from import competition have not necessarily produced distributional effects that are as large as in the U.S. However, the evidence indicates that trade shocks have had measurable political

effects nonetheless. In particular, the rise of right-wing populism and the Brexit vote have both been linked to the China trade shock. Chinese import penetration has been linked to increased support for nationalist, far-right parties in a wide range of empirical analyses covering regions within 15 European countries (Colantone and Stanig, 2018a); Italian municipalities (Barone and Kreuter, 2019); German counties (Dippel et al., 2018); and French cantons (Malgouyres, 2017). It is significantly associated with the strength of the pro-Brexit vote in Britain's 2016 referendum (Colantone and Stanig, 2018b). It is also found to lead to lower support for democracy and liberal values in a study of regions covering 15 European nations (Colantone and Stanig, 2018c).

It is somewhat surprising that so many studies covering different European nations have found such strong causal effects from Chinese import penetration to shifts in political preferences. Safety nets and labor market protections are much stronger in Europe than in the U.S. Imports from China and other low-cost nations have not figured prominently in political campaigns, as they have in the U.S. While public opposition to trade agreements has been on the rise in Europe, this opposition generally revolves around trade with the U.S. and Canada, specifically the proposed Transatlantic Trade and Investment Partnership (TTIP) and the Canada-Europe Comprehensive Economic and Trade Agreement (CETA) (Young, 2019). The apparent fact that the local labor market effects of Chinese imports have left a measurable political imprint even in Europe is suggestive of an oversized sensitivity to trade shocks.

4.2. Trade, fairness, and appropriate remedies

How should the labor market disruptions caused by trade be remedied? In a market economy, labor markets are buffeted constantly by shocks of different types. Jobs can be lost or displaced because of demand shocks, technology shocks, management decisions, and a host of other reasons. Trade is only one source of labor market disruption, and normally far from the most important one. Most economists would probably agree that there should be some kind of compensatory mechanism (unemployment and training benefits) when the shocks hit those at the bottom end of the labor market. They would also agree, however, that the safety net should not discriminate by the type of shock. If we are going to help those who are adversely affected by labor market disruptions, we should not treat those who are hit by import competition differently from those who are involuntarily displaced for other reasons.

The view that policy makers should not be concerned by the nature of the underlying shock is predicated on an implicit judgement that all market shocks are alike and therefore require identical responses, if any. But this judgement may not be consistent with basic moral intuitions. To make the point as starkly as possible, consider the following thought

experiment. Suppose Olivier and Jean run two firms that compete with each other. Consider the following scenarios:

1. Olivier works really hard, saves and invests a lot, comes up with new innovations, and outcompetes Jean, resulting in Jean and his employees losing their jobs.
2. Olivier gets a competitive edge over Jean by finding a cheaper supplier in Germany.
3. Olivier drives Jean out of business by outsourcing to a supplier in Myanmar, which employs workers in 12-hour a day shifts and under extremely hazardous conditions.
4. Olivier brings workers from Myanmar to France under temporary contracts and puts them to work under conditions that violate French labor, environmental, and safety laws.

These scenarios are isomorphic from a purely economic standpoint insofar as each creates losers as well as gainers in the process of expanding the overall size of the economic pie for the national economy. That is, Olivier's gains are larger than Jean's losses. They differ only in the manner in which these gains and losses are generated.

Most audiences react very differently to these shocks. Scenario 1 generally elicits the least opposition; what is happening seems to be the normal operation of a competitive market economy. Scenario 2 typically raises also few concerns – at least for an audience that is well educated and understands the benefits of international trade. However, support drops sharply with scenarios 3 and 4. It appears there is something problematic with the exchanges described in the latter two scenarios. What is different with these scenarios is that they entail a form of market competition that would be considered unacceptable if it took place at home – and is in fact illegal under domestic laws. (Many economists still favor scenario 3. But it is not clear then why they should not also favor scenario 4, which would violate the law.)

In recent work, di Tella and Rodrik (2020) carried out a survey in which U.S. respondents were presented with a news story about a factory closure that would leave hundreds of workers at risk of unemployment. The "treatments" consisted of different explanations for why the factory might close. These included: a technological shock (automation), a demand shock (changing consumer preferences), management failures, and two trade shocks, namely, outsourcing to a developed country (France) and outsourcing to a developing country (Cambodia). A control scenario where no specific shock is mentioned was also included. Respondents were asked two questions on how the government should respond: (a) whether the government should provide financial assistance to displaced workers, and (b) whether the government should restrict imports.

The results support three broad conclusions. First, respondents' willingness to provide financial compensation to workers is dependent on whether the shock is trade related or not. Non-trade shocks increase willingness to provide financial support; trade shocks

decrease it (in both cases relative to the control scenario). Second, trade shocks greatly increase preferences for import protection, relative to non-trade shocks. This is a result that we have also found in our survey of French respondents (see Appendix 10). Third, there is a further difference between trade that involves a developed country and trade that involves a developing country. The preference for import protection is greatest in the case of outsourcing to a developing country.

Hence respondents draw sharp differences across the scenarios and how the government ought to respond. While financial compensation – safety nets – is viewed as appropriate for domestic market shocks, it is viewed unfavorably for trade shocks. They also viewed trade with developing countries as more problematic than trade with developed countries, exhibiting a preference for much greater import protection in the first case.

One way to interpret these results is through the lens of distributive fairness. International trade is viewed differently from domestic competition because certain kinds of international competition can undermine domestic norms with regards to what is an acceptable redistribution. (Note that a similar thing happens when competition from tax havens undermines the domestic tax regime, when imports from jurisdictions with poor safety enforcement undermine domestic consumer safety rules, or carbon-intensive imported products displace domestic production subject to strict decarbonization rules.) This is the argument that corresponds to scenario 3 in the thought experiment above. In this case, compensation is generically inadequate because what is at stake is the surreptitious modification of the rules of the game – the undermining of social bargains reflected in domestic regulations through the back door. Trade is not merely a market relationship, but also an instrument for reconfiguring domestic institutions to the detriment of certain groups. One could argue that such instances require targeting directly the trade flows that have the alleged effect.

4.3. Addressing social dumping

Consequently, we need to distinguish between two different arguments for why trade may be problematic from a distributional – and hence social and political – perspective. When international trade operates just like any domestic form of market competition, it makes little sense to set it apart and treat it differently from other approaches for dealing with inequality and insecurity in labor markets at large (using unemployment compensation, progressive tax systems, active labor market policies, employment-friendly macro policies, etc.). But when trade entails practices that violate laws or norms embodied in domestic institutional arrangements, and thereby undercuts domestic social bargains, it may be more legitimate to restrict the import flows that have the alleged effect.

In the specific context of trade with developing nations, what should be of particular concern for labor advocates is not low wages or labor costs per se, to the extent that those

reflect labor productivity or alternative employment opportunities. Restrictions on imports should not be permissible merely because wages in an exporting country are low. But trade may be considered unfair when competitive advantage is gained through the violation of worker rights. A possible response would be for European trade policy to remedy against specifically this kind of trade, to prevent what might be called “social dumping.” This would be analogous to border carbon adjustments – import tariffs on carbon-intensive products – when domestic carbon policies are stricter than those in trade partners. A safety valve that allows principled objections to free trade to prevail may make it easier to repress protectionist steam.

A policy that targets social dumping must distinguish between true social dumping and ordinary market competition. Therefore, it needs a domestic investigatory process of fact finding, as in the case with regular anti-dumping. To see how such a process can be devised we take our cue from the prevailing trade remedy regime under the WTO.

The WTO allows countries to impose anti-dumping duties when imported goods are being sold below cost. In addition to determining dumping, domestic authorities must show a “material injury,” or threat thereof, to a domestic industry. Separately, under the Agreement on Safeguards, countries are allowed a (temporary) increase in trade restrictions under a narrow set of conditions. Triggering the safeguards clause requires determination that increased imports “cause or threaten to cause serious injury to the domestic industry,” that causality from imports be firmly established, and that injury be not attributed to imports if there are multiple causes for it. Safeguards cannot be applied to developing-country exporters unless their share of imports of the product concerned is above a threshold. And affected exporters must be compensated by providing “equivalent concessions.”

A broader interpretation of safeguards might acknowledge that countries may legitimately wish to restrict trade for reasons going beyond competitive threats to the profitability of their industries. Distributional effects that conflict with domestic norms are one such reason. We could imagine recasting the current agreement into an Agreement on Social Safeguards, permitting the application of safeguard measures under a broader range of circumstances. This would require replacing the “serious injury” test with another hurdle: the need to demonstrate broad domestic support, among all concerned parties, for the proposed safeguard measure.

The investigative process in each country would: (i) determine that the imports in question do threaten to undermine a domestic standard or widely held social norm, (ii) gather public testimony and views from all relevant parties, including consumer and public-interest groups, importers of the product(s) concerned, and exporters to the affected country, and (iii) ascertain whether there exists broad support among these groups for the application

of the safeguard measure in question.[1] A technical report laying out the likely economic and distributional consequences of proposed safeguard measures could be prepared by an independent body (or commissioned from economic experts) to frame the discussion.

Ordinary protectionism would not have much chance of success if groups whose incomes would be adversely affected by trade restrictions – importers and exporters – were necessarily part of the deliberative process and the investigative body had to determine whether these groups also support the safeguard measure. At the same time, when deeply and widely held social norms are at stake, these groups are unlikely to oppose safeguards in a public manner, as this would endanger their standing among the public at large. Imagine, for example, that forced labor was used in producing goods for export in country X, or that labor rights were widely and violently repressed. Exporters to country X and downstream users of X's products may find it difficult to publicly defend free trade with this country.

In less clear-cut cases, the main advantage of the proposed procedure is that it would force a public debate on the legitimacy of trade and when it may be appropriate to restrict it. It ensures that all sides would be heard. This is something which rarely happens. This procedure could also be complemented with a strengthened monitoring and surveillance role for the WTO, to ensure that domestic procedures are in compliance with the expanded safeguard clause. The specific oversight criteria might include transparency, accountability, inclusiveness, and evidence-based deliberation. An automatic sunset clause could ensure that trade restrictions do not become entrenched long after their perceived need has disappeared.

It would be incumbent on governments to ensure that the requirements of democratic deliberation are fulfilled: Are the views of all relevant parties, including consumer and public-interest groups, importers and exporters, civil society organizations, sufficiently represented? Is all relevant evidence, scientific and economic, brought to bear on the final determination? Is there broad enough domestic support in favor of the opt-out or safeguard in question? These procedural requirements echo those in the existing WTO Agreement on Safeguards, although the scope of its application would be greatly enlarged.

This procedure would force a deeper and more representative public debate on the legitimacy of trade rules and on the conditions under which it may be appropriate to suspend them. The most reliable guarantee against abuse of opt-outs is informed deliberation by the polity at large. The requirements that groups whose incomes would be adversely affected by the opt-out – importers and exporters – participate in the deliberations and that the domestic process balance the competing interests in a

[1] This proposal draws on Rodrik (2019); see also Shaffer (2019) for a legal treatment.

transparent manner would minimize the risk of protectionist measures benefiting a small segment of industry at large cost to society.

Moreover, even though domestic interests would presumably dominate the deliberations, the consequences for foreign countries need not be entirely overlooked. When social safeguards pose serious threat to poor countries, for example, non-governmental organizations and other groups may mobilize against the proposed opt-out, and those considerations may well outweigh ultimately the costs of domestic dislocations. A labor union may win protection when its members are forced to compete against workers abroad who toil in blatantly exploitative conditions. They are much less likely to carry the day against countervailing domestic interests when foreign working conditions reflect poor productivity rather than repression of rights. As the legal scholar Robert Howse notes, enhancing confidence in the ability of domestic deliberations to distinguish between legitimate domestic regulations and protectionist "cheating" should allay concern that domestic measures are purely protectionist. "Requiring that regulations be defensible in a rational, deliberative public process of justification may well enhance such confidence, while at the very same time serving, not frustrating, democracy" (Howse, 2000, p. 2357). The proposed safeguard would be the embodiment of the principle that countries have the right to uphold their standards when trade undermines broadly popular domestic practices, by withholding market access or suspending WTO obligations if necessary.

Current safeguard procedures require most-favored nation (MFN) treatment of exports, permit only temporary measures, and demand compensation from the country applying the safeguard. These need to be rethought in the context of the broader arrangement we are proposing. MFN treatment will often not make sense. If the safeguard is a reaction to labor abuses in a particular country, it is appropriate to direct the measure solely against imports from that country. Similarly, an ongoing abuse will require ongoing use of the safeguard. Instead of imposing temporary relief, it would be better to require periodic review or a sunset clause that could be revoked in case the problem continues. This way trade restrictions or regulations that hamper other countries' interests are less likely to become ossified.

The issue of compensating the trade partner is trickier. When a country adopts a safeguard measure, the logic goes, it revokes a "trade concession" it had previously granted to other countries in an internationally binding agreement. Those other countries are entitled to receive equivalent concessions or to revoke some of their own concessions in return. In a dynamic world with near constant change, the nature of the concessions that a country grants to others cannot be predicted perfectly. This uncertainty turns international trade agreements into "incomplete contracts." When unforeseen developments change the value or cost of trade flows – because of new technologies (genetic engineering), say, or new values (on the environment), or new understandings (on desirable development strategy) – who controls rights over those flows? The requirement of compensation provides those

rights exclusively to exporters; the exporter can continue to demand market access on the original terms. But we might just as legitimately argue that the value of the original concessions depends on the circumstances under which they were provided. Under this interpretation, an exporter could not claim a benefit that did not exist, nor the importer be forced to suffer a social loss that was not originally contemplated, when the agreement was signed. This would bring control rights closer to nation states and sharply limit the amount of compensation that exporters could expect.

Authoritarian regimes likely will become easier targets for safeguard action when their exports cause problems. Even though some of their labor practices, for example, will be easy to justify, others may not be. Minimum wages significantly lower than in rich countries can be rationalized in the domestic debate by pointing to lower labor productivity and living standards. Lax child labor regulations are often justified by the argument that it is not feasible or desirable to withdraw young workers from the labor force in a country with widespread poverty. In other cases, arguments like these carry less weight. Basic labor rights such as non-discrimination, freedom of association, collective bargaining, and prohibition of forced labor do not cost anything. Compliance with these rights does not harm, and indeed possibly benefits, economic development. Gross violations constitute exploitation of labor and will open the door for safeguards on the ground that they generate unfair distributional costs.

Our proposal aims to delegitimize unwarranted protectionism (against developing countries in particular) by enabling trade restrictions in that relatively narrow range of circumstances where they are warranted on social grounds. Broadening safeguard action in this manner would not be without its risks. The possibility that the new procedures are abused for protectionist ends and open the door to unilateral action on a broad front, despite the high threshold envisaged here, has to be taken into account. But as we have already seen in the last four years in the U.S., protectionism can also be the result of excessive labor-market disruption and the sense of unfairness that may result.

A deepening backlash against trade may in fact be rendered more likely in the absence of a clause against social dumping. Absent creative thinking and novel institutional designs, the tensions created by globalization will not ease. That would be far worse than the safeguard regime we have just described. Moreover, qualms about the protectionist slippery slope have to be tempered by considering the abuse that occurs under the existing rules, without great detriment to the system. Notably, the existing anti-dumping regime is an explicitly protectionist mechanism with little economic justification. It has not destroyed the multilateral trade regime, operating instead as a highly imperfect, but much needed safety valve. It is not clear why a well-designed safeguard clause that extends to genuine social fairness concerns would have consequences that are worse.

We note that France has already passed legislation to incorporate human rights and environmental considerations in French firms' international operations. In 2017 France became the first country in the world to adopt legally binding human rights and environmental due diligence obligations on large French companies with foreign activities. Firms are required to prepare vigilance plans based on the U.N. Guiding Principles on Business and Human Rights and face civil liability if they do not meet them.[1] Importantly, the requirement applies not only to firms' own operations but also to suppliers with whom the company maintains an "established commercial relationship." By 2019 such vigilance plans on covered companies' global supply chains were already under assessment, and the first civil claims on alleged failures had already been filed. The Act also applies to foreign firms with a significant business presence in France (Ruggie et al., 2020). However, it does not cover imports by firms unaffiliated with large French corporations.

We end by pointing out an important complementarity between our anti-social dumping proposal and other recommendations in the report. Protection against imports will achieve little unless there are strong *domestic* policies that further equity and reduce economic insecurity through the kinds of tax and labor market policies we have discussed. For occasional protection to work, there must be something worth protecting. On the other hand, when such policies are in place, it is important that trade not serve as a backdoor for undermining them. Hence sound trade safeguards are a complement for domestic policies of inclusion.

[1] An English translation of the law can be found on the Respect International website.

SECTION 5

POST-PRODUCTION POLICIES

1. Rethinking Tax Systems

A priori, globalization and the rising mobility of capital makes the latter harder to tax. Governments have increasingly tried to use taxes on the less mobile bases to finance government spending and the burden has fallen more and more on labor. Social security and payroll taxes have increased by four percentage points as a share of GDP in the G7 countries since 1970. The growth in the tax revenue to GDP ratio in rich countries has been financed mostly through taxes on labor. As a result, despite the increased wealth and capital income since the 1980's, capital income taxes on individuals play a much more limited role than before 1980.

And yet, several shorter and longer-term developments should prompt France to rethink its taxation of capital. First, as inequality and polarization have increased as described in Section 1, dissatisfaction with globalization and the perceived unequal gains of capital and labor are growing. A push for policy change is underway and is likely to increase. Second, the Covid-19 crisis has and will continue to increase the pre-existing inequalities and deepen the fault lines described in Section 1. It will also exacerbate revenue needs and reduce the public tolerance for tax evasion or avoidance by capital and wealth in light of pressing societal needs. Third, this comes on top of a secular rise in public revenue needs due to population aging and demographic changes. Finally, there is actually more scope for taxing capital income now than there was for the last decades. Important progress made on the exchange of information between countries on the incomes of individuals and companies opens up new avenues for taxing capital that were considered impossible for a long time. The fatalistic attitude of the last decades that it is hopeless to try and tax internationally mobile capital and companies in a globalized world may need to be reconsidered.

Taxing better

Our general push in this proposal is to "tax better." France already has a high tax burden relative to other OECD and EU countries, and there is little scope for further fiscal weight. In fact, France Stratégie (2020c) recently even linked the high fiscal burden in France to the sharper decline in manufacturing. Instead, we provide ideas for broadening tax bases, improving compliance, and leveraging new tools to improve the efficiency of the tax and transfer system. From the outset, we want to make it clear that in this report, we do not discuss the level of taxes. A gold standard tax system in terms of efficiency and effectiveness is hard to design, let alone implement successfully. But renewed international cooperation, exchanges of information, technology, and data analytics provide big opportunities to improve the taxation of capital, labor, transfers of property, and companies.

Major guiding principles: a primer

It is worth briefly revisiting some key principles from tax analysis that can inform the thinking on tax issues.[1]

In a nutshell, tax theory tells us that the right tax on any income flow (labor earnings, capital income, inheritances) or asset (housing, financial assets) depends on its efficiency costs in terms of economic activity and on its distributional impacts. The efficiency costs depend on how much an asset or income flow can respond to taxation. Something that is very elastic and responds strongly cannot be taxed as much purely due to feasibility reasons. The responses of incomes or assets to taxes define what is feasible. The distributional impacts of a tax depend both on which people own the asset or receive the income and on how society values one euro transferred to these individuals relative to everyone else (i.e., the so-called "social marginal welfare weight" on these individuals). Thus, ineluctably social justice and fairness views will come into play. There is no answer possible to "what should a tax be?" that does not involve a fairness and social justice judgment on who, ultimately, "deserves" to receive a transfer or pay a tax. Social fairness views are complex and have been studied in France and in other countries in recent years (Saez and Stantcheva, 2016). Yet, a lot more needs to be done on understanding them and we address this point in Section 6.

The right tax is the one that will balance the efficiency costs from distortions to economic behavior against the gains in revenues or redistributive benefits. These forces can sometimes point in different directions. For instance, real estate and housing are generally less mobile and slower to adjust to tax changes than are holdings of financial assets. From an efficiency point of view, this means that taxes on real estate holdings or their

[1] A simple conceptual framework for how to think about labor and capital taxation in a clear way comes from Saez and Stantcheva (2018), which this section draws on.

associated income flows should be higher, all else equal. Yet, the pull of distributional factors is in the other direction, as real estate is typically more evenly distributed than financial assets. The more equal distribution of real estate makes it less attractive to tax.

But the elasticity of incomes or assets to taxes is not exogenously given and policymakers should not have a fatalistic attitude about it. There are policies that shape it. For instance, international exchanges of information can reduce the appeal for capital to move across countries for tax evasion or avoidance purposes. Sometimes the high responses are caused by the tax system itself, for example, by having too many loopholes or income shifting opportunities. In these cases, the overall right policy response is typically to first reduce the elasticity and reduce avoidance responses by closing loopholes and enforcing compliance. We discuss these issues extensively here.

In the policy debate, efficiency and fairness arguments are often mixed, and fairness views are hidden behind efficiency statements. For instance, saying that it is impossible to tax high capital incomes because capital is very mobile and will easily avoid taxes is an efficiency and feasibility statement. The accuracy of it is an empirical question and can be checked in the data – it is not a matter of opinion. To the contrary, saying that high capital income earners should not be taxed because they are deserving of their incomes and should be entitled to keep them is a fairness and social judgement statement; it is not an empirical question. On that front, we can verify using survey data the prevalence of different justice and fairness views among citizens (Section 6).

Many people would agree that it is desirable to have at least some progressivity in the overall tax and transfer system. A major principle to follow is to think of the tax and transfer system overall, rather than consider a given tax in isolation. Proportional or even slightly regressive taxes such as the value-added tax (VAT) may increase the overall progressivity of the tax and transfer system if they finance spending targeted precisely at those on lower incomes. In isolation, a given tax does not say much about progressivity or regressivity, or about economic incidence.

In addition, one indirect way of making taxes more progressive without changing tax rates is to enforce compliance, stop avoidance, and close loopholes. Tax expenditures can be regressive, especially if uncapped or if the cap is set too high. This is because many such gaps and avoidance opportunities in the tax system tend to benefit higher-income households more.[1] Hence, in general, reducing such opportunities indirectly benefits lower-income households and can be progressive. We discuss loopholes in more detail below.

[1] To take a stark example to make this point salient, a very broad-based system with a flat tax and an exemption level could actually be more progressive than a system with increasing rates, but that excludes the income from many assets (if the latter are disproportionately held by high-income households).

In general, it can be problematic if the tax gap between two related tax bases becomes too large. For instance, it could be counterproductive to have too different taxes on capital and labor. At the most basic level, such large gaps can cause income shifting between tax bases, such as a self-employed person choosing to become incorporated or wages from working in one's private business being paid out in the form of dividends. In principle, such shifting can be minimized with proper regulation and tax code design. Concretely, the tax code should not allow for what is essentially the same income to be classified in two different bases and for people to engage in tax arbitrage by selecting the most advantageous tax base for any given income. Those opportunities appear to be rarer in France than in the U.S., but do exist for businesses and entrepreneurs.[1] It is conceivable that they could be exploited more as shifting incentives have increased after 2018 (with the flat tax (*prélèvement forfaitaire unique*, PFU) and programmed fall in the corporate tax).[2] In general, a progressive income tax cannot be sustained very well when the corporate tax becomes too low, because higher-income individuals especially can incorporate and receive income through their company, taxed at the low corporate tax rate. Earnings can be retained for a (very) long time within the corporation and thus avoid individual income taxes. It has been shown that a lot of equity income like this is untaxed at the individual level as it is kept within corporations or not realized.

More fundamentally, as explained above, tax burdens have generally been shifting away from capital and towards labor, and this may have reinforced some existing trends. In the short run, financing all or most social programs by labor taxation and social security contributions on labor income can create an incentive to shift away from labor income, reduce labor market participation, increase labor market duality (e.g., between standard and non-standard employment), and diminish labor productivity and growth. On the other hand, shifting at least part of such financing to general tax revenue (that could cover all

[1] In the U.S., a prime example of a shifting opportunity between the labor and capital bases is the choice between the S-corporation status (taxed as a pass-through entity, under the personal [labor] income tax) and the C-corporation status (taxed as an incorporated business, under the corporate income tax). While there are some legal and regulatory distinctions between these two forms of business, they are largely identical for a wide range of companies, allowing for a lot of tax arbitrage between the labor and capital tax bases. Plenty of empirical evidence has shown the shifting between these corporate statuses based on the gap between personal (labor) income and capital income taxes. This type of shifting opportunity, itself engineered by the tax code, should be avoided to the extent possible.

[2] The papers by Boissel and Matray (2019); Bach et al. (2019); Lefebvre et al. (2020) find little evidence for shifting between dividends and salaries, for instance, in France. One explanation is that taking into account all tax rates, excluding social insurance contributions, the tax rates on salaries and dividends pre 2017 were not very different, thus not presenting many incentives to shift income. This is no longer true if social contributions for retirement are taken into account, but those give rise to benefits in the future and are hence more ambiguous. Post 2018, the gap between labor and capital income taxes is likely to rise with the adoption of the PFU and the programmed fall in the corporate tax thus opening up new incentives to shift income.

income, including capital) could reduce these trends.[1] In the longer run, if taxation keeps propping up the cost of labor relative to that of capital, the incentives to innovate in labor-savings technologies and invest in automation and robotization can increase, thus perpetuating and reinforcing the shift away from labor (Acemoglu, Manera, and Restrepo, 2020). France has taken some small steps in the direction of shifting some of the financing of social insurance to general taxation with the *Contribution sociale généralisée* (CSG), which has been added to the personal income tax. France still relies heavily on labor taxation.

Finally, there is an issue of timing. In most countries, capital income is taxed based on flow rather than on stock. Thus, capital gains are taxed upon realization, rather than on accrual. For instance, capital gains are taxed when an asset is actually sold, even though the asset may have been appreciating in value for a long time. This means that taxpayers have some flexibility in timing the realization of their capital gains and there can be deferral of realizations for tax purposes. A few countries in the world have a wealth tax, which is a tax on the stock of capital rather than on its flow. A wealth tax taxes the value of the stock of capital (i.e., wealth) as it changes (i.e., on accrual). France has a partial wealth tax on a subset of wealth. In particular, given that it has recently excluded financial assets from the wealth tax base, it is now in the same position as many other countries that are trying to grapple with the question of how best to tax capital gains. Proponents of taxing on accrual point out that capital gains can accumulate for a possibly very long time without being realized and that the tax system on realization can distort the decisions to sell and buy assets. Opponents of it highlight the difficulties in valuing assets that are not (yet) sold, especially on an on-going basis. They also point to the potential liquidity problems that can ensue if a large tax is owed without a corresponding income flow. It is not coincidental that many of these issues are also the ones raised in opposition to a wealth tax, as a capital gains tax system that is based on accrual becomes closer in spirit to a wealth tax. A well-functioning inheritance tax is sometimes considered a backstop to the accumulation of capital gains, i.e., a one-time wealth tax (per generation), but in practice features many exemptions and special treatments as discussed above that diminish this role. The issue of how best to tax capital gains will merit a lot more work in the future.

What do people think about personal income taxes?

In our *2020 Taxes and Policy Survey*, we asked people what they believed the objectives for taxation should be. 71% of respondents agreed that one of the reasons for taxation is to finance public services; 44% agree that they are meant to redistribute income; and 39% agree that they are supposed to incentivize or disincentivize certain economic behaviors

[1] For contributions which are less directly linked to earnings, such as those financing health or family-related benefits, the OECD advocates a shift to general taxation including capital income that could be beneficial.

and foster economic activity. Close to 70% of respondents rank France in the top 5 among the 27 EU countries in terms of total tax rates (taxes and social insurance contributions). In terms of knowledge of the tax system, people underestimate the top personal income tax rate (the average perception is 35%, the reality is 45%).[1]

We found that only 51% of respondents believe that the current system is progressive enough in that high-income households pay their fair share or more in taxes. On the other hand, half of respondents believe that the middle class pays more than its fair share. 73% of respondents believe that inequality in (pre-tax) incomes is a serious problem.

2. Personal Taxation: Capital Income and Labor Income

In this part, we discuss policy directions on personal taxation, focusing on capital and labor taxes. We discussed inheritance or gift taxation earlier in the report in Section 3, point 1.

2.1. Pushing further the exchange of information on capital

The biggest opportunity for improving capital taxation lies in the recent progress on the Automatic Exchange of Information (AEOI) implemented and pushed by the "Global Tax Forum." Appendix 3 reviews its parameters and effects to date across different countries. France itself has already gained and has a lot more to gain from such a transparency mechanism.

This exchange of information means that it is possible to tax capital in a way that was not feasible before. In particular, it is much more conceivable to explore the possibility of progressive taxes on capital, as the incomes in various countries of a given taxpayer can now be tracked. Of course, people can still move their tax residency to another jurisdiction altogether, but that is less easy and immediate than simply shifting capital income abroad. 11 OECD countries have adopted a progressive rate on capital income, including Australia, Canada, Ireland, the U.S., the UK, and Spain (OECD, *Taxation of Household Savings*, 2018).

The first order priority is for France to continue to be a key player in fostering the automatic exchange of information. In addition, in its current shape, the exchange of information does not cover all major types of assets. A recommended push to be given (ideally at the OECD level) is for automatic exchanges of information to happen for all classes of assets, including real estate and private business assets. It should be noted that the current EU

[1] Respondents were asked for the top tax rate excluding the CSG.

regulations regarding AEOI between member states have a broader scope than the OECD's and already include some non-financial assets such as immovable property.[1]

This can also help relieve the evolution seen in many OECD countries and that we described above, namely, that taxes are falling more and more on labor, as is the case with social insurance contributions. For those contributions, which are less linked to earnings – like contributions towards health or family-related programs – the OECD advocates a shift to general taxation on overall income (which includes capital income).

It is worth emphasizing that the recent wealth tax reform in France is likely to have shifted the tax burden away from capital, although other recent reforms may have had different consequences. The wealth tax reform is still being evaluated by France Stratégie and it is hence impossible to draw definitive conclusions.[2] The preliminary report shows that the impact in distributional terms has been quite regressive, an impact that is likely to remain true in the medium term. The OECD is currently also scoring the reform in terms of its distributional impacts, building on their methodology in their "Taxation of Household Savings" publication from 2018 and finds that it moved France from a relatively progressive capital tax system in 2016 to a much flatter one in 2019. While France is now more aligned to some extent with other OECD countries, the opportunities for capital taxation with the new AEOI and compliance improvements could lead to an overall revision of these trends.

2.2. Capital tax base broadening: taking a critical look at the *niches fiscales*

By now, it may sound almost cliché to state that the capital tax base needs to be broadened and that loopholes need to be closed. Yet, this recommendation keeps being emphasized from many sides for a good reason: it is both inefficient and regressive to have a lot of tax code loopholes. A hard look needs to be taken at the loopholes and tax expenditures more generally (the *niches fiscales* and *dépenses fiscales*) related to capital income in France.

A crucial first step would be to have a clearer picture of what the *niches fiscales* are actually doing. Even the Cour des comptes complains that there are only scarce estimates of their costs, use, and effects.[3] In theory, there is a cap (of €10,000) on overall benefits that people

[1] European Commission (2018), *Report from the Commission to the European Parliament and the Council – on overview and assessment of the statistics and information on the automatic exchanges in the field of direct taxation*, December.

[2] France Stratégie (2020d), Comité d'évaluation des réformes de la fiscalité du capital, deuxième rapport.

[3] « Au-delà des seuls chiffrages, qui demeurent imparfaits, les dépenses fiscales doivent faire l'objet d'évaluations afin de s'assurer de leur efficacité et de leur efficience. Or celles-ci sont quasi inexistantes et incomplètes, ce que les documents budgétaires relèvent d'ailleurs ». Cour des comptes (2019), "Les dépenses fiscales. Note d'analyse de l'exécution budgétaire."

can receive through the loopholes, but a number of tax reliefs are not subject to this cap, and it is not clear how well-traced or enforced this is.

As a general rule, there is no need to have unlimited exemptions outside of very exceptional cases. Hence, the scope of the exemption cap could be broadened and enforced. Another general rule is that loopholes, tax exemptions, and tax expenditures, once established, are very difficult to remove, as can be seen from the increase of such tax provisions over time. Indeed, it is harder to remove an advantage already granted than it is to oppose granting it in the first place, given special interest and lobby groups' understandable resistance to give up acquired privileges. Thus, for newly proposed tax exemptions and special treatments, it is very important to think critically and estimate their anticipated costs and benefits *before* they are implemented.

Given the lack of precise data on the distributional and efficiency impacts of loopholes in France, we can recommend thinking about them through the following lens and applying different solutions to these three distinct types of cases (described in more detail in Appendix 3). This kind of reasoning should also be applied to newly proposed special tax treatments that need to be rigorously evaluated before they are implemented. The first case type is exemplified by the uncapped exemption on capital gains on the primary residence. This exemption can make sense from a distributional perspective given that a large share of the wealth of the middle and upper middle class is tied up in real estate, especially a primary residence. Yet, it is not necessary for distributional reasons that this exemption be uncapped. To the contrary, it should apply only to property values below a certain threshold, where the latter could be set high enough to leave the middle class largely unaffected.

The second type is exemplified by the tax exemption of the *Plan d'épargne en actions* (PEA) which provides tax relief for returns on financial market investments up to €150,000 if those are held for more than five years. This type of exemption is likely not disproportionately benefitting higher-income households, as it is capped, and it may even have some positive efficiency effect. While all of these statements need to be evaluated rigorously, this is a type of capped, a priori not complicated exemption that may be satisfactory as it is. The third type is showcased by the *loi Pinel* that provided tax exemptions for investments in a given type of new construction. Although the tax benefit is capped, this exemption is likely not very progressive. Its original goal is to be "corrective" and efficiency improving by providing incentives for investments that are considered to have positive social externalities and are hence underprovided. The recommendation for such types of exemptions is to have very rigorous evaluations to see whether they are, in fact, fulfilling their intended role. If this is the case, citizens and policy makers may need to live with some level of regressivity as long as the corrective, efficiency-improving effect is worth it. If not, there may be a need for further restrictions, rules, or caps on the tax advantages. However, there is no way of knowing this on a general basis without much more rigorous

evaluation of each such tax expenditure.[1] We come back to the need to policy impact evaluations and best practices in this area below.

2.3. EU-level coordination and fighting preferential tax regimes

Labor can also be mobile, especially when it comes to higher-income, higher-skilled people working in professions with transferrable human capital. Kleven, Landais, Munoz, and Stantcheva (2020) review the evidence. Preferential tax regimes for foreigners are widespread. As a result, in many countries, the top tax rate for foreign high-income earners is below that for domestic high-income domestic earners (see Appendix 3). While this can be beneficial for each country individually, such policies are beggar-thy-neighbor policies, akin to "tax dumping." Currently, there is limited retaliation from other countries, perhaps because the countries imposing such schemes are relatively high-tax countries to start with. Yet, there could be a race to the bottom if those schemes spread more systematically, and as both inequality and revenue needs increase. Such schemes may also become more attractive both to countries and to taxpayers if remote work and inequality continue to rise. Like for capital income taxes and corporate taxes covered later, there is a lot to be said in favor of some amount of international cooperation on labor income taxation.

More generally, cooperation and coordination of the EU on the taxation of mobile high earners could be considered. Overall tax rates on top earners are set differently in different countries because of their particular circumstances and considerations. Hence, homogeneity is by no means the ultimate goal and there are many arguments in favor of tailoring tax policy to local settings. Yet, avoiding blatant tax dumping seems beneficial, and such preferential schemes are a good place to start fostering intra-EU cooperation.

3. Reducing Fiscal Leakages: Tax Compliance and Productivity of the Public Sector

We now address distinct, but related issues on the tax side: how to harness data sources and analytics tools, and better info and methods to recover fiscal leakages. Fiscal leakages are qualitatively different from loopholes created by the tax system itself, which we

[1] To give more concrete examples based on the *loi Pinel*: Appendix 3 summarizes the evidence by Bono and Trannoy (2019) and the report of *Inspection générale des finances* (2019) on the *loi Pinel* and the *loi Scellier*. In particular, the authors show that part of public money is actually pushing up prices rather than stimulating extra investment. This ultimately depends on the elasticity of housing and property supply, which also vary at a highly local level. Such careful evaluations are needed on much broader scale in order to assess the impacts of special tax expenditures. In addition, there are other competing tools to foster more affordable housing and these need to be horse-raced against a simple tax expenditure for investors as this one (Trannoy and Wasmer, 2013).

addressed above, or tax avoidance opportunities, and are about taxpayers not complying with the tax system, going above and beyond, and potential evasion territory. On the spending side, we discuss efficiency measures, such as public sector productivity review, staff, and better procurement, fraud reduction.

3.1. Improving tax compliance

Improve and expand third-party reporting

Research has shown over and over again that there is barely any evasion when it comes to third-party reported assets or income flows. Yet, many areas are still not properly subject to third-party reporting. Indeed, while regular workers are mostly the recipients of wages and employee income that is third-party reported, higher income individuals receive much more of their income in the form of capital gains, dividends, rental income, and proprietorship or business income. These forms of income have much higher rates of non-compliance. Key challenges revolve around private businesses and partnerships. Sarin and Summers (2020) propose a way to resolve those. According to this scheme, business owners and entrepreneurs that earn above a given threshold could be required to report their bank accounts that host business income. Banks could then act as third parties and be charged with reporting the flows and a summary of deposits and disbursements on those accounts to the tax authority, which could be used to verify that taxes are properly paid.

Data analytics to identify non-compliance

The tax authorities should start more systematically exploiting opportunities for big data and analytics to detect fraud and track taxpayers. There have been large advances in predictive algorithms, machine learning, and AI. Combined with the tax data available in France, these data analytics methods could allow for better and more cost-efficient tracking and enforcement of compliance, as well as for better targeting of the tax authority's scarce labor and material resources. Two example cases in which such techniques could fruitfully be deployed are as follows. First, for small- and medium-sized enterprises it is possible to combine data sets across years and sources (e.g., different agencies) and use predictive models to estimate the expected revenues of businesses. The tax authority could then flag businesses which fall short of that expected revenue target and focus efforts on those. Similarly, a lot of progress has been made in the private sector (e.g., finance and private equity), in research to value assets (even relatively illiquid ones), and to estimate capital income tax flows. Such techniques have been employed for instance by the Australian Tax Office in an attempt to reduce the number of refunds paid out due to error or fraud. It created algorithms built on social network analysis and visualization tools to model and

understand relationships between individuals, trusts, and partnerships and prevented incorrect payments worth $500 million in one year alone.

Experimental approaches to test compliance interventions

In addition to identifying non-compliance, the tax authority can then leverage new experimental methods to test enforcement mechanisms. In several countries, hard enforcement actions (like audits followed by penalties) and soft reminders and educational communications have been tested (De Neve et al., 2020; Hallsworth et al., 2018; Koumpias, 2017). Testing has included outreach to taxpayers and their advisers and varied the channels used (mail, phone calls, and mobile messages) as well as the messaging and the actions initiated. For example, authorities sent some businesses a request for self-correction, others a request for limited additional information, and some a notice of audit conducted by mail or in person. Socially minded messages have also been tested.

It is worth mentioning that when it comes to implementing such new and innovative practices, we do not recommend a big bang approach here, but rather a "test and learn" approach. An iterative approach is also less likely to disorient employees of the public sector and the taxpayers themselves.[1]

Making data available and fostering cooperation with researchers

In addition, thanks to the new availability of tax data for researchers (through the *Centre d'accès sécurisé aux données*, or CASD), there are lots of brains already put to work on tax questions. This represents a big opportunity to be pushed further. Additional datasets – especially as merged across years and sources – should be made available, and many more interactions with academia and researchers – in economics, data science, and statistics – could be exploited to improve the tax administration's compliance and enforcement. There are many high-quality academic papers being written on avoidance and evasion by individual taxpayers, small businesses, or large corporations. They flag behaviors and markers for them that can be used by the tax authority to identify non-compliance. They also estimate models of taxpayers' or firms' behaviors that can be used to predict non-compliance. To give even just one example in France, researchers have identified "bunching" (i.e., an excess of income) at the kinks generated by the tax code for small entrepreneurs, and a sharp movement of the excess mass as the kinks change over time (Aghion et al., 2017). A flag for misreporting is thus being located close to the bunching point, and this behavior tends to occur more for some sectors and types of businesses. The key point is that there are lots of patterns in the data that can help the tax administration identify evasion and avoidance if

[1] The McKinsey public sector practice has studied and implemented a number of initiatives with governments all over the world in recent years and has summarized a lot of findings in a series of publications ("Adapting tax collection for uncertain times," "Reimagining tax authorities for the future" - 2020).

proper research techniques are applied to them. Researchers that are armed with data and in cooperation with the tax administration can help with this. Involve them! (See also the *Areas of Research Interest* published by UK government departments under the guidance of the "What Works" centers, described below.)

Giving resources to tax enforcement

The tax administration needs resources to be able to make the best out of the new data and analytics opportunities. This requires overhauling the technology infrastructure and building advanced analytical capacity through investments in appropriate digital technology (software and hardware). It also involves regular staff training to stay up to date with the fast advances in data analytics, as well as interactions with researchers. To give the example of the U.S., Sarin and Summers (2020) point out the very outdated information technology of the Internal Revenue Service (IRS). They also describe a recently piloted return review program (RRP) that improves the matching of taxpayer filings with information returns to identify and freeze fraudulent refunds. The program had a gigantic 50-1 return, substantially more than traditional enforcement programs.

Deterrence of future evasion and multiplicative benefits

All of the aforementioned investments in compliance may have higher returns than suggested, because they also cause deterrence in the future. As the probability of being detected and penalized rises, and as taxpayers foresee the tax authority's higher capacity to catch tax fraud, the incentives to evade diminish. Hence, the future impacts of such compliance interventions and capacity-building are likely to multiply.

3.2. The spending side: rethinking the public sector's productivity[1]

Although not the immediate issue that comes to mind, it would actually be a big omission to not discuss public sector productivity in this report. We are in a period where budgets are very tight and will be made even tighter by the Covid-19 crisis. Hence, we need to urgently discuss the fact that revenues are sometimes wasted and that some expenses are unproductive. In the end, the questions cannot only center around whether to raise a given set of taxes or cut a given set of social spending, but also need to be about how the public sector absorbs and then spends the revenues. It is worth emphasizing and re-emphasizing that the government's and the public sector's efficiency can also contribute to or harm the budget in many ways. The size of government and the public sector in France as measured by revenues as a share of GDP is already among the largest in the

[1] This part draws heavily on a series of reports by the McKinsey Public Sector practice, https://www.mckinsey.com/industries/public-and-social-sector/our-insights.

world relative to its economy. An aging population and demographic shifts, as well as the developments outlined in the introduction are driving increases in health-care costs, pension obligations, and social insurance (forecast by the IMF to represent another 5% of global GDP by 2050). In addition, the implementation and enforcement of all these proposed policies, as is clear in each subsection of the report, ultimately depends on the government's efficiency.

In line with our suggestion to rethink public finance management itself, the Cour des comptes (2019) notes that there is a "disappointing" management of fiscal spending, with a lack of explicit link between spending and political objectives, a complexity of measures. They also note the lack of piloting strategy and ownership with little testing and evaluation and poor metrics to measure performance. They push strongly in favor of rekindling public policy evaluation and adjustment as a function of testing results.[1]

Governments do not and should by no means have the same objectives as private businesses. Yet, citizens would likely gain (and possibly gain a lot) if governments adopted some of the best efficiency practices of private businesses and adopted more efficient procedures. These involve public sector productivity reviews, staffing and talent management strategies, better procurement, fraud reduction and smart finance decisions. While beyond the scope of this report to outline detailed steps, the following aspects should be considered.

Finance

The finance function of the government needs to go beyond the traditional "treasury" role of budgeting and financial stewardship and into actively driving investments; measuring outcomes and mapping inputs to outputs (through data analytics, to estimate returns on investment); reviewing spending comprehensively and frequently; and actively managing the government balance sheet (that is made of billions of assets and liabilities).[2]

[1] "*Par ailleurs, comme les années précédentes, la Cour fait le constat d'une articulation insuffisante entre les dépenses fiscales et les objectifs des politiques publiques auxquelles elles sont censées concourir. La complexité des dispositifs rend parfois leur appréhension délicate. La stratégie de pilotage est lacunaire et souffre d'un défaut d'appropriation : les règles et les effets concrets des dispositifs sont souvent méconnus, voire en contradiction avec les objectifs des politiques publiques auxquels ils sont rattachés, peu de dépenses fiscales sont évaluées et les outils de mesure et de suivi déployés pour contrôler leur efficience sont défaillants. L'action menée pour évaluer et réduire en conséquence les dépenses fiscales doit être relancée*" (Cour des comptes, 2019).

[2] Sweden engages in government portfolio reviews that involve a deep analysis of state-owned assets and liabilities to determine whether they satisfy predetermined, strict criteria for continue public ownership.

Better procurement and project management

McKinsey estimates that "smarter procurement" – via supply management, demand control, and processes such as e-tendering portals – "can save governments around 15 percent of addressable spending[1] while simultaneously boosting outcomes."[2] A better governance for state-owned enterprises and improved management of the major IT, defense, and infrastructure projects can also not be overlooked.

Moving towards digital and data-enabled governments

France has already taken major steps to move in the direction of more data-driven and digital government. More can be done to digitize interfaces with citizens (to reduce access time and improve contact between governments and citizens), to automate processes in the background, and to share data with and involve citizens in the solution (see Section 6 for our proposals on this).

Testing, evaluating, and experimenting

Many advanced economies have been moving forward with public policy evaluations. France has also done this, but the momentum needs to be sustained and the practice encouraged decisively. The countries which are best examples in the field of impact assessment as identified by France Stratégie are the U.S., Canada, the UK, Sweden, and Germany.[3] In line with the Cour des comptes' push for more evaluation of public spending and better metrics, France Stratégie has identified three of the key factors for success as i) the existence of formal mechanisms promoting assessments; ii) the degree of dissemination and influence of these assessments on the public as well as on decision-makers; and iii) the openness of the administrative environment to economic researchers.

While there is not a single institutional model that works, good practices require the need for a better link between the demand for and production of evaluations; the definition of common standards to guarantee independence, credibility, and transparency of the impact assessments; and the sharing and diffusion of the results, practices, and challenges of the policy evaluations with a broad and large audience. In the spirit of these good practices, France Stratégie also points to several concrete examples to inspire the use of impact

[1] McKinsey (2020), "The opportunity in government productivity", April 18.

[2] For instance, Denmark's government procurement program saved about $80 million in yearly expenditure in its first wave that focused on computer hardware, office supplies, equipment, and furniture.

[3] See the summary "Public policy impact assessment: what can France learn from the most advanced countries?" (France Stratégie, 2020) and the Working Paper "Vingt ans d'évaluations d'impact en France et à l'étranger. Analyse comparée des pratiques dans six pays" (France Stratégie, *Document de travail*, No. 2019-16, December).

assessment in France. In the U.S., the *Intergovernmental Personnel Act Mobility Program* fosters career mobility between research communities and the public administrations. The British Treasury provides detailed methodological guides on impact assessment, which has the added benefit of ensuring a common framework. In Canada, evaluation competencies receive accreditation (the *Accredited Appraiser* designation). In Anglo-Saxon countries, the "What Works" centers have been centralizing the results of impact assessments and classifying public systems based on effectiveness. They have also engaged in outreach to diffuse these results to a large and broad audience. In the UK in particular, "What Works" has stimulated government agencies to publish *Areas of Research Interest* to signal to researchers which areas are in need for scientific evidence.

4. Corporate Taxation

Motivation and principles

Today's corporate tax system in France and most other countries is outdated for multinationals. On the one hand, it allows savvy companies to exploit loopholes and misalignments in countries' tax rules, leading to profit shifting and tax avoidance. On the other hand, the playing field is not level and companies may be confronting double taxation and tax uncertainty. Hence, double taxation and non-taxation coexist. Clearly, the taxation of multinationals is a highly complex issue that requires paying attention to a myriad of important dimensions. Yet, it is not inevitable that globalization will make the taxation of companies impossible and there are excellent initiatives already underway and to be fostered further.

It is critical to review the taxation of companies and particularly multinationals, because, first, the revenue shortfall from not being able to tax them is potentially large for many countries, including France. Second, there is a social fairness dimension to this issue in the eyes of many citizens. Multinationals and their shareholders are considered by many to be among the winners of globalization. Not taxing their profits appropriately could lead to a lot of resentment and backlash that could potentially be minimized with an efficient and just tax system. These fairness issues are only exacerbated by the revenue needs post-Covid-19 and the fact that many companies will – in one way or the other – have benefitted from extensive government help during the crisis. It is important to say straight away that the goal should be not only to appropriately tax "foreign" companies that operate in France – as was recently in the debate centered around U.S. digital companies, but also to make French companies operating domestically and abroad pay their fair share. Worth noting is also that despite sometimes simplistic statements about a company's "nationality" the ownership of multinationals and of large companies more generally is actually quite complicated and crosses (many) national lines: a French company can be owned partially

by foreigners, whether it operates in France or not; French shareholders can hold stock in foreign companies operating in France or abroad.

What are people's views on corporate taxes?

In our *2020 Taxes and Policy Survey*, we find that people are much more supportive of raising taxes on large French companies and those that provide digital goods and services (around 33% of respondents are favorable to such tax increases) than on small or medium-sized French companies (only 11% support such tax increases). 57% of respondents supports increasing taxes on foreign companies operating in France (including those that hire workers in France). In general, taxes on small and medium-sized companies are unpopular and considered unfair, while those on large French companies or foreign enterprises are more popular. Bear in mind, however, that the "nationality" of companies is a complex issue to start with, as explained above.

Current big directions of reform: The "BEPS" Pillars 1 and 2

The important Base Erosion and Profit Shifting (BEPS) initiative by the G-20 and the OECD in the Global Tax Forum has produced and pushed a set of recommendations to ensure a better taxation of multinationals. We have put together a very detailed appendix (Appendix 4) that describes these initiatives, analyzes the best impact assessments available to date, and explains the challenges ahead for France and the EU.

In brief, the BEPS initiative is based on two pillars. Pillar 1 focuses on the allocation of taxing rights (which country or countries will be allowed to tax the profits of a given company? Based on what?) and seeks to review coherently the profit allocation and tax nexus rules. Multinationals are currently mostly taxed where they reside and where they have physical presence (e.g., production facilities and employees). Yet, a growing share of people believes that the market countries, where the companies sell goods and services, even without having a physical presence there, should be entitled to get at least some share of tax revenues.

Pillar 2 – the so-called "GloBE" (Global Anti-Base Erosion) proposal – focuses on multilateral rules that would give countries the right to "tax back" in cases where other jurisdictions have not exercised their primary taxing rights, or where the tax payment by the company has been "too low" according to some benchmark. This pillar represents a backstop for tax authorities. It has a lot of similarities with GILTI (Global Intangible Low-Taxed Income) implemented by the U.S. (also described in Appendix 4). The OECD framework would consider GILTI a "compliant income inclusion rule" under Pillar 2, allowing both mechanisms to co-exist.

Negotiations about the technical aspects of Pillar 1 are at an advanced stage, and technical specificities were presented in detail in October 2020. However, discussions are not

complete, and the OECD notes that "political decisions are required on a number of issues." Although the negotiations are being led by the OECD, the scope of both pillars are much broader since more than 130 jurisdictions are currently involved. The OECD hopes that a final agreement will be reached by mid-2021. Similarly to Pillar 1, negotiations about the final details of Pillar 2 are still ongoing regarding important aspects of the measure, such as the rate at which countries could tax foreign residual profits (the OECD has done simulations based on a rate of 12.5%) or the scope of industries impacted.

These comprehensive initiatives are extremely important and valuable and should be pushed forward. France needs to continue being a leader in and a supporter of these initiatives.

Alternative proposals

Some have expressed concerns that in the short or medium run, there may be challenges to implement the full set of measures recommended. Alternative proposals have been advanced that may possibly have some scope for moving ahead without extensive international coordination. Alternative proposals are mainly based on backstops, i.e., minimum taxes, akin to Pillar 2. While Pillar 1 would create a better coordinated, harmonized international tax system, these proposals give a right to tax back without coordination and without changing definitions of taxable profits, similarly to the current GILTI system in the U.S. Yet, they are no panacea – especially not for single or smaller countries, whose companies can more easily change fiscal residence. Thus, international coordination remains highly desirable and optimal. On Pillar 1, other ideas have been floated to make tax residency depend more strongly on sales of companies. While it makes a lot of sense to put some weight on sales, big changes to the status quo taxing rights are bound to generate conflicts between countries and disagreements on who should have the right to tax.

One of these alternative proposals comes from a recent study by Clausing, Saez, and Zucman (2020) in the form of a minimum tax. The idea is that in extremis it could be implemented possibly even unilaterally by a block of countries such as the EU (or a large economy such as the U.S.). For a country like France alone, however, this is hardly an option at all. The tax proposed is a country-by-country minimum tax, not a global minimum tax (i.e., taking into account that the destination countries have different tax rates). Essentially, a given country would act as the "tax collector of last resort" for its companies operating abroad and would collect the tax differential that foreign countries chose not to collect relative to some "desired" tax rate for its domestic companies. That desired tax rate could either be the prevalent corporate tax rate to level the playing field with companies operating domestically – and to reduce any incentive to shift activity outside of the national borders – or a lower rate if the goal is to not put domestic multinationals at a disadvantage abroad. This system does not require any more information than is already made available

with the provisions of the OECD BEPS reporting requirements (through which companies are required to report their profits and taxes on a country-by-country basis).[1] It is important that all foreign income is included in the tax base of the minimum tax, unlike the U.S. GILTI minimum tax which only applies to foreign income in excess of a 10% return on capital. This exclusion incentivizes the shift of capital investments abroad to lower the tax base and reduces revenues.

In principle, the consequences of a big block of countries such as the EU of implementing such a scheme could be far-reaching. First, EU companies would no longer have as strong incentives to relocate activities for tax purposes. Second, tax havens would have reduced incentives to try to keep their tax rates low and may even gain from increasing them, thus leading to a "race to the top" rather than the current race to the bottom. This latter effect will be larger the larger is the block of countries implementing a minimum worldwide tax. International competition may switch to trying to provide better amenities, infrastructure, and human capital to attract companies rather than slashing corporate taxes. From a political economy perspective, minimal taxes seem feasible at a large scale as they have the potential to generate many winners as opposed to losers.

Yet, such a minimum tax would only work if it is adopted in cooperation with at least a large block of other countries, such as the EU jointly with the U.S. (that has GILTI). It is thus not a magic bullet that allows countries to go without international coordination. The risks are that, first, French or EU multinationals start moving their tax residence to countries that do not have a minimum tax. It would need to be accompanied by yet another defensive measure which is to strengthen anti-inversion rules so that French companies cannot easily change their headquarters. But preventing new companies from incorporating abroad would be very difficult. If tax residence depended more on sales rather than on physical presence, these constraints may be relaxed, although even sales, especially digital ones, can be manipulated. Second, this could hurt the competitiveness of French or EU multinationals unless other countries start adopting higher corporate tax rates and minimum tax rates for their own multinationals too.

Do not ring-fence "digital companies"

There has been a lot of distinct discussion about digital companies specifically, and how to treat them particularly. In fact, there have been attempts by EU countries to implement explicit digital taxes unilaterally in the short run. Yet, an important element to bear in mind in the design and implementation of multinational taxation is to not ring-fence and isolate digital companies. Digital *technologies* do pose particular challenges, but they are not

[1] In the longer term, more harmonized and strict protocols for country-by-country reporting with clear definitions of profits, turnover, destination of sales and consolidation rules can be established, and the datasets made available to all participating countries for analysis.

peculiar to digital *companies* only. The lack of physical or permanent presence, the reliance on intangible assets including intellectual property (IP), the participation of customers or users in value creation, and the high value of data are not exclusive to digital companies and start being part of many other so-called "non-digital businesses" models. Ultimately, a large part of the whole economy is becoming digital to some extent and relying on digital goods and services. It is difficult to identify what company is truly a "digital company" and the focus should be much broader, as these international tax issues are affecting and will continue to affect many more companies. Thus, digital companies should not be ring-fenced and there should not be a separate base for taxation of such models or activities. Instead, "digital presence" should be a concept that is broadly applied for all companies.

Additional recommendations: data processing abilities and domestic inter-agency cooperation

In addition to pushing forward on international coordination for corporate taxation, France should take action on two fronts.

First, the ability to process large amounts of data will need to be strengthened to be able to cope with the requirements of the new rules on exchanges of information, country-by-country reporting, and tracking of corporate activity abroad. Boosting the French Tax authority's capabilities will require hiring people with strong quantitative skills (such as statisticians and data scientists), training existing employees to use digital tools, and modernizing the IT infrastructures. Some investment will likely be required. For instance, the IT budget of the French Tax authority, the DGFIP (Direction générale des finances publiques), will be around €550 million in 2020.[1] As a comparison, Crédit Agricole Group, which has about 52 million customers around the world (roughly the size of the French adult population), is expected to sped about €3.75 billion on IT projects in 2020.[2] See also our recommendations in point 3 of this Section.

Second, fighting international tax evasion and fraud effectively requires strong cooperation between the various *départements* of the French administration: the Tax Authority, of course, but also Customs and the relevant offices in the Justice, Interior, and Foreign Affairs ministries.

[1] Giraud Report 2019 (annexe 25).

[2] €15 billion over 4 years, so approximately €3.75 billion per year (Crédit Agricole website).

SECTION 6

A TOOL FOR UNDERSTANDING CITIZENS: SURVEYS

1. Large-Scale, On-Going Surveys as a Policy Tool

Good implementation of the policies in this report and beyond will require data collection, experimentation, and policy evaluations. But we also need data that reveals what is otherwise invisible: namely, what people think. This type of data is not often systematically collected, and, yet, is critical. “Surveys” are a way of getting into citizens’ minds to elicit perceptions, knowledge, understanding, attitudes, and views. These may be context-dependent and require an on-going study. Large-scale surveys should become a continuously used, well-designed, and interactive policy tool with which the government would communicate with citizens. They are not simple “opinion polls.” They are rather a scaled-up version of town halls and debates that could be had. They complement the direct dialogue that can occur between constituents at different levels and leverage mobile phone and internet technologies to reach a large and diverse set of people rapidly.[1]

The basic premise for using large-scale, on-going surveys is that policy needs to listen to people. This is not meant in an idealistic or wishful way, but rather as a rigorous method and tool for policy making. It is also important to give a voice to people that are not always first in line (whether across the income distribution, across socio-economic groups, or across regions) when it comes to asking questions.

It will be key to establish a serious reputation for these surveys and to do them predictably and regularly, so that people know that they will be heard and that policymakers will take

[1] Of course, phone surveys can complement the online technologies to reach populations that are not easily online.

them seriously. Of course, one needs to be cautious to not give the impression that every single request or input can be taken into account and implement. But done for a while, such a communication could improve the trust in government and institutions.

2. Surveys of Firms and Employers

Systematic and regular surveys should also be employed in the communication with firms and employers to explore the various opportunities outlined in Section 2 among others. Firms and employers have valuable inputs to provide, feedback to give, and ideas to suggest. Among others, such surveys could ensure a more equal chance for different sized and types of firms to provide input for the government. For instance, smaller or medium firms do not always get a platform to express their views, explain their difficulties and constraints, or suggest things that could help them.

3. An Iterative Policy Design and Testing Tool

Surveys can be a vital barometer of views before implementing policies (i.e., understand what types of reforms people or firms may or may not agree with), a pulse check during policy implementation (i.e., are things going the way they should? Do people understand the implementation?), and, finally, a way to immediately start assessing policy impact after implementation (Who gains, who loses? Are there elements to troubleshoot?). They are thus a key complement to other evaluation tools. On the ground, they would allow to quickly see effects and roadblocks in implementation. It is a way to involve citizens in the data creation and collection as explained in Section 5 (point 3). This, too, is an area in which the involvement of researchers can be very fruitful. Indeed, this approach has been deployed on a variety of issues by researchers, as exemplified by the studies of the Social Economics Lab ran by one of the authors (S. Stantcheva) at Harvard (socialeconomicslab.org).

4. What Can We Learn from Surveys?

There is a lot to be learned from surveys. When we as citizens decide which policies to support or not, we take into account our own socio-economic circumstances, our complex fairness views, and our underlying perceptions (and often misperceptions) about ourselves, others, the economic system, and policies. Armed with this knowledge, policy makers could first identify gaps in knowledge or misinformation that could be corrected with better information. They could identify difficulties people face with the current system or because of a new reform. They could learn about fairness views that need to be respected. The latter could be highly context-dependent, depending on what other policies are in place, and also differ drastically across the political spectrum or groups of people.

There are very relevant aspects about people's economic circumstances that are exceedingly hard to see in traditional, non-survey data. In fact, the traditional data may even be misleading. Thus, sometimes, the more effective and rapid way to acquire that information is to ask people directly. Consider the example of fuel taxes on households. Economic theory suggests that a fuel tax that is destined to curb the use of fuel will have its intended effect only if people are able to switch away from that type of fuel. For instance, people may be able to reduce fuel consumption by taking the bus instead of their car. But, if people are unable to switch to other modes of transportation, such a tax is going to purely be a negative transfer to (or a tax on) fuel-consuming households. People will not reduce fuel consumption (since they are unable to) and they will hence have to reduce other spending, possibly at a very high cost in terms of well-being. In other words, households may be hurt without any reduction in pollution. What information would non-survey data, such as transportation data, provide in this case? The data may show that there is a bus network that covers parts of the city. Yet, if people are surveyed, they may directly express their difficulties in actually dropping kids off at school, driving to the doctor in remote rural areas, or going to work night shifts when the bus schedule ends early. The transportation data may also show that very few people switch to public transportation, and a policy maker may then wrongly deduce that the fuel tax is too low and should be further increased. Instead, well-designed surveys could point policymakers to the actual constraints which prevent people from switching and which have to be resolved first before an effective fuel tax can be implemented.

5. Knowledge Gaps, Misperceptions, and Outreach

Policymakers can use surveys to identify where better information and educational outreach to citizens may be needed. As we saw throughout this report and as has been shown repeatedly in research, many economic policies that affect people's daily lives are deeply misunderstood. Public information campaigns that are pedagogical, neutral, and appealing can help improve understanding of key policies. Giving citizens the tools to grasp and reason about the economic world around them should be a goal of policymakers.

Throughout this report, we have illustrated the use of surveys with results from the *2020 Jobs, Inequality, and Insecurity Survey* and the *2020 Taxes and Policy Survey*. We have highlighted misperceptions and lack of knowledge about the current policies, and some of the aspirations and difficulties of respondents. In addition, we also asked respondents about their views on communicating with the government, to which we turn next.

6. Citizens Are Favorable to Surveys for Public Policy Purposes

In our *2020 Jobs, Inequality, and Insecurity Survey*, we asked a series of questions to understand how citizens perceive the communication and dialogue with the government and what they would hope to see improved.

We find that only 20% of respondents agree that the government takes into account the views of "citizens like them" in designing public policies or that the government is sufficiently exploring the views and opinions of citizens on policy issues. Only 21% trust the government to design policies that will benefit "people like them." A similarly low share believes that the decisions taken by the government are transparent.

This suggests that there is a lot of scope for improving the feelings of being heard and represented by policy makers. More than 60% of respondents say they would be either favorable or very favorable to a government conducting regular surveys on pressing public policy questions, which would be recurring, anonymous, and done online. 87% of respondents say that if such surveys were to be launched, they would take the time to respond. 50% of respondents believe that they have some new and original perspective to bring to bear upon public policy issues. 84% believe that the government needs to increase and foster data collection so as to improve the design of public policies. We also find that those aged 50-69 are a bit more favorable to such initiatives than are younger citizens. Overall, there seems to be strong support for using direct surveys as a tool to get citizens' views and inputs and to foster a feeling of representativeness and inclusiveness.

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CHAPTER THREE

DEMOGRAPHIC CHANGE: AGING, HEALTH AND IMMIGRATION

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EXECUTIVE SUMMARY

Demographic fundamentals are good but the number of older people will increase

Population aging is mild in France relative to other European Union (EU) countries. It is not caused by current low fertility – since birth rates in France are relatively close to the replacement level – but primarily by the baby boom and baby bust transition in the 1960/1970's and the projected increases in longevity. Life expectancy is high in France and healthy life expectancy at age 60 (WHO definition) is highest among all OECD countries both for men and women. As in other countries, health and life expectancy are unequally distributed and increase with income and wealth. This gradient is smaller than in the United States and the United Kingdom but roughly the same as the European Union average. Hence, generally speaking, the demographic situation is good in France but relative to the number of people in working age (20-64 years), the number of people 65 and older is expected to increase by 36% over the next two decades which demands a policy response.

The pension system needs structural reform

In international comparison, French public pension expenditures are high – 15% of Gross Domestic Product (GDP) according to the harmonized EU definition. Only Italy has higher spending (15.6%) but for a much older population. Current living standards of retirees are on average higher than that of the general population which suggests an intergenerational imbalance. The reform policy based on moving from wage to price indexation has put the pension system in a trap because it relates its financial and social outcomes to the interplay between inflation and productivity rather than to its demographic fundamentals.

The recent projections by the Conseil d'orientation des retraites (COR) imply long-run financial sustainability. However, they are based on optimistic productivity growth assumptions. Moreover, the current system will generate a severe decline of the pension benefit level relative to wages. While this is not yet felt by retirees, not the least due to the intransparency of the pension system, this is unlikely to be socially acceptable, will generate even more distrust towards the pension system, and will therefore not be politically sustainable. Hence, the pension system needs structural reform.

Employment is low, particularly among men aged 55-64

Employment rates are lower in France than the EU average across all age categories (except middle-aged women) but strikingly lower for men aged 55-64 (11 points lower: 56% vs. 67% in the EU). One cause is relatively high unemployment among men and women aged 55-64 (6.3% vs. 4.9% in EU). More important, however, is early exit from the labor force. At 60.8 years, France has the lowest average age of labor market exit in the OECD. Together with high life expectancy, early retirement creates by far the longest duration in retirement in EU and OECD. French men spend 4.5 more years in retirement than the EU average, and women 3.8 more years. This difference accounts for about 25% of higher pension expenditures. The future challenges of demographic aging are thus exacerbated by a low number of workers relative to retirees already today.

Health limits work for some but not for all

Chronic illness is rising in France in common with other EU countries. While those with chronic illness are less likely to work at all ages, the particularly low employment rate among older individuals in France is not primarily driven by the prevalence of chronic illnesses. However, the incidence of chronic illness, and its impact on age of death and participation in the labor market is socially graded. Individuals in lower socio-economic groups are more likely to die earlier and, in the age cohort approaching retirement, having a chronic health limitation limits work to a greater extent for those in lower occupational groups.

Labor market integration of immigrants is poor

Poor integration of immigrants contributes to the low employment in France. Immigrants' labor force participation rates in France are particularly low, especially among non-Europeans and female immigrants. More than 45% of non-European immigrant women are either unemployed or not looking for a job, and this gap narrows only slowly over time. Migrants with higher levels of education face challenges on the labor market as well. Those who do find employment are more likely to work in unskilled jobs and often feel overqualified. The reasons for migrants' labor market disadvantage are low levels of education/skills, including challenges to have foreign credentials recognized in France, a

lack of other labor market relevant resources such as an insufficient proficiency in French and fewer social ties to non-immigrants, migrants' cultural background and attitudes, and ethnic/racial discrimination.

Responding to population aging requires a holistic approach

A holistic and synchronous approach to these challenges is essential. In order to financially balance the pension system there are three essential levers: increasing contributions, cutting monthly benefits, and increasing retirement ages. If longevity increases further – as is expected – and if future monthly benefit cuts and contribution increases should remain mild, the key is to address the low employment of older workers. Retiring later is going to be unavoidable for the average French worker.

Reforms thus need to address the pension system, the labor market, the maintenance of health, and further education in order to enable individuals to remain employed. Moreover, this should be complemented by higher employment of immigrants. Such an integrated approach is not only necessary for economic success but also to convince the population that the joint effect of all reform elements is more than the sum of its parts, and the reform package far more than another round of cutting benefits.

Pension reform is essential as a response to population aging

Pension reform is the keystone of the recommended policy package. To be efficient, it should not only address population aging but also the current pension system's fragmentation that creates intragenerational inequities and is perceived as unfair. Moreover, its complexity makes it incomprehensible and costly to administrate. The government's January 2020 proposal to the Assemblée nationale based on the Delevoye plan, namely to create a universal point system, is an excellent starting point because it is oriented at something that is known, namely the AGIRC-ARRCO system, is transparent and easy to communicate.

However, three enhancements to the Delevoye plan are important and necessary. The first is to have a simple and transparent relation between points and earnings that does away with the distrusted purchase value of a point. The second enhancement is a balancing mechanism that adapts the pension system to demographic and macroeconomic developments. We recommend a weighted mix of two mechanisms, namely indexing initial pension benefits to wages minus the system's dependency ratio (number of contributors divided by number of beneficiaries) and increasing the average age of labor market exit without making the *âge pivot* the central mechanism. The weight of each element should be determined by a steering committee which includes the social partners, taking account of current circumstances, actuarial projections and the health of a reserve fund.

Both enhancements to the Delevoye plan will re-direct the pension system from its current reliance on the interplay between inflation and productivity to an orientation to its demographic fundamentals. Increasing the average exit age from the labor market is not primarily targeted at balancing the financial health of the pension system, but is essential for macroeconomic growth since incentivizing a higher retirement age is a direct way to increase the labor force participation of the older workers, which has a powerful positive impact on potential growth.

The third enhancement will fundamentally change redistribution. The point system as proposed by the government leads to low pension benefits for low earners, who are only protected by the minimum pension. Giving low earners additional “bonus points” will guard against coming near to old-age poverty. Moreover, since the sum of points will determine the age at which a target replacement rate is achieved, this lets workers with low earnings reach this age earlier than under the government proposal. The introduction of bonus points should increase the political acceptability of the proposed pension reform, together with indexing benefits to the increase of wages rather than prices.

Accompanying reforms: labor market policies to support working longer…

Keeping individuals longer in the labor force requires accompanying labor market policies to lower old-age unemployment as well as non-employment by discouraged job seekers. Policies need to support those who continue to work past the earliest eligibility age and limit exit from the labor market before that age. Labor market policies, in cooperation with employers and other social partners, need to improve working conditions for older workers. “Good jobs” for older workers should allow greater flexibility in work hours and partial retirement. This should increase currently low job satisfaction and maintain high productivity. Instruments of active labor market policies such as wage subsidies to re-employ older unemployed and targeted training programs should be used more often.

Further vocational education needs be strengthened to close the skill gap between older and younger workers. Age discrimination should be combatted. Targeted policies should support health programs at work to improve working conditions and reduce occupational illnesses and accidents. Disability insurance should further move its focus from compensating non-working individuals to better integrating workers with disabilities, for example by strengthening rehabilitation policies, whilst providing an adequate safety net for those who are unable to work.

…health policies to reduce the growth in chronic illness…

Working longer requires better health maintenance not only for the generations around retirement age, but also for younger individuals who will be the future generations of older

workers. This means adopting policies to tackle the steady increase in chronic illness by increasing the amount of preventative care and having a greater focus on the early treatment of chronic ill health. For the healthcare system, this requires changes to the financial incentives for healthcare suppliers and demanders and the greater use of innovative methods to deliver care, including telemedicine.

…and integration policies to increase immigrants' labor force participation

Increasing overall labor force participation requires special attention to immigrants. France could lower the employment gap vis-à-vis the EU average simply by better integration of immigrants. This requires coherent policies, especially for recent immigrants, that support the recognition of existing skills and the achievement of new ones and credentials that are relevant on the labor market, most importantly language skills. More hours of language training for non-French speakers have been shown to positively affect migrants' labor force participation, partly by increasing information about vacancies and application procedures. In order to counteract the intergenerational transmission of low levels of education, access to better schools needs to be improved for the children of immigrants and for immigrant children. Given the importance of informal learning opportunities and the availability of role models, extra funding for disadvantaged school needs to go hand in hand with incentives for schools, including private ones, to make a greater effort to increase the schools' social mix. Documenting underrepresentation of certain origin groups in larger firms and organizations is an important first step in tackling labor market discrimination. This requires the collection of much needed and so far missing data on (parental) place of birth.

In summary, reforms are needed to increase the labor market exit age, to accommodate differences in life experience and life expectancy, and to better integrate immigrants into the labor market. Pension reform is at the center of our recommendations and, more generally, higher employment rates among individuals aged 55 and older. We stress the necessity of complementing pension reform by measures to improve the labor market for older workers, strengthening health maintenance and reducing health inequalities and better integrating immigrants into the labor market. Reforms need to be holistic and need to alter not just financial incentives but also lead to changes in social norms with respect to retirement, working when older and the employment of immigrants.

SECTION 1

FACTS AND PERCEPTIONS

In contrast to inequality and climate change, population aging in France rests largely on good developments. Increasing longevity is a great societal achievement. A comparison of fertility, longevity and health in France with her neighbors and trading partners shows that many of the problems often associated with population aging are to a large extent potentially subject to policy and resulting behavior change than purely a matter of demographics.

From an economics perspective, population aging – the increase of the share of elderly in a population – is associated with more pension recipients per pension contributor, more unhealthy individuals per contributor to the health insurance system, more people in need for care per potential caregiver, and more consumers per worker. Hence, in spite of resting mostly on good developments, population aging will strain the social insurance systems and reduce economic growth unless it is harnessed by a policy response. France's Achilles heel is her low labor force participation. This is so far a missed opportunity because increasing labor force participation will help to offset the increasing ratio of pension beneficiaries to pension contributors. Hence, from a macroeconomic point of view, we emphasize that the labor market is the strategic market on which to focus in times of population aging.

We first describe why population aging – in spite of resting on good developments – demands a policy response, especially structural pension reform (1.). Pension reform, however, needs to be accompanied by measures that increase labor force participation and productivity. We identify three groups in the French population which deserve specific policy attention. The employment rate of French men aged 55+ is especially low in comparison to other countries. This is due to unemployment and non-employment before the earliest eligibility ages for a pension and early retirement thereafter, encouraged by a lack of adequate incentives and misleading perceptions (2.). While health is good for the average French worker aged 50+, health disparities are large.

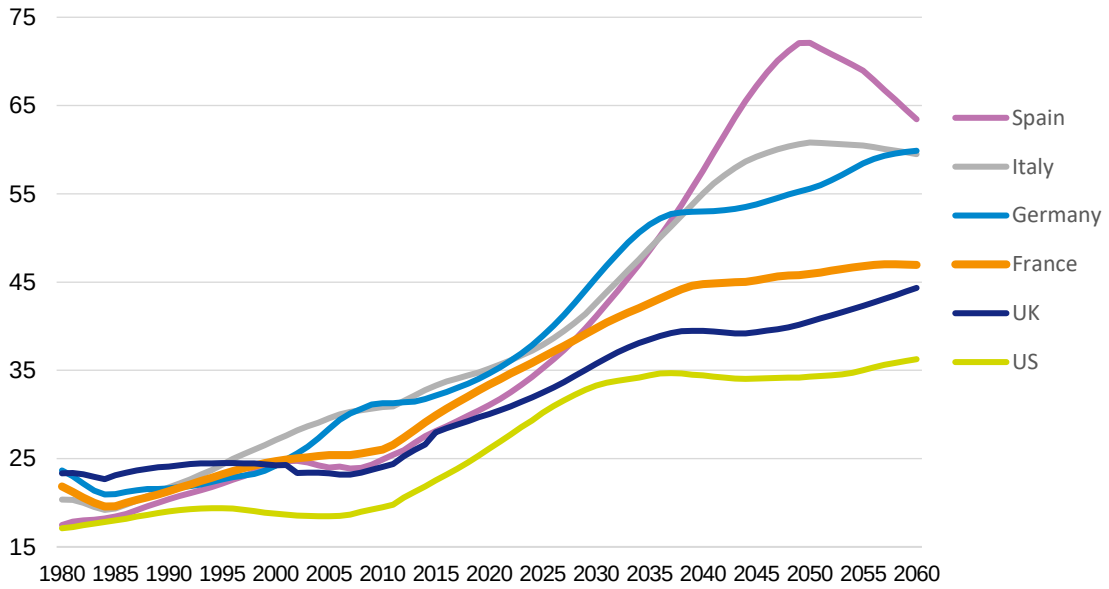
An important task is to (re-)integrate workers with mild chronic conditions into the labor market (3.). Labor force participation of immigrants, especially women, is also low and jobs are not well matched with their qualifications, wasting productivity (4.). Based on the facts collected here, the next section presents our general principles for aging-related reforms, with detailed policy recommendations.[1]

1. The Challenges of Population Aging

1.1. Old-age dependency is increasing…

The extent of population aging is usually expressed as an increase in the demographic "dependency ratio", the number of individuals above a certain age divided by the number of individuals considered as being of working age. Figure 1 shows that the French dependency ratio is projected to steadily increase over the coming decades. While 33 French aged 65 or more in 2020 will depend on 100 French people aged 15-64, it will be about 45 elderly in 20 years, an increase of almost 36%. Moreover, the Figure shows that this trend has accelerated during the last decade and will stay at that speed for the next two decades before it will first decelerate and then stabilize at around 2058.

Figure 1 – Old age dependency ratio (65+/15-64) in France and selected OECD countries



Source: OECD Baseline projection, downloaded August 2020

[1] Supplementary material and evidence is relegated to the Appendices 9 to 18: see the Appendices volume online.

The increase of the old-age dependency ratio in France is mainly driven by the baby boom/baby bust transition and an increasing longevity, while fertility and migration do not play significant roles (see Appendix 9 for a detailed account).

Like most other industrialized countries, France had a baby boom with high birth rates between 1946 and 1973. The first-borns of these cohorts have reached the current earliest retirement age of 62 in 2008; the youngest baby boomers will reach that age in 2035. For this period, the increasing old-age dependency ratio is driven by the past decline in fertility from its exceptionally high level during the baby boom to a lower level from the late 1970's onwards. The baby boom-baby bust transition is a historical given that cannot be changed and that has long-tailed after effects.

After about 2035, the further increase of the old-age dependency ratio is mainly driven by the expected future increase in longevity from an already very high level. This is a genuinely positive development that we want to strengthen. Here, the main challenge is to have wider participation in the positive development and a reduction in the large existing disparities of life expectancy.

The lower fertility level from the late 1970's onwards does not contribute much to population aging since it is relatively high and close to replacement level. It is important to realize that raising fertility is not an option to compensate for an aging population during the next two decades, since it takes that long to have children grow up and become educated.

While immigration might help to rejuvenate a country, unrealistically large immigration flows would be required to change the age structure of a population of 67 million French. Moreover, in order to increase the macroeconomic impact of immigration and to garner popular support for rising immigrant numbers, the share of skilled individuals among all migrants would have to be large (Marois, Sabourin and Bélanger, 2020). Increasing the share of skilled individuals among all immigrants, however, is challenging since immigration to France is in large part family-based. The skill composition of family-based migration generally resembles the skill level of the migrant stock population – in France, this is on average rather low-skilled. The state's ability to intervene in this self-sustaining social dynamic of migration is limited (Massey et al., 1999).

Hence, changing the demographic forces themselves is not a policy option. The baby boom is given, longevity is a blessing, and fertility and immigration do not have the leverage needed for the next two decades.

Moreover, the negative tone underlying the word "old-age dependency" is misleading because it rests on the view that a certain fixed age defines "old" and thus "dependent". Many figures in this report use the conventional marker of age, namely age 65. This is of course arbitrary. In terms of economics, dependency relates to not working, being ill, or needing care. This is to a large extent a subject of policy and resulting behavior rather than

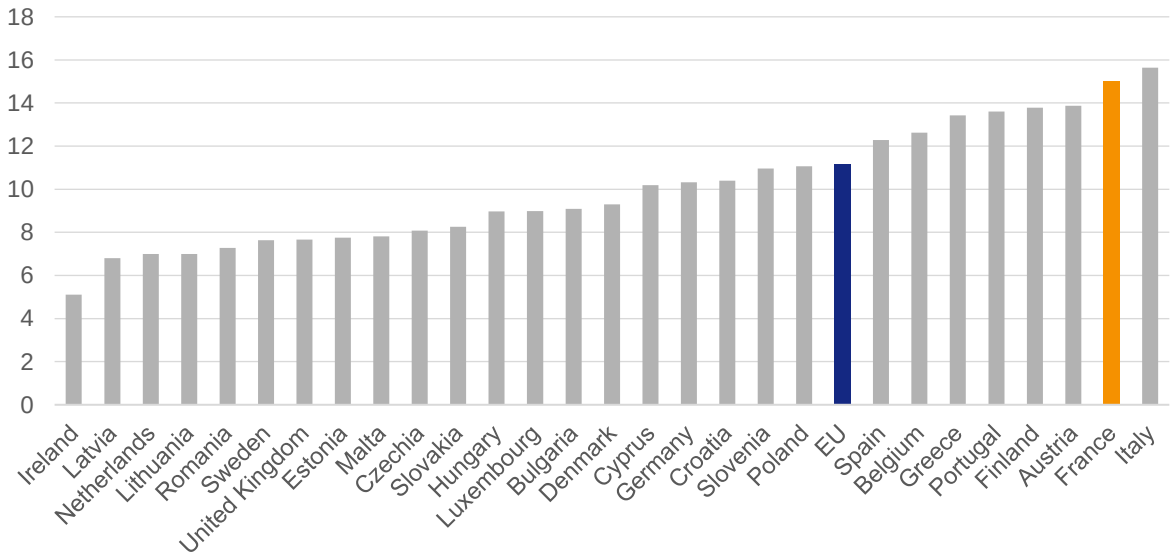
just a matter of demographics. Moreover, past improvements of life expectancy and health have been large, and we expect further positive trends in the future. Hence, what is considered old when looking backwards (such as looking at our parents and grandparents) is a biased view of how our own age and that of our children will be in the future.

1.2. …and so are pension expenditures

The main threat of population aging in economic terms is a declining labor force as a share of the total population. Hence, the financial basis of the social support systems will shrink while the number of beneficiaries will increase.

Already now, France has a pension system which takes up a large amount of national resources.[1] Except for Italy, France has the highest public pension expenditures measured in relation to GDP, about 3 times as much as the United States and about 50% higher than Germany (Figure 2). The current contribution rate at average earnings is 27.5%.[2] This is the highest contribution rate among OECD countries except the Czech Republic (28%) and Italy (33%) and is likely to exert negative work incentives.

Figure 2 – Public pension expenditures, 2020, percent of GDP



Note: The EU Commission's figures are based on a harmonized definition across member countries. They are higher than French official figures since the EU Commission includes certain disability and unemployment benefits which are not defined as public pensions in the French accounting system.

Source: Projection by EU Commission, 2018 Ageing Report

[1] Appendix 12 provides a summary description of the French pension system.

[2] See Appendix 10, section on costs for figures including government subsidies.

In spite of the high contribution rate, the French pay-as-you-go pension system is not in balance but generates an annual deficit of about 0.5% of GDP (COR annual report 2019). The Covid-19 pandemic has made the situation worse. A recent report by the Conseil d'orientation des retraites (COR, October 2020a) states that "the crisis would thus cause an additional financing requirement of around 1 point of GDP in 2020 (i.e. around €21 billion 2019) and 0.2 points in the following years (i.e. just under €5 billion 2019)" until 2025 when it is assumed that "GDP would return to its balanced growth path and the deficit would be essentially structural in nature."

In spite of the French demographic advantage, the EU Commission's projections forecast that this high expenditure ratio and the tendency towards running deficits will remain so at least until 2040 (Table 1).

Table 1 – Public pension expenditures, percent of GDP

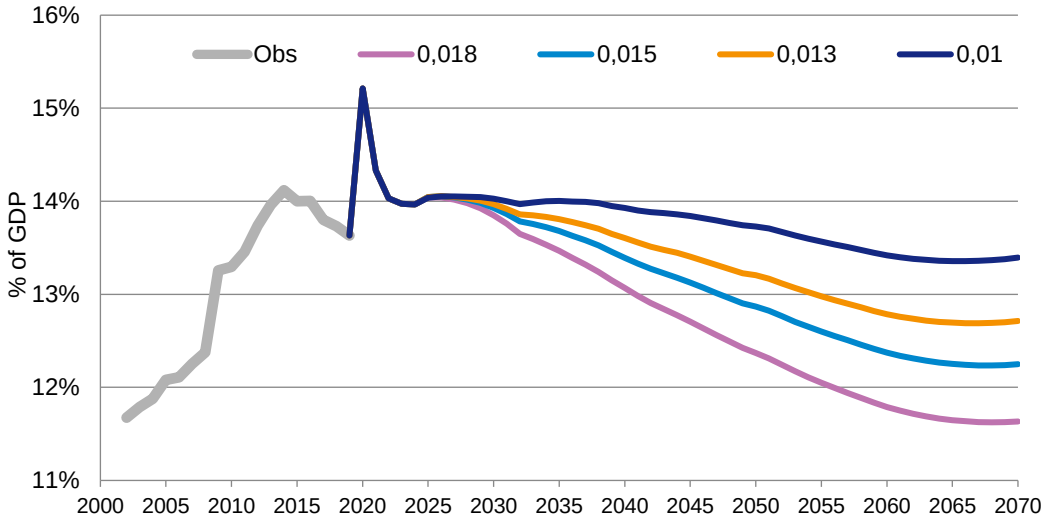
	2016	2020	2025	2030	2035	2040
Austria	13,8	13,9	14,0	14,4	15,0	14,9
Belgium	12,1	12,6	13,4	13,8	14,2	14,5
Denmark	10,0	9,3	8,8	8,6	8,4	8,2
France	**15,0**	**15,0**	**15,3**	**15,4**	**15,3**	**15,1**
Germany	10,1	10,3	10,8	11,5	11,9	12,0
Italy	15,6	15,6	16,4	17,2	18,2	18,7
Netherlands	7,3	7,0	7,1	7,5	8,1	8,5
Spain	12,2	12,3	12,4	12,6	13,2	13,9
Sweden	8,2	7,6	7,4	7,2	7,0	6,8
United Kingdom	7,7	7,7	8,0	8,0	8,4	8,6
United States	4,9	5,2		5,5		5,7
EU28	**11,2**	**11,1**	**11,4**	**11,6**	**11,9**	**12,0**

Note: The EU Commission's figures are based on a harmonized definition across member countries. They are higher than French official figures since the EU Commission includes certain disability and unemployment benefits which are not defined as public pensions in the French accounting system.

Source: Projection by EU Commission, 2018 Ageing Report

The most recent projections by the Conseil d'orientation des retraites (COR, November 2020b) are delivering a more optimistic picture (after a sharp spike due to the Covid-19 crisis that is mainly due to the decline in GDP during the Covid-19 recession). COR's base projection assumes a productivity growth of 1.3%, which implies that pension expenditures will decline from around year 2030 onwards as a share of GDP (Figure 3).

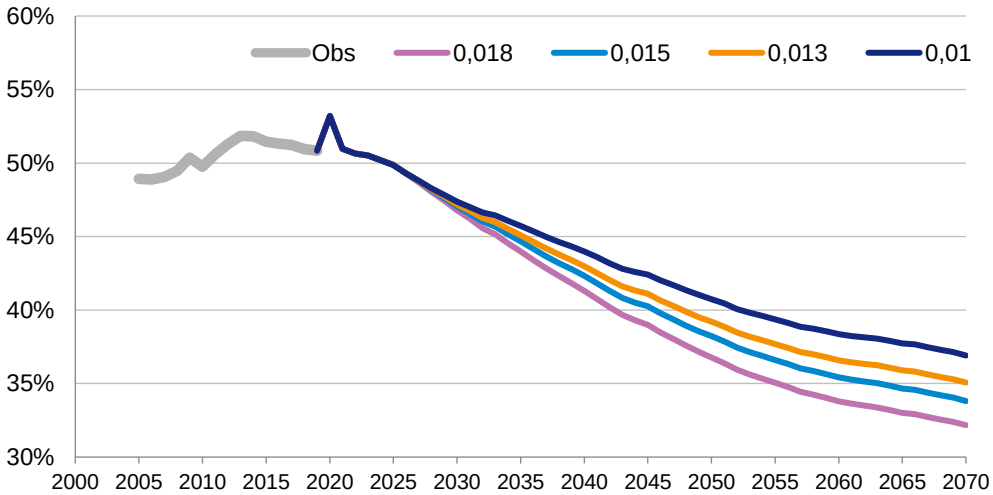
Figure 3 – Public pension expenditures, 2000-2070, percent of GDP



Source: Projection by COR 2020 Annual Report

The large share of public pension expenditures in GDP may be accepted as a social choice. It does not, however, generate a socially acceptable situation for all pensioners. As the COR report shows, the pension level (average pension for the stock of all pensioners as a percentage of average gross earned income) will decline from 50.8% in 2019 to about 35% in 2070 (Figure 4). Hence, financial sustainability is achieved by a severe reduction in pension benefits relative to wages. While retiree households currently have higher living standards than the general population (see Figure 6 below), the decline projected by COR is so large that it appears unlikely to be socially acceptable and thus politically sustainable.

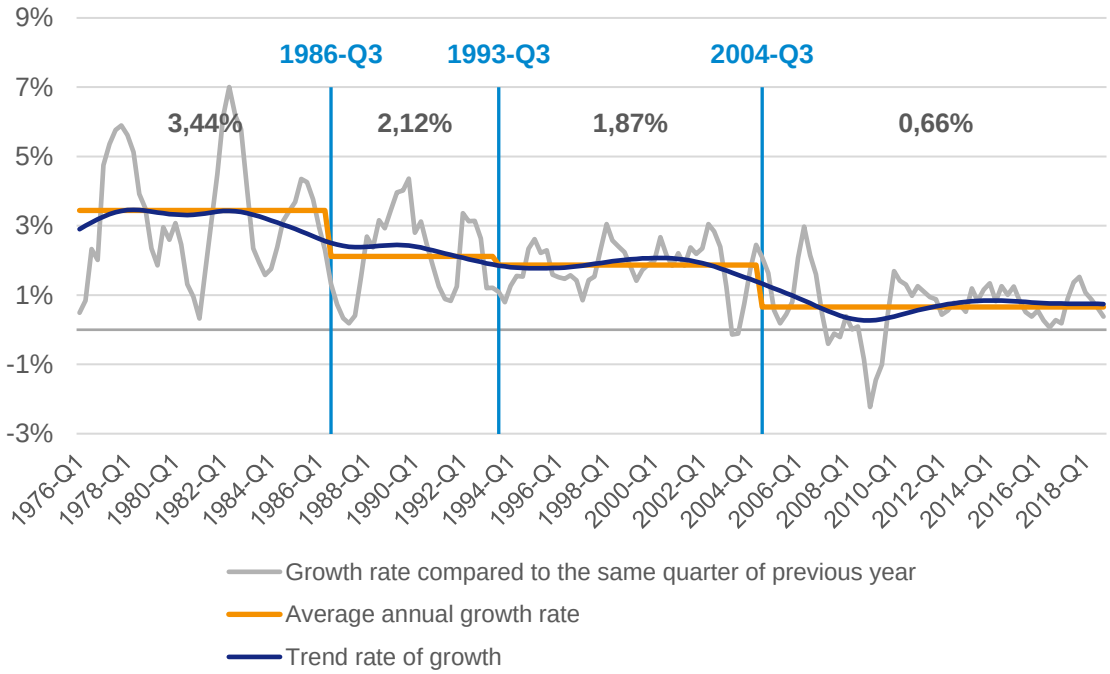
Figure 4 – Average pension as a percentage of average gross earned income, 2000-2070



Source: Projection by COR 2020 Annual Report

The base assumption of 1.3% productivity growth is a very optimistic assumption. In fact, productivity growth since 2004 has averaged about 0.66% (Figure 5). If this much lower productivity growth also holds in the future, the decline in the pension level would be lower (from currently 50.8% to about 40% in 2070) but expenditures would continue to increase at least for the next two decades.

Figure 5 – Productivity trend (GDP per hour worked), 1976-2018



Source: France Stratégie (2020a)

The sensitivity of the pension system to productivity growth and the resulting relation between expenditure growth and benefit decline, relative to earnings of the working population, is generated by the recent reforms which have tried to make the system more financially sustainable. This was achieved by moving from wage indexing of benefits and accrued earnings to price indexing. Cost savings are then generated by the difference between inflation and wage growth, i.e. by the growth of productivity. Sufficient cost savings to make the system financially sustainable thus rely on low inflation and high productivity growth. The difference between price and wage inflation, however, drives a wedge between the income of wage earners and pensioners that increases with the time in retirement.

Hence, the decision to rely on price indexation as one of the primary instruments to save costs has made the French pension system dependent on the vagaries of productivity developments. Moreover, it pitches pensioners against workers: while workers appreciate

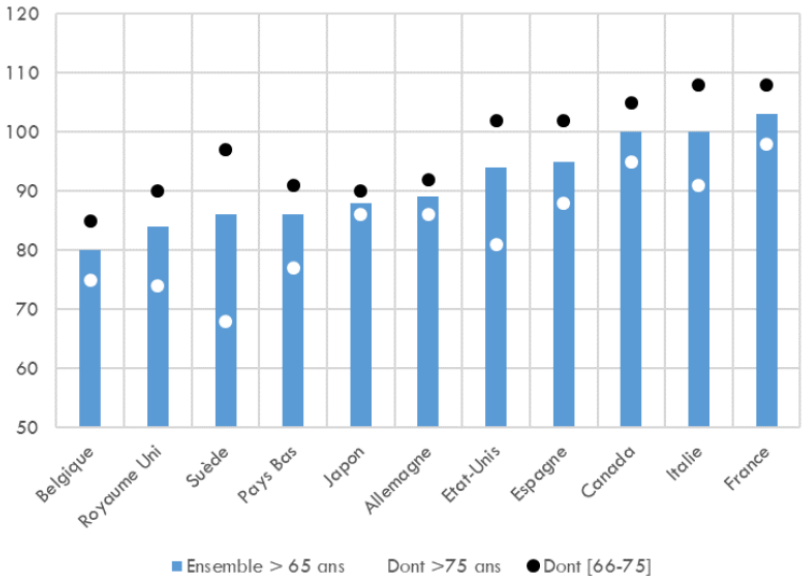
large productivity gains since they increase wages, pensioners lose in relative standing when productivity growth is high.

Ultimately, the reform policy based on moving from wage to price indexation has put the pension system in a trap because it relates its financial and social outcomes to the interplay between inflation and productivity rather than to its demographic fundamentals. This exacerbates the conflict between financial and political sustainability. The pension system therefore needs a structural reform, which re-directs the pension system from its current reliance on the difference between inflation and productivity to an orientation towards the demographic fundamentals.

1.3. Inter- and intragenerational imbalances of the French pension system

Population aging threatens the intergenerational balance if pension and other age-related social expenditures increase and have to be financed by the younger generation. This comes on top of a situation in which the living standards of retirees – measured as equivalized disposable household income – is higher than that of the general population and among the highest in the EU (Figure 6).

Figure 6 – Equivalized disposable household income of retirees in percent of the equivalized disposable household income of the general population

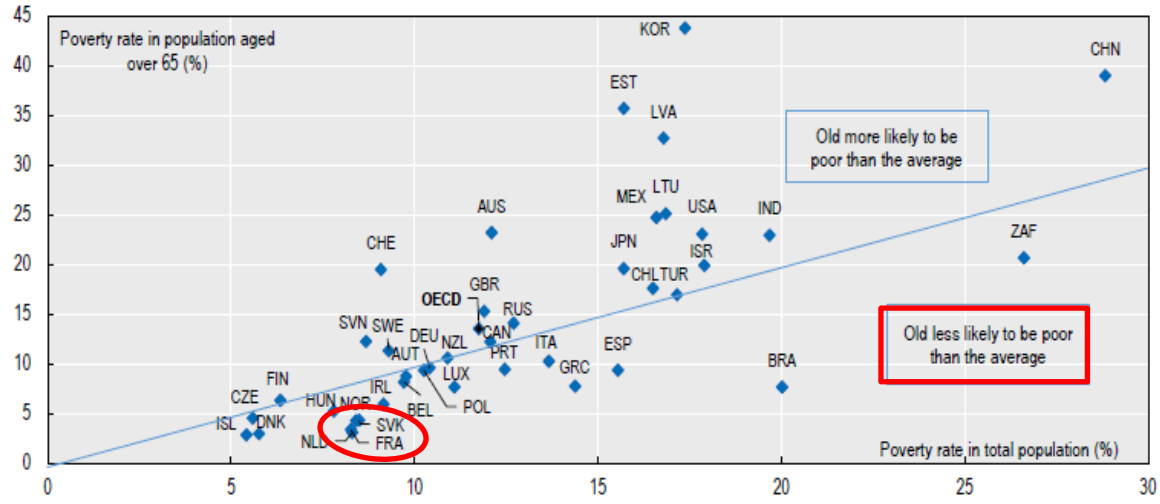


Note: The blue bar relates to retirees aged 66 and older. Comparing the 66-75-year-olds with those older than 75 shows that including younger retirees (60+) would yield an even larger imbalance.

Source: Étude d'impact – projet de loi organique relatif au système universel de retraite – projet de loi instituant un système universel de retraite (2020), p.13

This does not only hold for the average household, but also for low-income households. As Figure 7 shows, while France has one of the lowest old-age poverty rates in international comparison across the OECD countries (vertical scale), poverty in the general population is substantially higher.

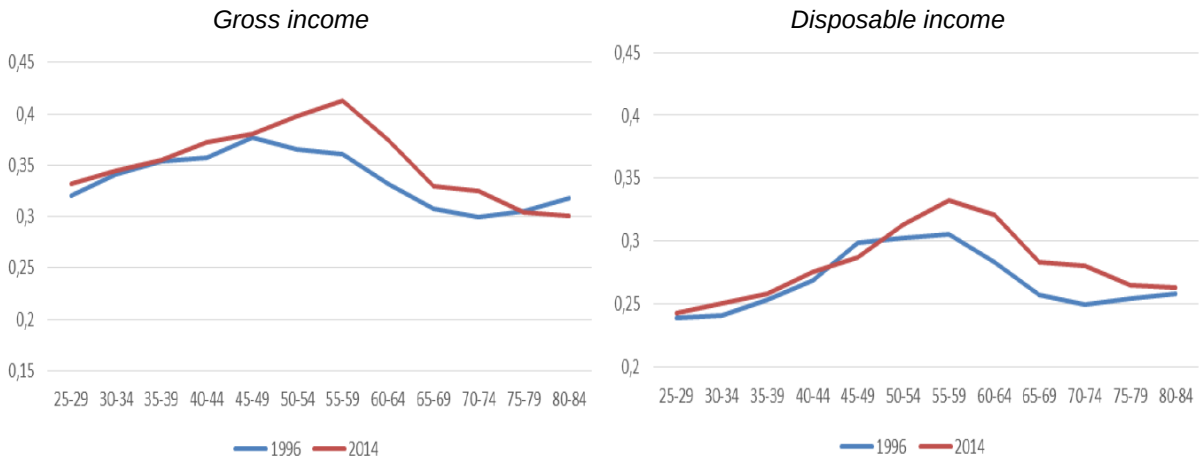
Figure 7 – Income poverty by age: older vs. general population, 2016



Source: OECD (2019c) Pensions at a Glance 2019

Population aging per se is unlikely to increase intragenerational inequality due to the redistributive character of most pension systems. This holds also for France as is shown in Figure 8. While inequality increases during working life, it then decreases with old-age.

Figure 8 – Inequality of household income by age as measured by the Gini coefficient



Source: D'Albis and Badji (2020), "Les inégalités intra-générationnelles en France", PSE WP 2020-14, based on INSEE data (ERF, ERFS)

Nevertheless, the projected decline in the pension level by the latest COR projections (COR 2020b) from almost 51% in 2019 to about 35% in 2070 (see Figure 4) is an alarm signal that pension reform has to include measures to prevent household with lower than average pensions to come close to old-age poverty. While the minimum pension ("contributive minimum") will prevent outright old-age poverty, already getting close to the poverty line is likely to stir concern and political resistance. The next section will therefore suggest countermeasures (Section 2, 2.5).

2. Labor Market For Older Workers

Weak labor force attachment is the Achilles heel of the French economy. It is particularly pronounced for older French, those with chronic illnesses and migrants. This is not a new insight but requires targeted policy action. Point 2.1 describes the early labor market exit of French workers in comparison to other industrialized countries. It is partially driven by financial disincentives of the pension system (2.2) but also a reflection of soft factors such as job dissatisfaction and false beliefs (2.3).

2.1. Low old-age employment and early labor market exit

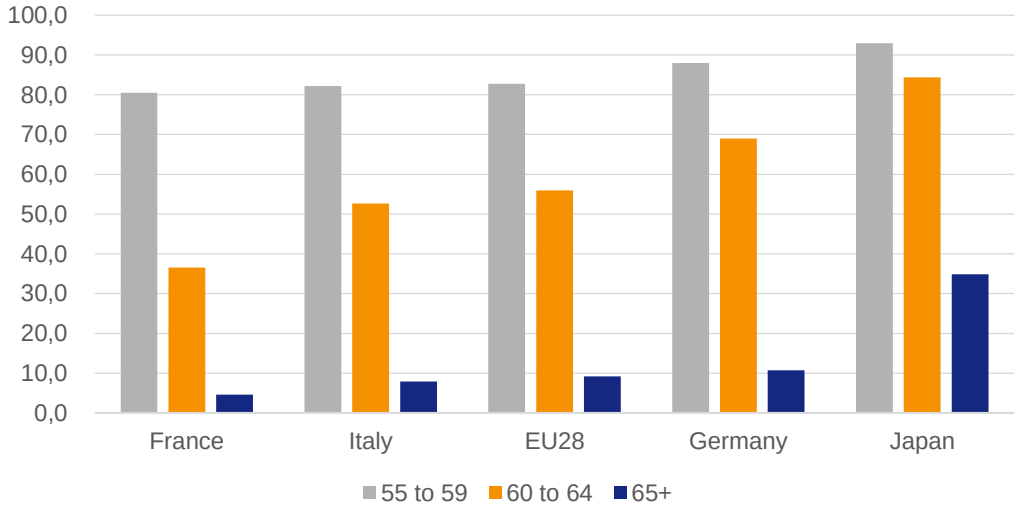
French labor force attachment is low in international comparison. Table 2 shows employment rates. While the difference between France and the EU average is within three percentage points for most groups depicted in Table 2, and women 25 to 54 even have a higher employment rate than their EU counterparts, the key difference is for men at ages 55 to 64, who have a much lower employment rate than the EU average of the same group – the difference is 18.5% or 10.4 percentage points. Figure 9 refers to labor force participation. It shows that for this indicator as well, a difference prevails in all age groups relative to Italy, the EU average, Germany and Japan, and that it strikingly increases with age, with, all in all, an overall gap close to that observed for the employment rate.

Table 2 – Employment rates France vs. EU27

Men	20-24	25-54	55-64
France	51.8	85.4	56.2
EU27	54.8	86.5	66.6
Women	**20-24**	**25-54**	**55-64**
France	46.9	77.6	52.0
EU27	47.9	75.0	53.3

Source: 2019 Q4 Eurostat

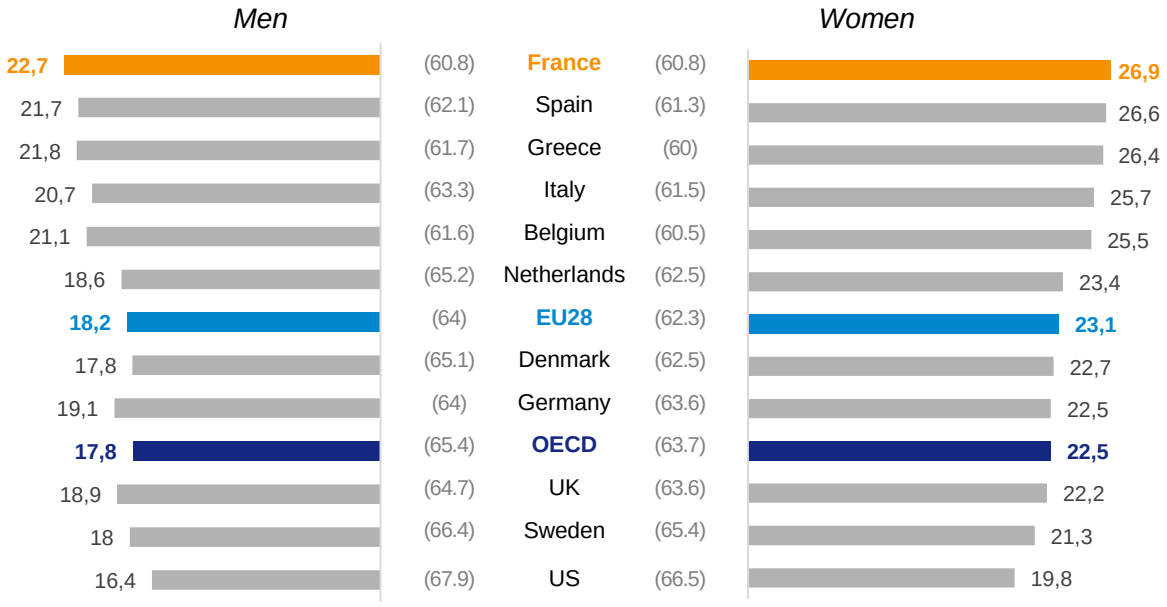
Figure 9 – Labor force participation of men aged 55-64



Source: OECD. Data extracted on 17 Oct 2020 18:15 UTC (GMT) from OECD.Stat.

The low old-age attachment is reflected in a very early average labor force exit age which is the lowest in the OECD and 3.2 years earlier than the EU average for men and 1.5 years for women (OECD, 2019c). Together with the highest life expectancy in the OECD (see Appendix 9), this results in a very long duration in retirement which is the highest in the OECD and about 4.5 (3.8) years longer than for EU average men (women), see Figure 10.

Figure 10 – Remaining life expectancy at average labor market exit age

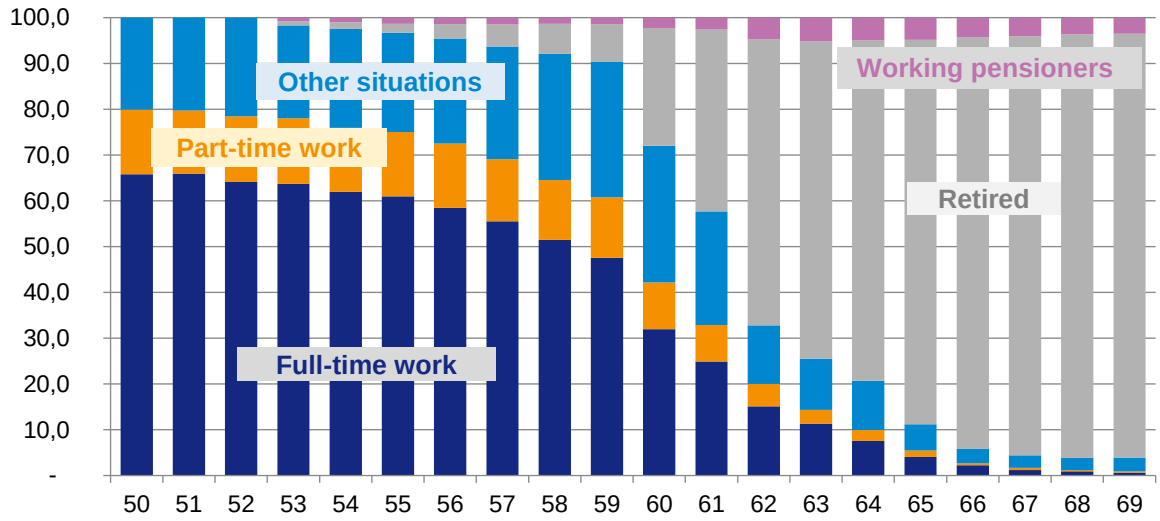


Note: Number in brackets denotes mean age of labor market exit.

Source: OECD (2019c) Pensions at a Glance 2019

Figure 11 shows that the detachment from the labor force starts much earlier than claiming a pension which has started at age 60 until recently, except for disability pensions and pensions due to a very early career start. At age 60, about 54% of men and 52% of women who were employed at age 55 have already left the labor force. This early exit happens much faster than in the average EU28, especially for men (Figure 12).

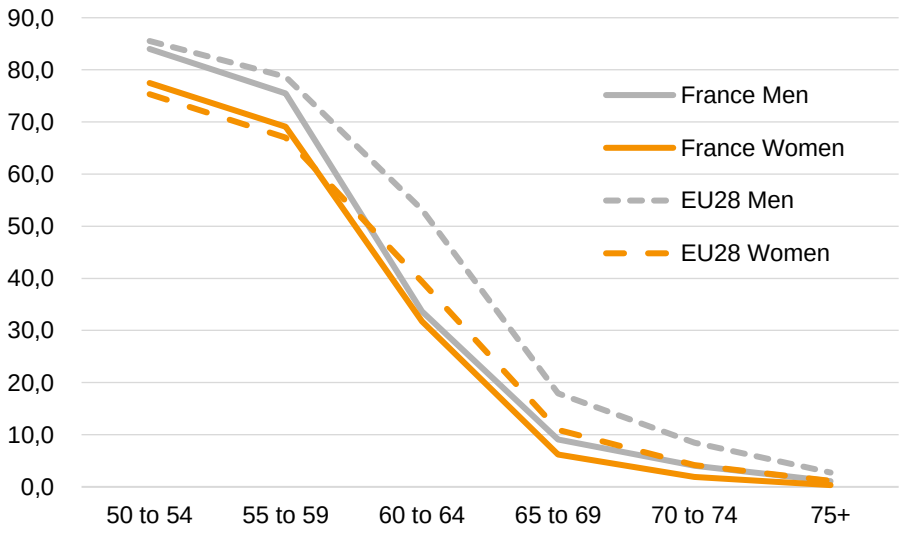
Figure 11 – Declining employment share after age 50, 2019



Note: See Figure 18 for a more detailed analysis of the "Other situations" category.

Source: COR Annual Report 2018, based on INSEE labor force survey and DARES calculations

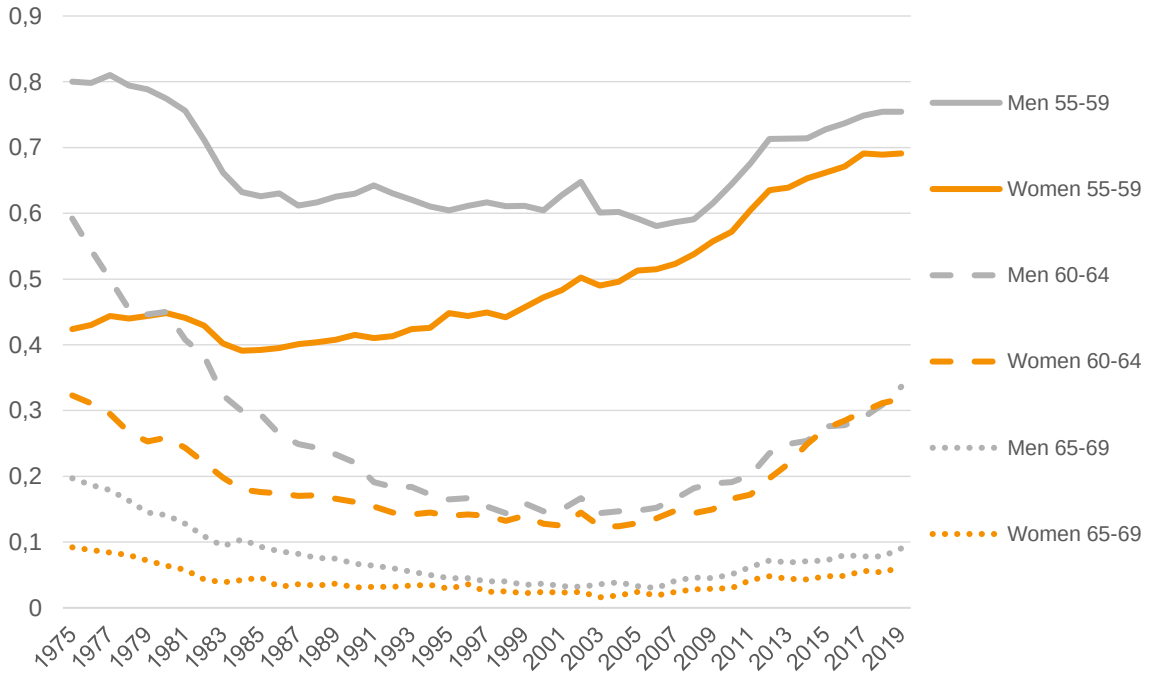
Figure 12 – Declining employment share after age 50, by sex, 2019



Source: OECD. Data extracted on 17 Oct 2020 18:15 UTC (GMT) from OECD.Stat.

Ironically, while men live about 10 years longer than in 1975, a smaller fraction are in employment at older ages than in 1975 (Figure 13). In 1975, about 80% of men aged 55-59 were employed, and about 60% of men aged 60-64. After 2000, the employment rate for men has rebounded. The recent increase offset about 20 years of previous decline but is still below what it was in the 1970's, especially among men aged 60 and older. The picture is different for women. Female employment among women younger than 60 years has strongly increased, less so, however, for older women.

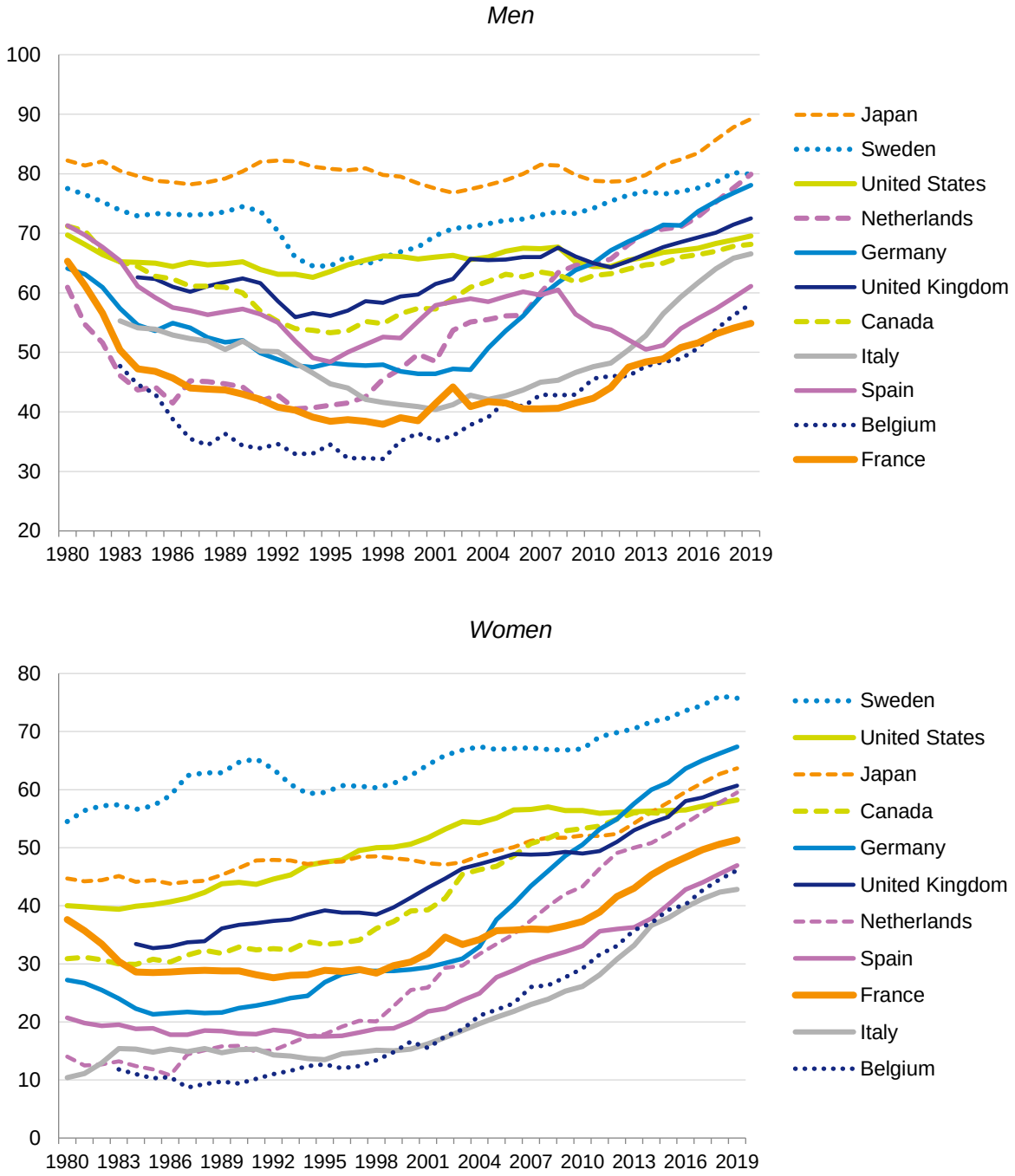
Figure 13 – Employment rates, 1975-2019



Source: 1975-1979: French LFS, 1980-2019: OECD

While the increase of old-age employment in France visible in Figure 13 is a good development, it has been weaker than in other OECD countries and remains lower than in Spain and Italy. This is shown in Figure 14 for men and women aged 60-64. Female employment has been substantially higher in France in the 1980's than in most other European countries with the exception of the Nordic countries. However, while the employment of women aged 60-64 has increased steadily since then in countries like Italy, Spain and Germany, it declined similarly to French male employment and only went up again at the turn of the century.

Figure 14 – Development of employment rates, ages 60 to 64, 1980-2019, in percentage



Source: OECD. Data extracted on 09 July 2020 16:47 UTC (GMT) from OECD.Stat.

One implication of a declining labor force share of the total population is a reduction in economic growth, more precisely, in GDP per capita. If labor supply and saving behavior remain unchanged, the decline in the labor force share translates into an equiproportional decline in consumption per capita, which may be regarded as a measure of overall economic well-being. Workers per capita is projected to decrease at 0.28% per year for

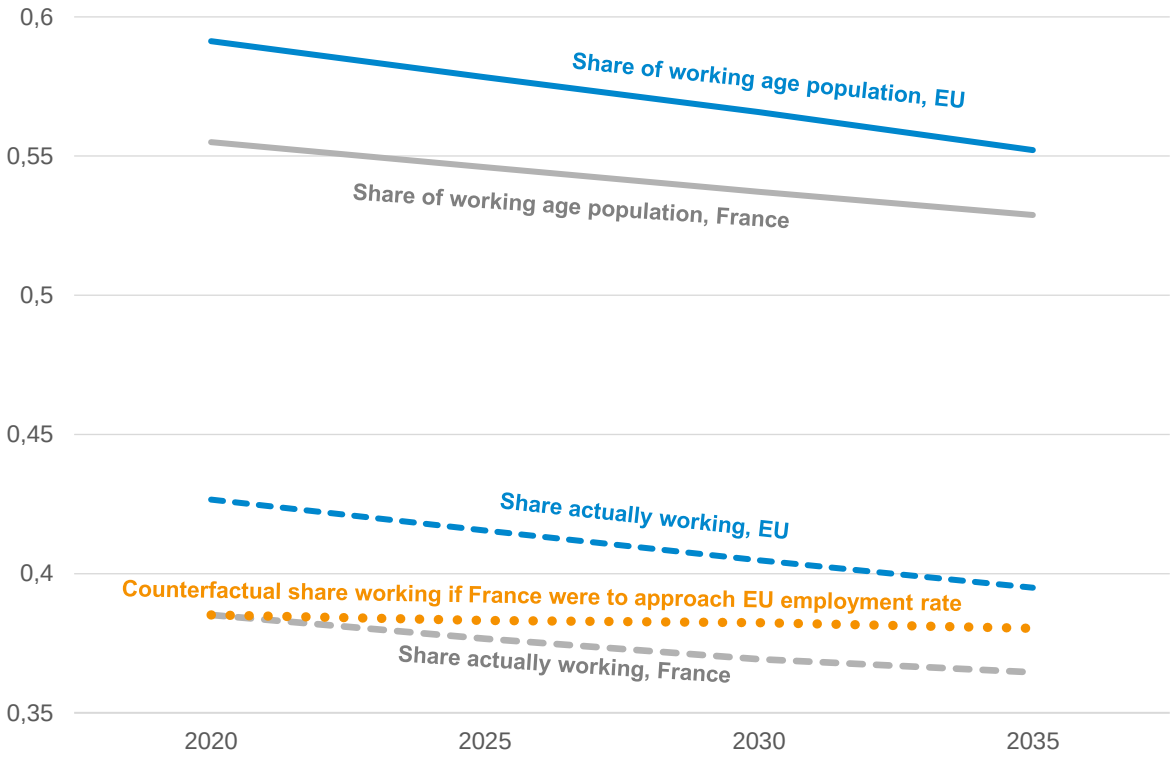
the next 15 years based on Eurostat's baseline projection. GDP per capita has increased at a rate of 0.81% per year averaged over the past 15 years in France (World Development Indicators, last updated from September 8, 2020, see also Figure 5). If the output per worker remains at this level, then population aging means that the growth pace of GDP per capita will decline by about a third over the next 15 years. The French economy will thus keep growing in spite of population aging. However, unless there will be an increase in labor force participation, growth will be only two-thirds of that what the French have been accustomed to.

Economic growth has a purpose. One is to finance the French social safety net, which will need more resources in the future due to population aging. Pensions, health insurance, unemployment insurance and the new long-term care insurance are financed by contributions and taxes that mainly depend on the number of people employed and their earnings. Population aging and its decline of the share of workers in the population imply a decline in pension revenues relative to pension expenditures as well as a decline in contributions to healthcare and long-term care when these services will have rising costs. A key general reform strategy thus must be to increase labor force participation in France, especially among older men, and their productivity.

Increasing labor force attachment of older individuals is not impossible. All industrialized countries shown in Figure 14 have managed to stop the trend towards earlier retirement and to increase the employment of older individuals, especially among men aged 60-64. The international group led by Börsch-Supan and Coile (2020 and 2021) has shown that much of this U-shaped pattern of recovery can be explained by reforms in the pension systems of the depicted countries, including France (Bozio, Rabaté, Tô and Tréguier, 2020), in particular by increasing the incentives to work longer and by increasing the statutory retirement ages such as the earliest and the normal eligibility ages.

The following simulations should clarify these points and show that – thanks to the mild population aging in France – relatively small steps suffice to compensate for the decreasing employment share. Figure 15 depicts the projected decrease in the share of the working-age population (solid lines) for France and the EU average. Due to the relatively high past fertility rate in France, the projected decrease in France (from 55.5% in 2020 to 53.7% in 2030, i.e. 3.2%) is lower than for the EU as a whole (from 59.1% in 2020 to 56.5% in 2030, i.e. 4.3%). The share of people in employment is much lower (dotted lines). Assuming the same labor market integration also in the future, the share of people in employment in the French population will decline from 38.5% in 2020 to 36.4% in 2030, i.e. by 4.1% during the next decade, or about 0.4% per year, thereafter declining less quickly, such that the average annual decline between 2020 and 2035 will be about 0.28%. However, if France were to approach the average employment rates in the EU within the next decade, there would be no decline of the share of people actually working (orange dotted line).

Figure 15 – Projected share of population at working age and actually working, EU and France



Source: Own calculation based on OECD employment rates 2019 and Eurostat proj_19np BSL

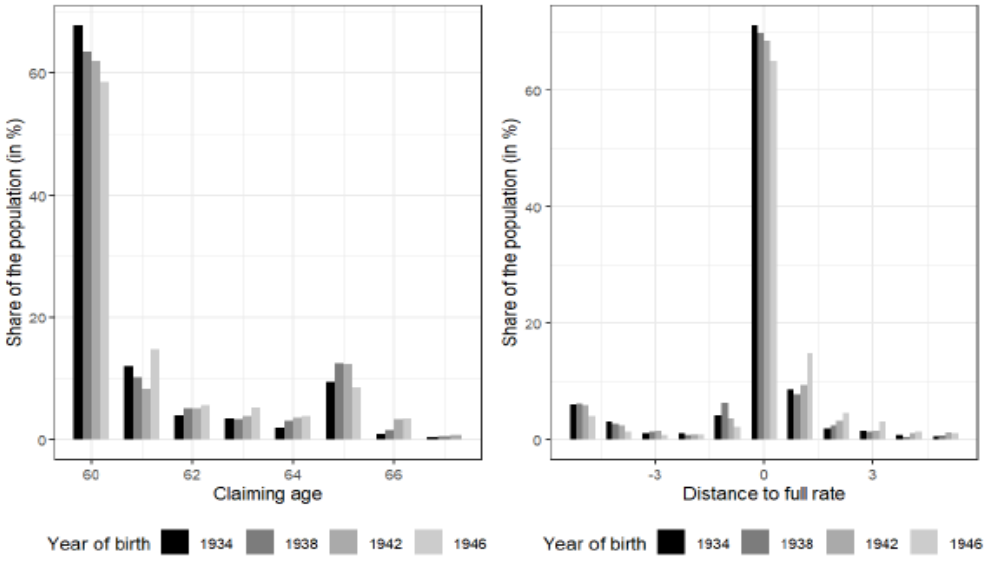
Section 2 will present a similar simulation for a higher labor force participation of migrants (see point 5). A mix of both policy objectives would fully offset the decline in economic growth that would emerge due to population aging without an increase in employment. The primary economic challenge of population aging is thus not demography per se, but the need of an adequate behavioral response to it, in particular a steady increase in labor force participation of older men in response to the increase in longevity.

2.2. Financial disincentives

Most French employees claim their pension benefits at the age of full rate.[1] This is shown in Figure 16 and indicates that there are strong incentives not to work beyond this age.

[1] The age of full rate is currently defined as the age at which a worker will receive a pension benefit that is 50% of the reference wage which as the average of the 25 best earnings years in a career. For a precise definition see the description of the French pension system in Appendix 12.

Figure 16 – Claiming behavior between 1994 and 2014



Source: Bozio et al. 2020, NBER ISS10 p.20, based on EIR-EIC

As underlined in the preceding section, Bozio, Rabaté, Tô and Tréguier (2020) provide econometric evidence that this is the case, based on work by Gruber and Wise (2004) and the follow-up work by Börsch-Supan and Coile (2020) who identified disincentives to working longer as a main driver of the low labor force participation in the 1980's and 1990's. Figure 17 shows that the remaining life-time pension benefits actually decline after the age of full rate. In other words, working past the age of full rate actually reduces life-time pension benefits since the fewer years of receiving benefits due to working longer are not sufficiently compensated by higher benefits.

Figure 17 – Accrual of life-time pension benefits by distance to age of full rate

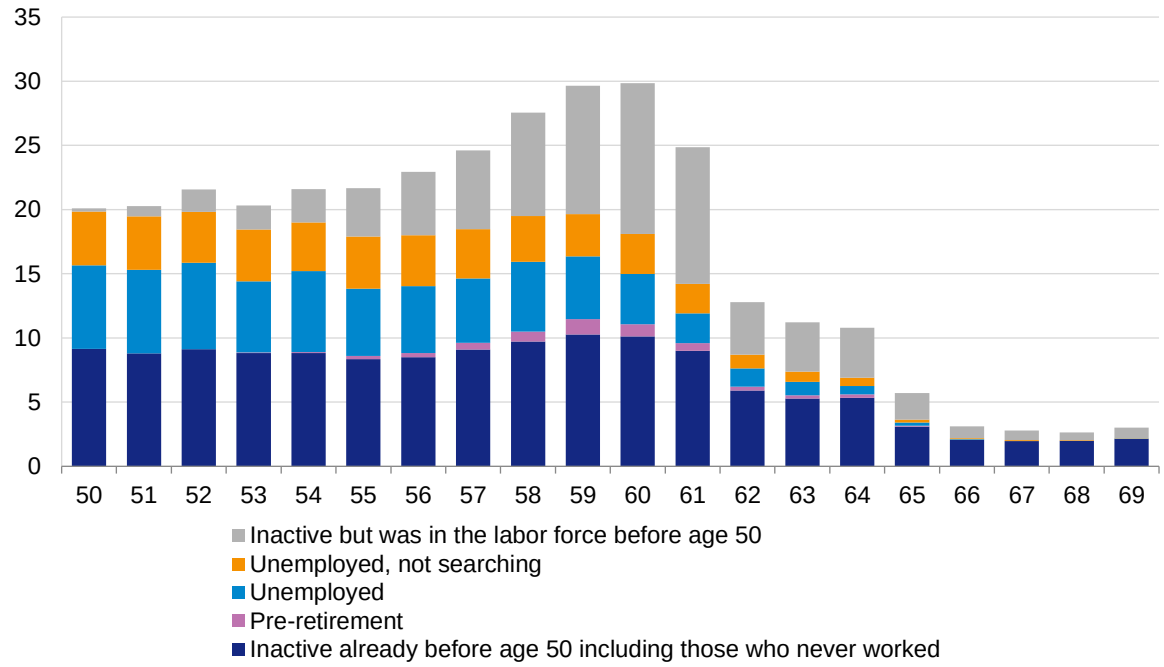


Source: Bozio, Rabate, To, and Treguier (2020)

The studies in Börsch-Supan and Coile (2020) show that lowering these disincentives was a significant cause for the reversal towards higher old-age labor force participation since the late 1990's (see Figure 14). Figure 17 shows that the disincentives in France have been reduced for later cohorts but not enough to be neutral because the accrual of life-time benefits remains negative. This will be addressed in our recommendations (Section 2).

Moreover, labor force exit starts much earlier than claiming a pension and often involves interim situations (see Figure 11). These interim situations are detailed in Figure 18.

Figure 18 – Declining employment share after age 50, 2019



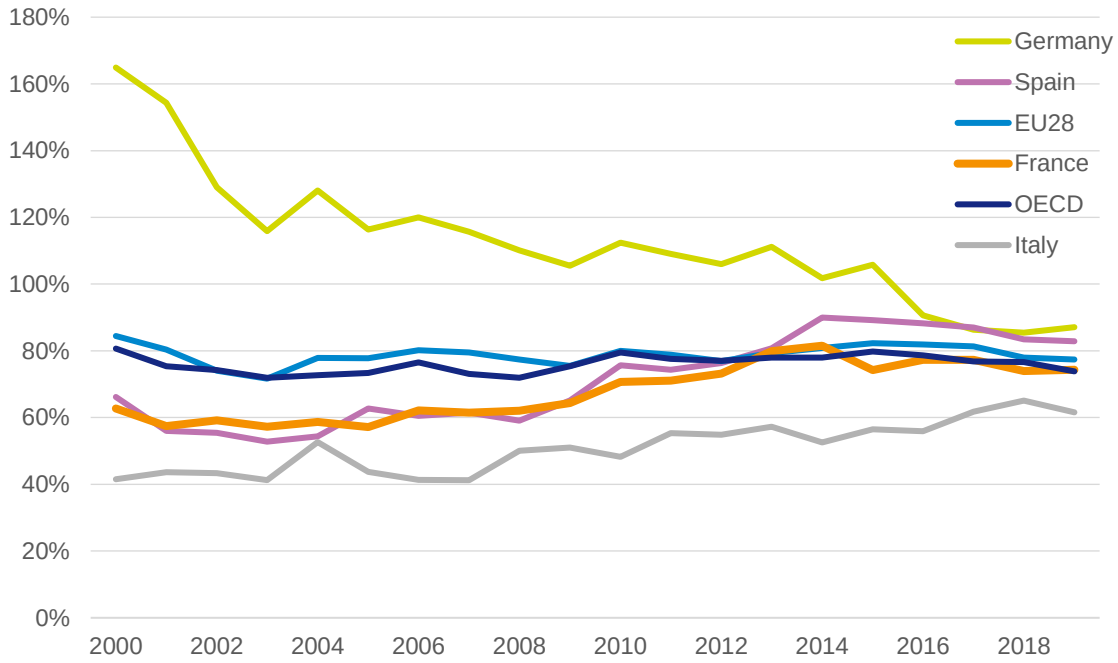
Source: COR Annual Report 2018

Besides a very small share of people in pre-retirement, one reason for labor market exit before pension eligibility is unemployment. The unemployment rate in 2019 was 6.4% for men aged 55-59, slightly higher than in Italy and substantially higher than on average in the EU (4.9%) or in Germany (2.7%) for this age group although it is still substantially lower than youth unemployment in France (20.4 for men and 16.2 for women aged 20-24, OECD Employment Statistics). This is a recent phenomenon. Until 2013, France had an unemployment rate for 55-59-year-old men lower than the EU average, and much lower than in Germany.

However, while the recent old-age unemployment in France may be a reason for concern, it is not the core problem of lacking old-age employment. As a matter of fact, while unemployment among older men rose in France during the last about 20 years relative to overall unemployment and declined in Germany, it is still lower in relative terms than in

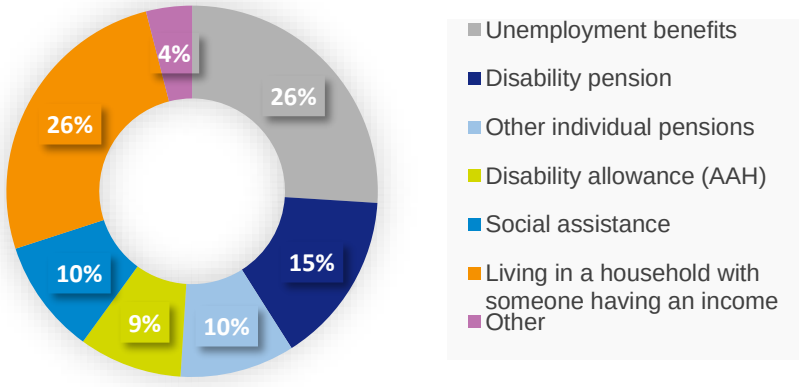
Germany and about the same as the EU and OECD averages (Figure 19). The challenge is less unemployment than inactivity. It is the largest interim situation in Figure 18, often implying a reliance on social benefits (Figure 20).

Figure 19 – Unemployment rates of men age 55-59 as a percentage of the overall male unemployment rate



Source: OECD. Data extracted on 31 August 18:22 UTC (GMT) from OECD.Stat

Figure 20 – Income of persons neither in employment nor in retirement or early retirement (53-69-year-olds, end of 2015)



Source: France Stratégie (2018), Les seniors, l'emploi et la retraite

The high frequency of non-employment situations is obviously not related to pension reforms or beliefs about retirement since it starts much earlier in life than the earliest eligibility age for pensions. It is not a universal phenomenon and not an unavoidable implication of later eligibility ages for public pensions. The German counterexample is notable, especially since early retirement has been made harder after 2013 and the statutory retirement age has been increasing since 2011. Not only did unemployment decline in Germany but also non-employment, while employment of older men strongly increased (see Figure 14). Econometric evaluations detailed in Section 2 (3.2) provide evidence that this was caused by the reforms of the German labor market institutions between 2002 and 2007. This motivates the recommendations for labor market policies in the next section adressing the early detachment from the labor market in France.

2.3. Motivational and perceptional impediments for old-age employment

While the financial disincentives against working past the age of full rate need to be addressed through pension reform, there are also additional motivational and perceptional impediments, which discourage the employment of older individuals, both on the supply and the demand side of the labor market.

Four impediments stand out. Among employees, the European Social Survey reports that 35% of men and 40% of women believe that age 60 is “generally too old to be working 20 hours or more per week”. This mainly based on perceptions of failing health which we will address in point 3. Second, job satisfaction is low in France and appears to drive workers in France earlier into retirement than workers in other European countries. Third, among employers, there is the perception, but no evidence, of a decline in productivity at relatively early ages. This is in line with age discrimination that appears more widespread in France than in other European countries. Finally, the belief that older workers should make place for younger workers drives many decisions in companies and politics – although, in general, this belief is based on a fallacy.

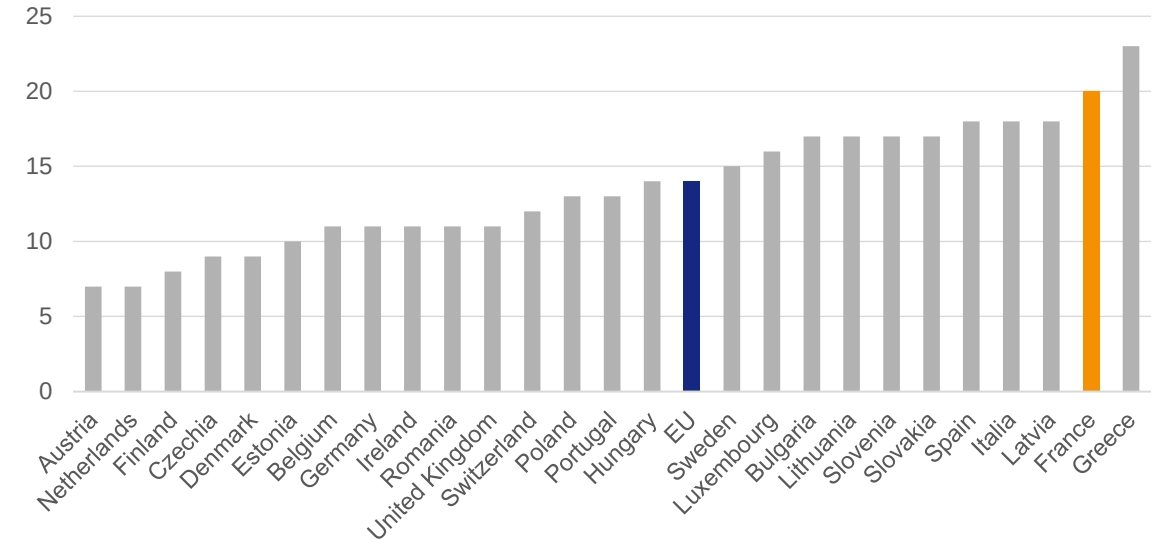
Job satisfaction is low and affects early retirement

French workers report a very low job satisfaction (Figure 21). 20% of French workers state that they were not very or not at all satisfied with their job, 43% more (6 percentage points) than the EU average.

Siegrist et al. (2006) relate two dimensions of job satisfaction to the intention to retire at the earliest age possible. Figure 22 updates their analysis and shows that the low rewards for their efforts makes French workers wish for an early retirement. The odds ratios on the x-axis indicate how many more workers want to retire at the earlier opportunity if they have low rather than high control over their jobs (left panel) or are badly rather than well awarded for their efforts (right panel). The red dot indicates that French workers who have low

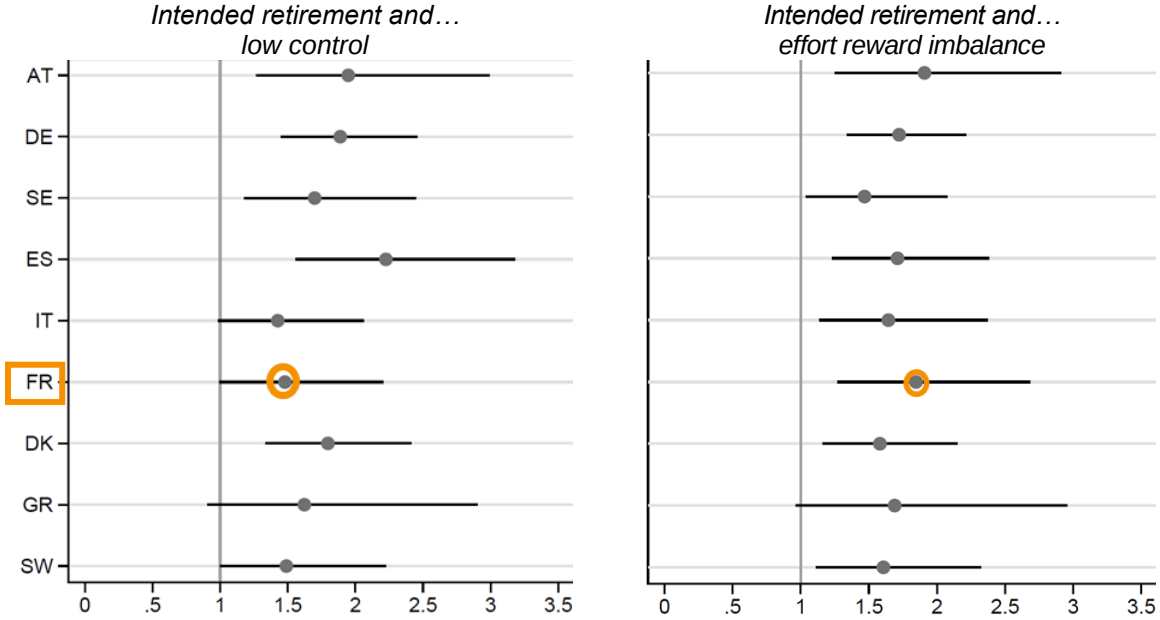
control over their job (left panel) are about 1.5 times as likely to intend to retire as soon as they have this possibility, while French workers whose efforts are not well rewarded (right panel) are 1.8 times as likely to retire at the earliest possibility.

Figure 21 – Job dissatisfaction



Source: European Work Condition Survey (Eurofound 2017)

Figure 22 – Effect of lacking job satisfaction on intended retirement



Odds ratios and 95% confidence intervals

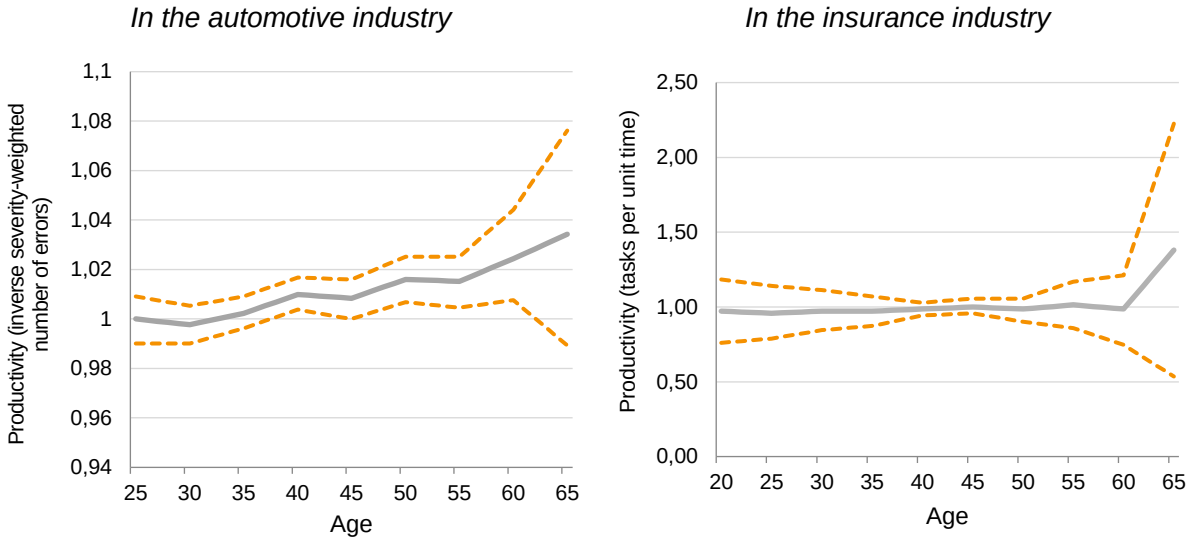
Source: Own calculations based on SHARE wave 6

Productivity of older workers remains high

Another impediment against working longer is the impression that human productivity rises quickly until it reaches a peak at a relatively young age and then declines. This idea is widespread and implicit in many discussions about aging. Even in the macroeconomic literature, one usually assumes an increasing and then decreasing profile with a peak somewhere between age 30 and 45 (e.g., the seminal work by Altig et al., 2001). Often regarded as an established fact, it has profound implications for personnel policies by employers and retirement choices made by employees. It is used as a motivation for early retirement policies in many countries. Moreover, if the impression were true, population aging would have negative effects on overall productivity as the share of older workers is increasing.

Microeconomic evidence differs from these "stylized facts" (Aubert, 2003; Aubert and Crépon, 2007; Malmberg et al., 2008; Göbel and Zwick, 2009; Börsch-Supan and Weiss, 2016; and Börsch-Supan, Hunkler and Weiss, 2019). These studies, which take great efforts in correcting their estimates from selectivity effects, find that there is an initial increase in productivity, probably a learning effect, but then productivity remains flat until the early eligibility age (Figure 23).

Figure 23 – Age and productivity



Note: The solid grey line is the average productivity while the dotted orange lines indicate the range in which 95% of all productivity observations lie.

Source: Börsch-Supan and Weiss (2016), Börsch-Supan, Hunkler and Weiss (2019)

Therafter, most workers have left the labor market. Average productivity is still increasing between age 60 and 65 but this cannot be measured precisely. An important insight of the study by Börsch-Supan, Hunkler and Weiss (2019) is the heterogeneity behind the right panel of Figure 23 (see Appendix 18). Employees with routine tasks (about 21% in their sample) experience a declining productivity, while workers with advanced tasks (about 7%) have a statistically significant increase until age 65. However, the majority of tasks (about 72%) exhibit a flat age-productivity profile.

The belief that productivity peaks at relatively young ages and is low already in the 55-64 age interval is accompanied by what appears to be straightforward age discrimination or at least mistrust against older workers. 76% of managers state that "an age over 55 years plays against a job candidate" (France Stratégie, 2018, based on Eurobarometer 2015). This is the third highest value in the EU, and 15 percentage points larger than the EU average.

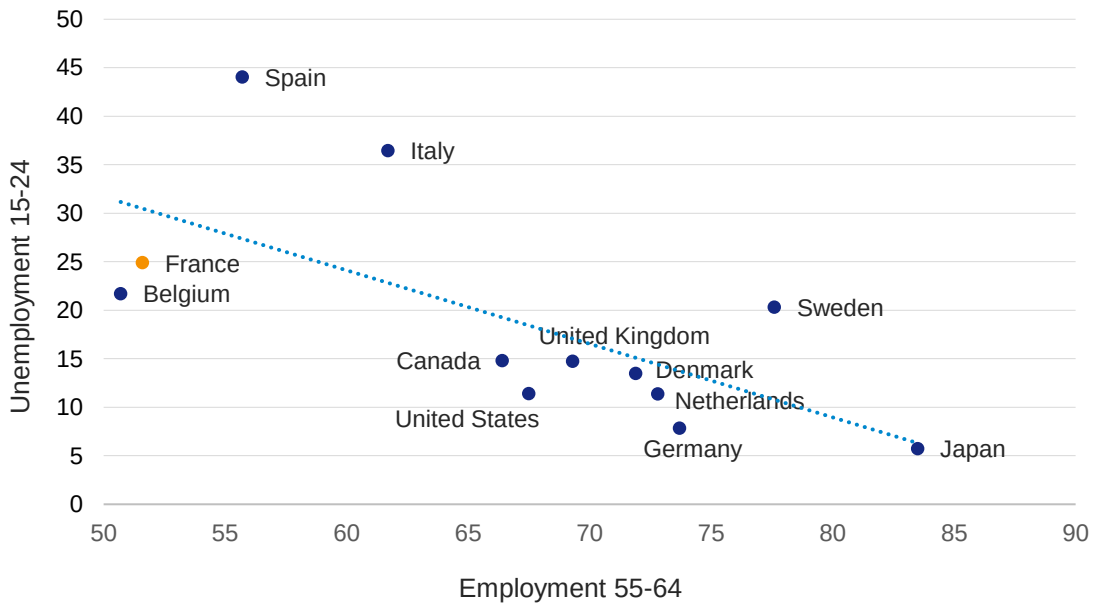
Old-age employment does not increase youth unemployment

Finally, a very strong perceptional impediment that hinders old-age employment rests on the so-called lump-of-labor fallacy, probably the most damaging fallacy in economics (e.g., Eurobarometer 56.1, much stronger in France than the European average). It comes in many forms. While claiming that women crowd out men has become politically incorrect, the very same fallacy is still alive when it concerns migrants or older workers. It has been a strong argument for the 35-hour week in France and the resistance against the *âge pivot* in the Delevoye plan. The belief is deeply rooted in the analogy to a small enterprise with a fixed and small number of clients which have a fixed demand for the product of the enterprise. Such an enterprise is boxed into a fixed amount of output, and therefore can only employ a fixed lump of labor.

Figure 24 suggests that this boxed-in enterprise is not a good analogy to a sufficiently large economy. It shows that in cross-national comparison, higher employment of older individuals is actually *positively* correlated with higher employment of the young, i.e., countries with a high prevalence of early retirement have, in general, *higher* unemployment rates and *lower* employment of the young.[1] Notably, France is a country with very low old-age employment but relatively high youth unemployment. Nevertheless, the misconception of a fixed lump of labor which has to be shared between the old and the young keeps dominating much of the policy debate on pension reform.

[1] The R-squared of the correlation is 45%. This is not driven by the outliers Greece and Spain. Without these countries, the positive correlation gets even stronger (R-squared 57%).

Figure 24 – Old-age employment vs. youth unemployment



Source: Own calculations based on OECD Employment Outlook 2020

Microeconometric evidence supports this macroeconomic correlation and provides a causal interpretation for Figure 24. Gruber and Wise (2010) use pension design changes in 11 countries as instruments to identify how higher or lower employment of older individuals has affected the employment of the young. Its German country chapter (Börsch-Supan and Schnabel, 2010) provides a particularly neat case since three strong and isolated reforms in the years 1972, 1984, and 1998 can be identified that dramatically changed retirement incentives. Their regression analyses show positive correlations between youth employment and increased work incentives for the older workers. Their causal interpretation is that early retirement has substantial increased pension expenditures which has increased the contribution rates and thus labor costs for employers, therby reducing labor demand.[1] The results in the other countries in Gruber and Wise (2010) vary considerably across specifications, many remain insignificant. Of the significant ones, almost all support a causal interpretation of the negative correlation between old-age employment and youth unemployment visible in the time series data of Figure 24.

Hence, the suggestive power of the often invoked analogy of a small enterprise with a fixed and small number of clients as a model for a sufficiently large economy and a sufficient time to work out shocks is grossly misleading. In contrast to such a small

[1] About 25% of pension expenditures are related to early retirement in Germany. Contributions are born 50% by employers.

enterprise, entire economies can grow, increase the demand for all goods and services, and therefore also the demand for labor. Moreover, costs for early retirement cannot be put on somebody else's shoulders as enterprises often can do it. In an entire economy, all social transfer expenses have to be borne by tax and contribution payers. Since costs for early retirement increase total labor compensation of the young, thus make their labor more expensive, early retirement for the old causes less employment of the young. It should be stressed, however, that the boxed economy paradigm has value for firms and sectors which are stagnant or in decline; furthermore, such crowding out is a typical phenomen in a transition period, e.g., during a major recession when labor demand is low (Boeri and Garibaldi, 2019).

3. Health of Older Workers

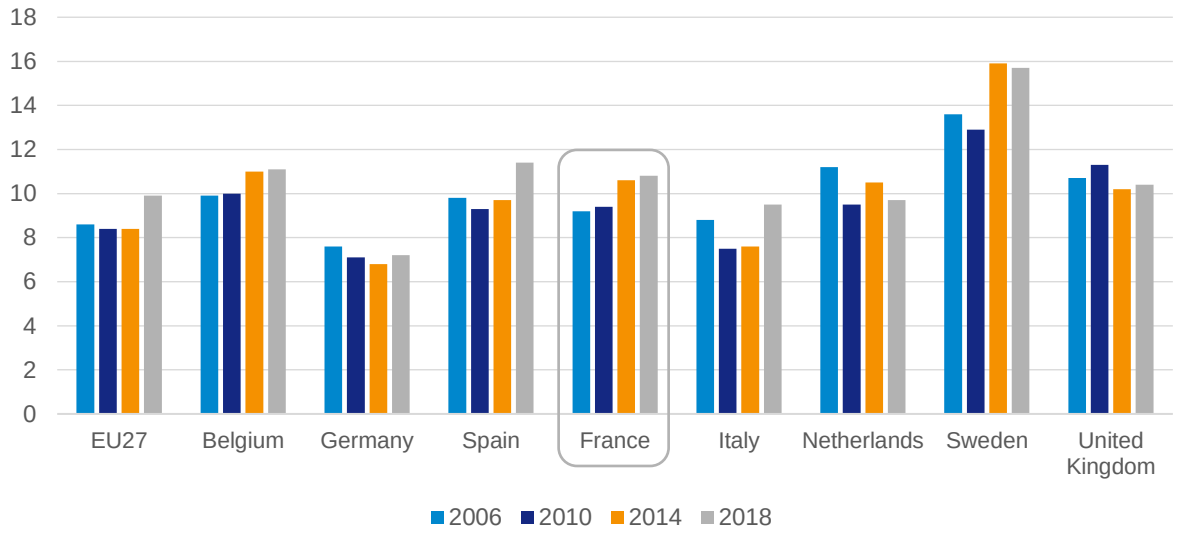
As pointed out in 2.3, there is a widespread perception among French employees that health declines in a way such that age 60 is "generally too old to be working 20 hours or more per week". This is not true for the average French employee (3.1). However, France displays, as many other countries, large health disparities, which correlate with socio-economic status (3.2). While those in less good health are generally less likely to be in work, the relationship between work and health is complex (3.3).

3.1. Average health

Tere are many measures of good health. One measure related to the ability to work is the absence of functional limitations. Figure 25 (next page) uses the "disability-free life expectancy" at age 65 as reported by Eurostat. It measures the time between the age of 65 and the first occurrence of a limitation in one of ten daily activities such as walking 500 m, stepping up one flight of stairs, or carrying a bag of 1 kg. Figure 25 shows that the average functional health of older French individuals is similar to their European counterparts.

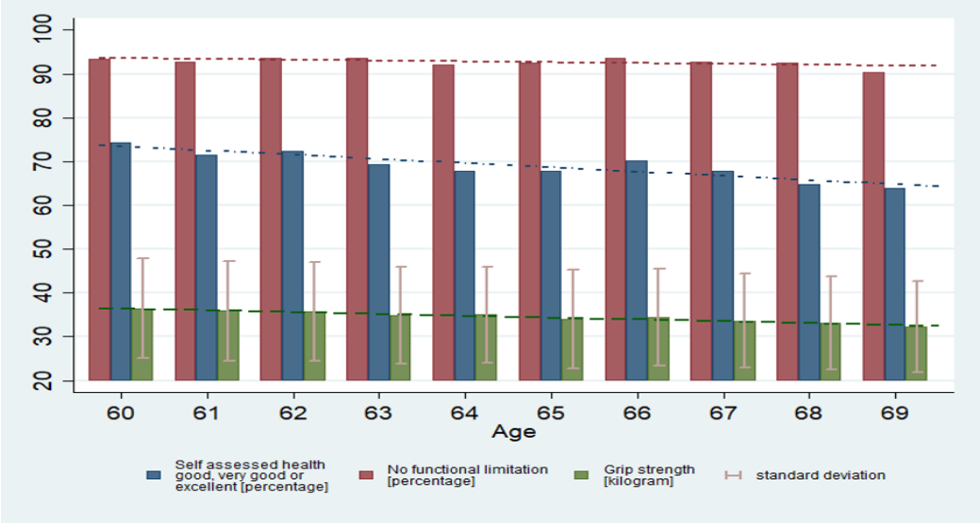
Figure 26 provides a closer look at health during the common "retirement window", i.e. the ages between 60 and 69, using three measure of health with increasing objectivity. It is based on the most recent SHARE data for France. The most subjective measure is an answer to the question "how do you rate your health" with answers ranging from excellent to poor. More objective is the functional health as used for the disability-free life expectancy in Figure 25. Finally, SHARE measures the strength of a hand's grip which measures the declining muscle strength in older ages.

Figure 25 – Disability-free life expectancy at age 65, in years



Source: Eurostat (2020) [TEPSR_SP320]

Figure 26 – Subjective and objective health measures in France during the retirement window

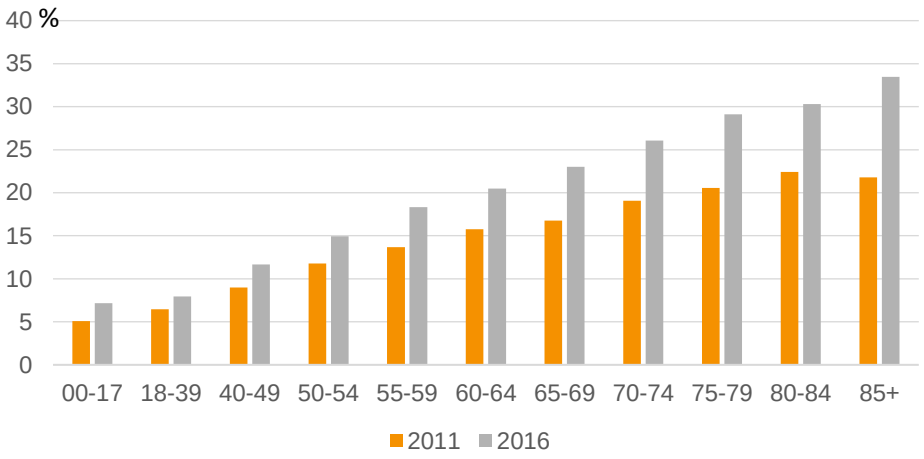


Source: Own computation based on SHARE Wave 6 (2016)

Most people in the 60-69 age range perceive themselves as relatively healthy and perform well on the basis of both objective and subjective measurements. All three health measures decline with age, particularly self-reported health, while functional health, defined as in the previous figure, declines only very little. Although the most objectively measured physical health measure (grip strength) declines between ages 60 and 69, that decline is much smaller than the variation within each age group (shown as error bars for the grip strength measure).

However, not all of life is spent in good health. Worldwide, the incidence of chronic illness and co-morbidities has grown and France is no exception to this trend (see Figure 27, and Appendix 16 for definition). In France, between 2007 and 2011, around 15 million people suffered from a chronic disease. While all age groups are affected, older individuals are more affected (HCSP Stratégie nationale de Santé, 2017) as shown in Figure 27.

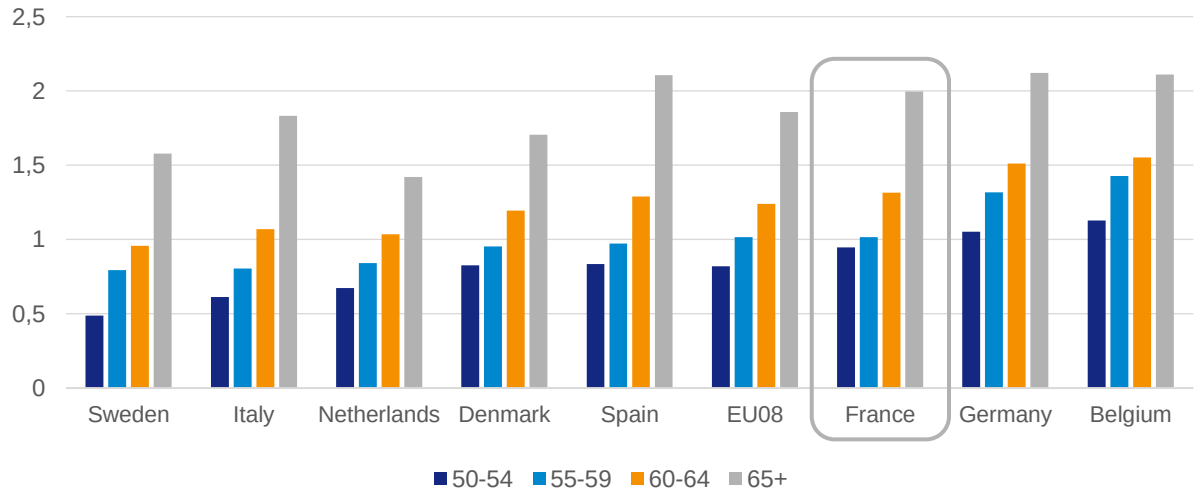
Figure 27 – Share of individuals with at least two chronic conditions, France, 2011 and 2016



Source: Grangier (2018)

In comparison with other Western European countries, some with substantially later retirement ages, France has similar levels and age gradients of chronic conditions to the average of the eight countries shown in Figure 28.

Figure 28 – Number of chronic conditions in Europe

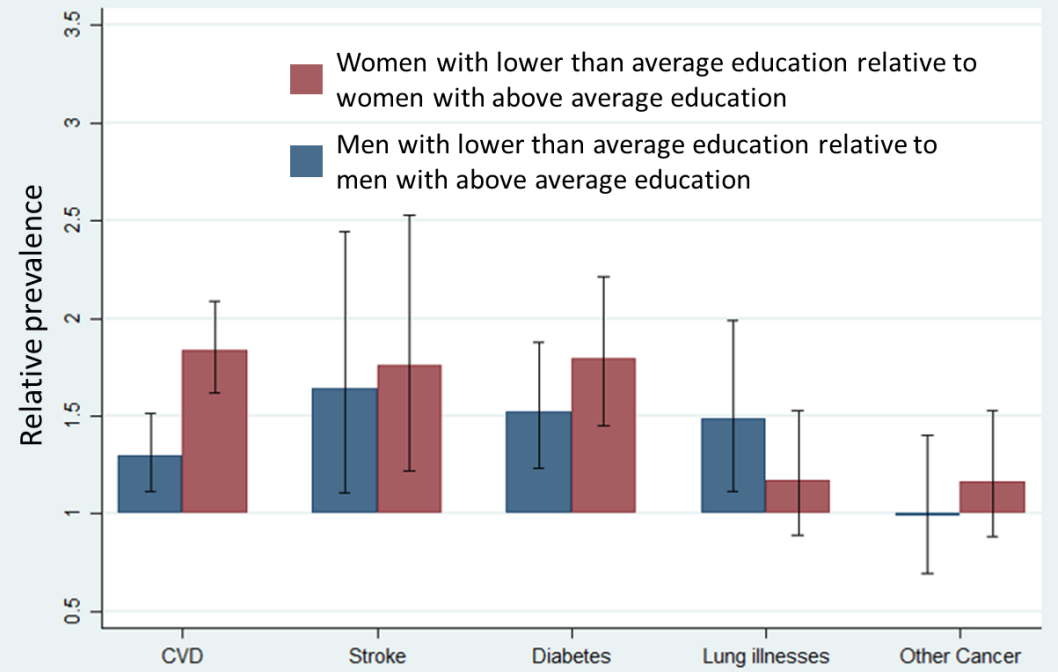


Source: Own computations based on SHARE Waves 6,7 and 8

3.2. The average health masks large health disparities

The main concern is thus not the health of the average French worker at an older age, but rather the health disparities between those with good and those with poor health. This variation is socially graded. Figure 29, based on SHARE data, shows large differences by education group. Some illnesses exhibit particularly large gradients while many cancers show none. For example, diabetes is 1.8 times more prevalent for women with lower than average education, while lung illnesses (mainly lung cancer) are 1.5 times more prevalent for men with low education, relative to individuals with above average education.

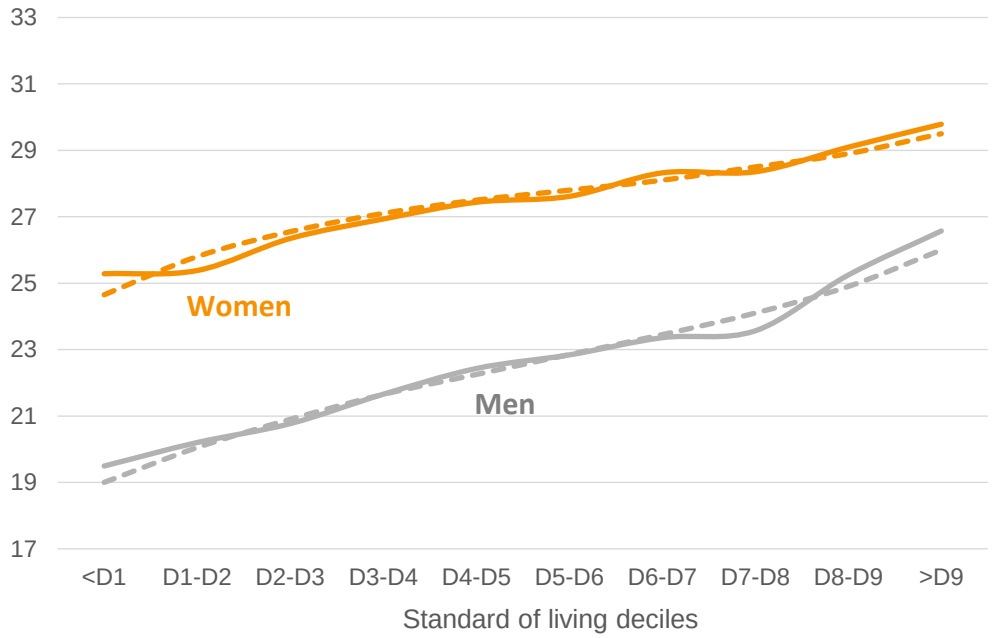
Figure 29 – Relative frequencies of chronic illness by education in France, 2015-2020



Source: Own tabulations based on SHARE Waves 6,7 and 8

The socio-economic gradient in morbidity extends to mortality. Figure 30 shows that the difference in life expectancy at age 62 between people in the highest and in the lowest deciles of equivalized household income is about 6.5 years for men and 5 years for women. INSEE data (2018) show an income gap in life expectancy at age 30 between the 5% people with the highest income and the 5% with lowest income of 8.3 years for women and for men of 12.7 years. A similar gap exists by education. Mackenbach et al. (2019) document a gap of 3.7-years for men and 1.6-years for women of life expectancy from 35 between high and low educated individuals in France.

Figure 30 – Life expectancy at age 60 by equivalized household income deciles



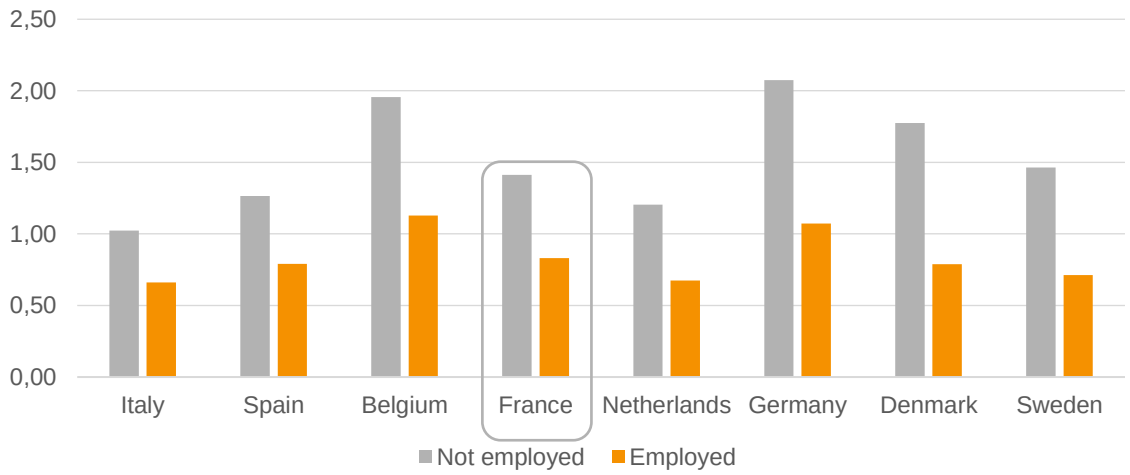
Source: Broken line: France Stratégie (2020b) based on the Wealth Survey (2010) and the Permanent Demographic Sample (2017) of Destiny. Solid line: Blanpain (2018)

There are systematic reasons for the large variation of health at given age. The factors associated with differences in health by socio-economic status (SES) are complex and many. Factors which are associated with quality of health include gender, ethnicity, early life events, education (e.g. Miguel and Kremer 2004, Fogel et al., 2011), work conditions and work stress (Siegrist et al. 2005; Bryson and Ilmakunnas, 2012), the environment, behaviour and features of the healthcare system. Thus while the socio-economic gradient visible in Figure 30 is substantial and statistically significant, it explains a relatively small share of the total variation in mortality.

3.3. Employment and health

Generally speaking, those in less good health are less likely to be in work (see also Appendix 16). Figure 31, based on eight countries covered by SHARE, shows that those aged 55-59 who are employed have fewer chronic conditions than those who are not.

Figure 31 – Number of chronic conditions by employment status, 2015-2020

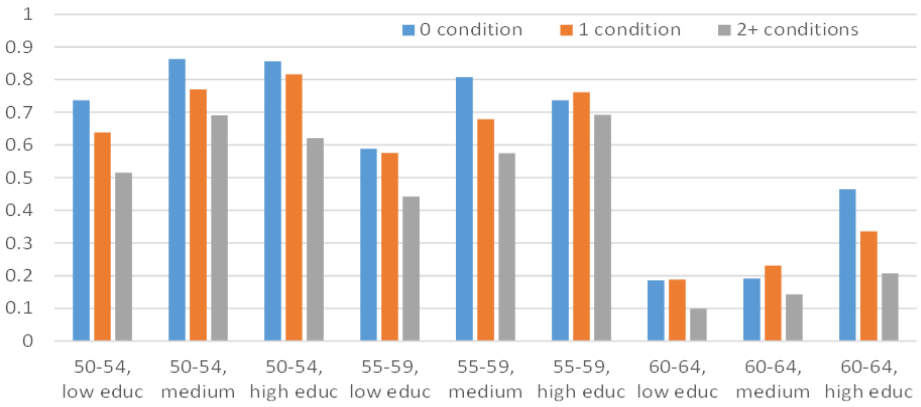


Source: Own tabulations based on SHARE Waves 6,7 and 8

However, while France has a particularly low employment rate among older individuals in international comparisons, this does not primarily seem to be driven by the prevalence of chronic illnesses. Analysis of SHARE data shows that in EU countries in which a higher proportion of those aged 55-59 are employed, the non-employed are relatively sicker, thus indicating that as employment in this age group expands so does the share of individuals with chronic conditions who are employed (Appendix 16). This illustrates that the relationship between work and health is complex and driven not only by how work affects health and how health affects ability to work, but also by a large range of social and institutional factors, including the social security system, government and employer support for individuals who have health problems and social norms on the macro level and personal characteristics on the micro level. Recent analyses of the impact of health on work ability have concluded that, on average, long run changes in health status are not the reason why older individuals are not in the labour market, either in France or a number of EU countries (Coile et al., 2017).

However, cross-sectionally there is a strong association between health and employment. Figure 32 shows the employment rate by age, education and chronic conditions in France. The Figure shows a strong education gradient, such that individuals in the lowest educated group are less likely to be employed than those of the same age with more education. Within each age and education group, the employment rate broadly falls as the number of chronic conditions rises, but there is also interaction between education, chronic conditions and age. The employment rate of those aged 55-59 with low education – regardless of their health status – is lower than all individuals in the other two education groups.

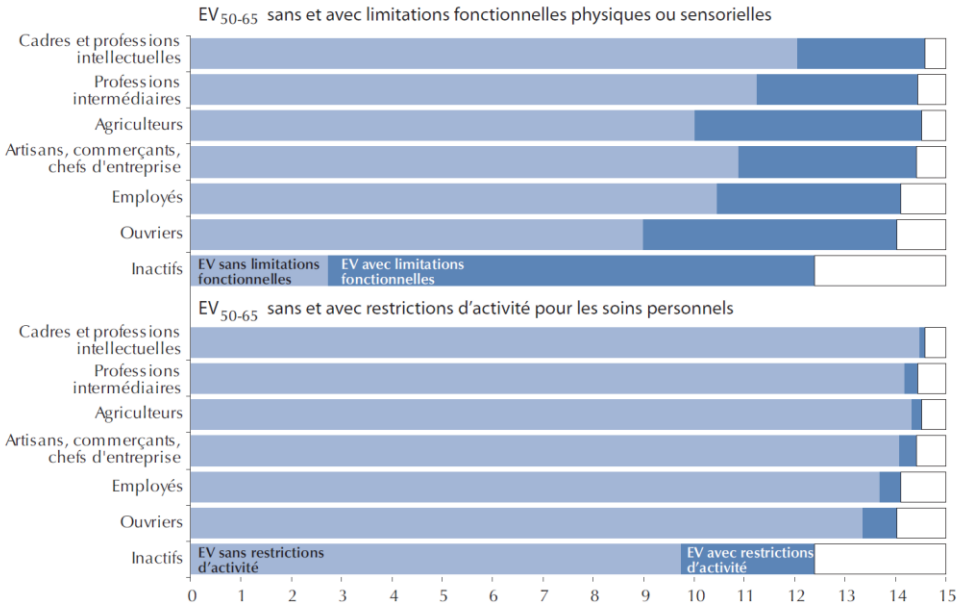
Figure 32 – Employment rate by age, education and number of chronic conditions, France, 2015-2020



Source: Own tabulations based on SHARE Waves 6,7 and 8

These associations play out in terms of length of life. Figure 33 shows the association between health status and expected length of life by occupation for those aged 50-65 in France in the first decade of the 2000's. In the top panel the light blue bars show the expected length of life without limiting conditions and the dark blue bars the expected length of life with limiting conditions. The bottom panel shows life expectancy split by years without and with restrictions on the ability to undertake personal care.

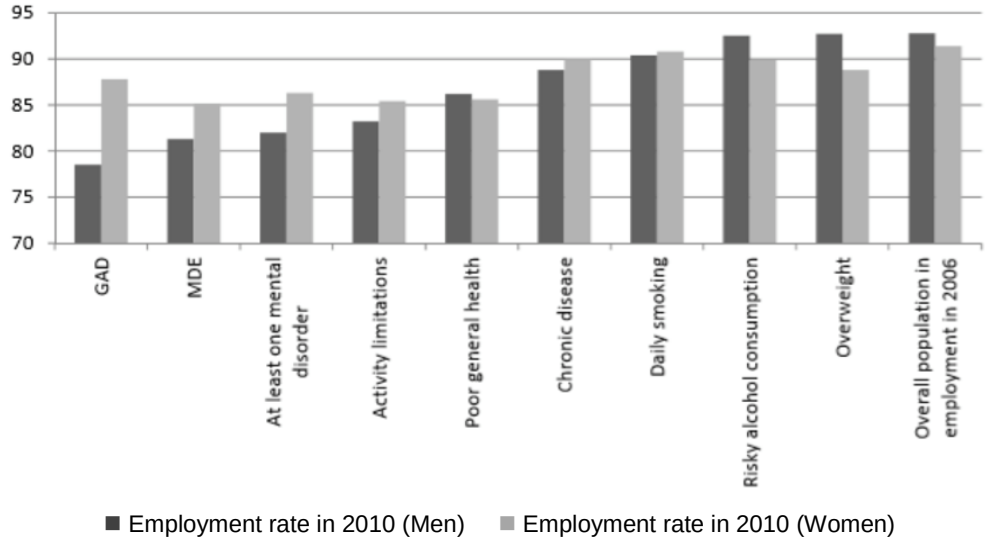
Figure 33 – Health status and life expectancy (EV) by occupation



Source: Cambois E. and Robine J.-M. (2012), "Tendances et disparités d'espérance de vie sans incapacité en France", Actualité et dossier en santé publique, No. 80, "20 ans de santé publique", September. N.B.: these data are old due to a lack of available updates.

The Figure clearly shows that those in higher occupational groups live longer, that fewer of those years are subject to limitations and that those individuals who are not working in the 50-65 age group have considerably shorter expected lives and considerably more of them are spent with health limitations. The graphic of course does not show the causal direction: those who are unhealthy may work less or leave the labour market, but difficult working conditions can also accelerate the depreciation of health "capital". Certain occupations are more likely to be associated with poor health. Hardship factors at work include exposure to marked physical constraints, a harmful physical environment and certain work rhythms (e.g. shift work) and psychosocial factors (*Plan Priorité Prévention*, 2018). Certain chronic diseases are linked to lack of work. While musculoskeletal disorders are the leading cause of compensated occupational diseases, other chronic diseases linked to lack of work include diabetes and mental health. Mental health accounted for 15% of the expenses of the French national health insurance fund for salaried workers in 2011 (Barnay and Defebvre, 2016). Not only are those suffering with mental health issues less likely to be employed, they are also more likely to lose their job. Figure 34 shows French employment rates by reported health status and alcohol and tobacco consumption. GAD (anxiety) and MDE (depression) are associated with the lowest employment rates amongst males. Their employment rate is much lower than for the overall population rate but is also lower than those who report having a chronic disease of any kind.

Figure 34 – Employment rates according to self-reported health status in France, in 2010



Field: individuals aged 30-55 in employment in 2006.

Source: Sip (2006). Quoted from Barnay & Defebvre, 2016

Regardless of the causal direction, integrating individuals with chronic illnesses fully into the labor market in France requires special efforts. Saliba et al. (2007) estimated that in the early 2000's in France, it was twice as likely that a man would work part-time if he had a chronic illness, while a woman was 50% more likely. Within the older cohort of working age individuals (aged 50 to 64), chronic diseases multiply the probability of being out of work by 3-fold, the probability of retirement by 2-fold and the probability of being unemployed, compared to being employed, by 1.5-fold. Not only are those with chronic illness less likely to be employed, they are also more likely to face career interruptions and more prone to be victims of discrimination (Dominique et al., 2007; Hullier et al., 2007). However, there are also a significant number of individuals who have long-standing illnesses who are employed. Eurostat figures for France in 2012 showed that over ¼ of those who are employed state they have a longstanding illness or health problem.

This evidence leads to several conclusions. First, health is not the primary cause of retirement in France for most workers since health is good for most individuals even after the statutory retirement age. Second, shifting the average labor force exit age by two years is not bound to fail due to health problems. These conclusions hold for the average. Third, the variation of health for any given age is large. Hence, a common fixed retirement age for everybody is not appropriate given this heterogeneity. Workers with health problems need to be given the opportunity to retire earlier. Fourth, there needs to be support for those with long-term conditions to remain in the labour market. Fifth, interventions are needed to prevent the rise in long-term conditions impacting on the employment patterns of the next generation coming up to retirement.[1]

4. Labor Market for Immigrants

4.1. Low activity and employment rates among immigrants

Even though the non-migrants' employment rate is also quite low, migrants have an even lower employment rate and the native-migrant gap is substantial (Table 3). Migrants low employment rate does not only have many disadvantages for those affected by it. A higher employment level in this group would also alleviate the problems of the French pension system that we have outlined above. If immigrants were employed at comparable levels as the French, the number of working people would increase by 267,000. This is half of the

[1] France saw a large rise in education in the 1980's which affects individuals currently in their 40s. There is a strong positive association between education and health. This might act as a brake on the average increase of chronic illness amongst future retirees. However, the problem of social disparities in health within this group and the association of poorer health with lower income and poorer jobs will remain.

increase in numbers we would see if the French aged 55-64 (that are at the core of the reforms suggested above) were as many to be in employment as their fellow EU28 citizens in the same age group.

Table 3 – Immigrants' labor market outcomes in selected OECD countries

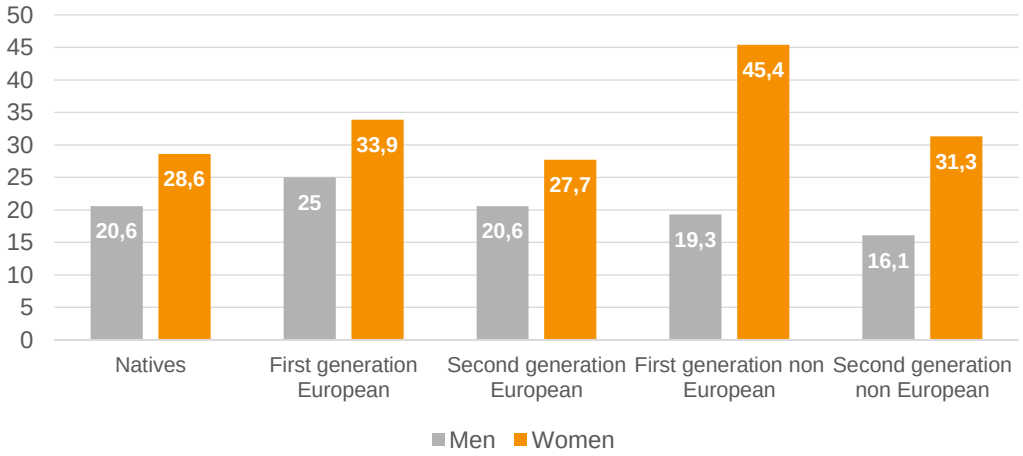
	2018		Gap with the native-born in 2018	
	Unemployment rate *Percentages*	**Employment rate** *Percentages*	**Unemployment rate** *Percentage points*	**Employment rate** *Percentage points*
France	**14.6**	**58.5**	**6.3**	**-7.9**
Austria	9.4	68.0	5.7	-6.4
Belgium	11.5	58.3	6.8	-7.7
Denmark	9.8	66.4	5.5	-10.6
Finland	14.1	62.2	7.0	-10.6
Germany	6.0	69.5	3.1	-8.1
Greece	28.6	52.8	10	-2.3
Ireland	7.2	70.7	1.8	2.7
Italy	13.7	60.9	3.4	2.8
Netherlands	7.0	64.9	3.6	-14.3
Spain	20.7	61.6	6.5	-1.0
Sweden	15.7	66.7	11.8	-14.1
United Kingdom	4.7	73.7	0.7	-1.2

Source: OECD (2019b), International Migration Outlook 2019, OECD Publishing, Paris, p. 78

There has been little change in migrants' employment rates in France over the last decade, either for recent migrants or for settled ones (OECD 2019, p. 89).

Two key factors shaping migrants' labor force participation are country of origin and gender. Labor force participation rates are particularly low among non-European female immigrants. More than 45% of non-European immigrant women are either unemployed or not looking for a job, and this gap narrows only slowly over time. Even after 6-10 years in the country, this group's labor force participation rate is at least 15 percentage points lower than that of comparable native-born women (Rubin et al., 2008, p. 6). Those born in France of immigrant parents have largely caught up in this respect (see Figure 35), even though this partly reflects that native born with a migration background (in this case: both parents born abroad) are much younger than those without immigrant parents.

Figure 35 – Percentage out of labor force in France by origin group, men and women aged 20-64



Note: Out of labor force includes unemployed and inactive.

Source: Based on Gorodzeisky A, Semyonov M, 2017: 10. Data: EU Labor Force Survey

The reasons for migrants' labor market disadvantage are multifaceted. Low labor force participation rates reflect low levels of education/skills,[1] including challenges to have foreign credentials recognized in France, a lack of other labor market relevant resources such as an insufficient proficiency in French and social ties to non-immigrants, migrants' cultural background and attitudes, and ethnic/racial discrimination.

4.2. Low levels of education and limited recognition of foreign credentials

While immigrants in France have on average only slightly lower educational credentials than non-immigrants (e.g. in 2019, 36.3% of foreign born had maximum lower secondary education as compared to 33.5% of native born according to Eurostat data), the differences between origin groups can be quite large. Among Moroccan immigrants, for example, there is a large share of individuals that have no schooling at all (Ichou et al., 2017). This is a key factor in explaining migrants' low labor force participation and employment rates. Migrants with a higher skill level are not only more likely to join the labor force than migrants with a lower skill level, their participation rates also increase faster over time (Simon and Steichen, 2014, p. 8).

Low levels of education are often transmitted from one generation to the next. Children of low educated parents have fewer competencies when they enter school and tend to make

[1] Unless noted otherwise, level of education and skill level are used interchangeably in this chapter.

less ambitious educational choices (Boudon, 1974). In the educational system in France, the share of students with an immigration background that belong to the low performing student group is high. With respect to reading proficiency levels, they have a higher relative risk of being in the group of the lowest performing students than children born in France (OECD, 2012a, p. 38), even though the share of students that took the test in a different language than the one spoken at home is below EU average in France (14.5 and 8.5% resp.). 57% of students with an immigration background visit disadvantaged schools (Q4), the 2nd highest share in the OECD (OECD 2017, p. 83). In addition, only 10% visit the most advantaged schools (Q1). This reflects partly residential segregation and an uneven spread of better schools across urban areas. But school segregation is stronger than residential segregation and an ongoing concentration of students with an immigration background[1] in disadvantaged schools limits these students' exposure to French language and values and access to relevant information about the educational system and – later on – the labor market.

Those who do find employment are more likely to work in unskilled jobs and to feel overqualified[2] for their job. For new immigrants in France, many of those working in lower-skilled sectors are employed below their qualification: 72% of new immigrants working in the construction sector are overqualified for their position; 70% of new immigrants in the trade and food industry are overqualified; and 50% working in "other services" (Simon and Steichen, 2014). Some groups are more impacted than others. Between 2003 and 2011, on average 55% of new immigrants from North Africa were over-qualified for the position they occupied, and 61% of recently-arrived sub-Saharan Africans (compared to 39% of all recently-arrived immigrants, and 20% of natives) (Simon and Steichen, 2014). The problem of overqualification is particularly severe among women and is not limited to (recent) migrants. It can also be found among those that were born in France of immigrant parents (Brinbaum, 2018) and it is even a problem for migrants with tertiary education. This partly reflects the challenge for immigrants to have educational and professional degrees acquired abroad recognized in France, a problem that does no longer play a role for the second generation. However, even individuals born in France of immigrant parents may hold degrees of a lower "quality", e.g. in terms of grades, school types or schools

[1] Including those who are immigrant themselves.

[2] In the ad hoc module of the Labor Force Survey in 2014, subjectively perceived over-qualification is captured with the following question: Considering your educational level, experience and skills, do you feel over-qualified for your current main job? With over-qualified is meant that the qualifications and skills of the person would allow more demanding tasks than the current job. In a recent study by the European Commission, the "Overqualification rate is calculated as a share of the population with a high educational level (i.e. having completed tertiary education, ISCED 5 or 6), and having low or medium skilled jobs (ISCO occupation levels 4 to 9) among employed persons having attained a high educational level." (European Commission 2011, p. 27). However, this definition has been adopted exclusively for the report and is a rather narrow definition that captures only overqualification among those with tertiary education. According to this study, overqualification in France is less severe in international comparison.

(i.e. unobserved heterogeneity). In addition, both migrants and the second generation receive fewer returns (e.g. access to qualified jobs) to their human capital because of discrimination (see below). While looking into the quality of degrees based on available data is challenging, more information is available on migrants' challenges to have their foreign degrees accepted in France.

Upon arrival in France, immigrants can contact ENIC-NARIC (the European Network of National Information Centres – National Academic Recognition Information Centre), the agency in charge of evaluating foreign credentials. The ENIC-NARIC issues two types of certificates: a *certificate of comparability* (which establishes a comparison between a foreign diploma and a certification level in the French and European framework) or a *recognition of prior learning* (which evaluates a period of foreign study that did not end in a diploma).[1] For refugees, this process is free (and expedited), while for other immigrants, the certificate of comparability costs €70 and the recognition of prior learning cost between 300 – over €1,000. The qualification recognition process is not so popular among recently arrived immigrants. In 2010, only 37% of new immigrants with a higher education degree requested to have it evaluated. Immigrants are often deterred by the paperwork, or by the expectation that their qualification won't be recognized. Others are unaware of this possibility (Domergue, 2012). For immigrants in 2010 who did submit a request to have their qualification evaluated, 46% received the same or lower equivalence, 27% received no equivalence, and 27% were still waiting for a response (Domergue, 2012). Migrants who are not trying to have their qualifications at least partly recognized in the destination country often end up working in positions they are overqualified for.

4.3. Labor market relevant resources: language skills and social ties

Differences in the level of education only partially explain migrant-native gaps in employment, as shown by studies that take into account (statistically: "control for") differences in both groups' educational credentials. A shortage of other labor market-relevant individual resources, like host-country language proficiency and social contacts to non-immigrants, hampers immigrants' full use of their skills in France.

Migrants with high proficiency in the language of their host country perform better on the labor market than those who arrive with little knowledge knowledge (Hirsch et al., 2014; Koopmans, 2016; Lancee and Hartung, 2012). In France, difficulties in writing or speaking French lower migrants' likelihood to be employed – and, even more, to hold a skilled job – at same levels of education (Brinbaum, 2018, p. 111). The OECD Programme for the International Assessment of Adult Competencies (PIAAC) is designed to assess the skills in

[1] Reconnaissance des diplômes étrangers en France. France Éducation international (n.d.), "Reconnaissance des diplômes en France".

the national language of the host country in a comparative perspective. According to this data source, the migrant-native gap in literacy scores in France is similar to Germany, Belgium and Denmark, but smaller than in countries like Finland and Sweden, where the share of migrants who do not speak the national language upon arrival is larger than in France (OECD, 2016b, p. 85).

But even when individual characteristics that affect employment, such as educational credentials and language skills and also family situation, duration of stay, and demographic variables are taken into account, immigrants from the Maghreb, Turkey and sub-Saharan Africa lag behind in their labor market integration (Brinbaum, 2018). These ongoing "gaps" are partly explained by a lack of social capital that facilitates access to labor markets. Having a broad social network in the host country is advantageous for learning about norms in the local job market and finding job opportunities. In fact, a recent study shows that additional language training has a strong positive effect on migrants' labor force participation rate – but not because it improves language skills. The mechanism is rather improved access to information: "Before, during and after the classes the participants can use their time to exchange about their experiences in France and to give each other important advice on the French life and labor market. This exchange involves not only the participants, but also the teacher" (Lochmann et al., 2018, p. 23). Ties to native-born individuals in particular increase not just the probability of employment, but also the occupational status of the job opportunities found through these channels (Kalter and Kogan, 2014; Kanas, van Tubergen, and van der Lippe, 2011; Koenig, Maliepaard, and Güveli, 2016; Lancee and Hartung, 2012).

4.4. Motivational factors and (perceived) discrimination

In the groups that have a particularly low labor market integration, gender differences are substantial. In order to understand why female migrants in particular have low labor force participation rates, the motivation to join the labor force needs to be taken into account. Men do not often grapple with the question of entering the labor market and searching for employment after migration (see Bürmann, Haan, Kroh, and Troutman, 2018; Haan, Kroh, and Troutman, 2017). But when analyzing female migrants' labor market integration, self-exclusion from the labor market plays an important role, reflecting cultural norms about women's participation in economic activities outside the household (Koopmans, 2016). Depending on cultural norms and the availability of childcare, the presence of children in the household also impact female migrants' labor force participation rates negatively (Fleischmann and Höhne, 2013). On the aggregate level, social norms about female labor force participation, for example that men should have more rights to a job than women when jobs are scarce, are systematically related to female employment rates. Rates of agreement with this example are higher in countries where female labor force participation is low (Heyne, 2017, p. 68). This is the case in important origin regions of immigrants to

France such as Maghreb and Turkey. These norms may affect the motivation to join the labor force even among the second generation, since value transmission among immigrants is generally high. Unfortunately, very few studies collect information on respondents' gender norms, so analyzing their impact is difficult.

Indirect evidence about the role of motivation in explaining female immigrants' lower labor force participation can be gained by comparing migrant-native gaps in the general probability to be employed and in the probability to be employed *for those who are active on the labor market*. Migrant-native gaps in employment among those who are active in the labor force exist for all origin groups. For example, 72% Turkish women active in the labor force are employed, compared to 91% of non-migrant women. However, when all women are considered, including also those who are not active on the labor market, the differences are much larger: Only 25% of all Turkish women are employed, compared to 71% of all non-immigrant women according to Labor Force Survey data. Among women who were born in France from immigrant parents, employment rates among all women are still below 50% (Turkish descent) and 60% (Maghreb and other African descent) (Brinbaum, 2018, p. 109). While this is no direct evidence for the role of motivational factors, it indicates that a low motivation to join the labor force may contribute to low labor force participation rates among women from these groups. Differences in family situation are not the main reason for these differences since labor force participation is still substantially lower for women who were born in France with Turkish or North African parents than for women without migrant background after controlling for family situation and other socio-demographic characteristics (ibid., p. 109).

Previous research shows a connection between strong individual religious beliefs and conservative gender values (Diehl, Koenig, and Ruckdeschel, 2009). Evidence from the "Trajectoires et Origines" dataset (Simon, Beauchemin, and Hamel, 2010) reveals that being visibly religious reduces the likelihood to join the labor force for all religious groups in France (Naseem and Adnan, 2019, p. 13). While evidence is scarce and overall inconclusive, it can be safely concluded that strong religiosity is generally related to lower labor force participation for women. Regardless if the negative impact of religiosity is stronger for Muslims than for Christians, the former group is overall more religious.

In addition to cultural factors, female migrants' motivation to join the labor force may be influenced by their perceived chances to actually find work. This is where perceptions of ethnic discrimination need to be taken into account, a variable included in many surveys tailored to immigrants. While several articles have recently pointed out that these perceptions should not be taken as an accurate indicator of actual experiences of discrimination (Diehl, Liebau and Muehlau, 2021), individuals may act upon the perceptions that their group's access to the labor market is hampered by discrimination. This may discourage them from starting the job search in the first place.

Assessing the impact of discrimination on migrants' labor market integration is challenging even though it can be directly observed in audit studies. These studies measure outcomes like the number of callbacks to "fake" applications that are qualitatively similar but differ with respect to the alleged applicants' origin, mostly indicated via the name or a photograph. According to a recent meta-study, France is a country with a comparatively high level of labor market discrimination, higher than, for instance, in Germany, Norway or the United States (Quillian et al., 2019). This is especially the case for Blacks and also for Muslims – even when the latter group is compared to Christian immigrants from the same region of origin (Adida et al., 2010). It is, however, difficult to assess the – cumulative – impact of the discriminatory incidents observed in audit studies on migrants' labor market outcomes.

Studies that analyze discrimination based on survey data also suggest that discrimination has a negative effect on migrants' labor market integration (e.g. Combes et al., 2016). The study by Brinbaum quoted above is based on reliable and rich data for France that contains information on educational credentials, demographic characteristics and language skills and looks into different indicators for labor market integration. According to this data, migrant-native gaps are still significant with respect to migrants' access to employment, i.e. when those who do not search for employment are excluded from the analysis. Moreover, immigrants from the Maghreb, other African countries and Turkey who are active on the labor market are even disadvantaged when they are compared to EU migrants with similar observable characteristics. To be sure, the remaining gaps (the so called "ethnic residuals") can also reflect unobserved differences with respect to social ties, type of educational degree or occupation. But overall, evidence that discrimination negatively affects the labor market integration of Muslim and African immigrants' in France, and particularly that of female immigrants, is rather strong, especially since research from audit also points in this direction (Quillian et al., 2019, p. 488).

Table 4 – Gaps between EU migrants and different groups of non-EU migrants in different labor market integration indicators for those active in labor force

	Probability to be employed	Probability to hold skilled job	Probability to feel overqualified
Ref. EU migrants			
Maghreb	lower	lower	higher
other Africa	lower	lower	higher
Turkey	lower	lower	n.s.
Asia	lower	n.s.	n.s.
Others	lower	n.s.	n.s.

Note: Logistic regressions, statistically significant effects after controlling for age, number of children, place of residence, partner's activity, duration of stay in France, French nationality, tertiary degree in France or elsewhere, language proficiency.

Source, Data: INSEE Labour Force Survey 2014; Brinbaum (2018), p. 111

In sum, the available data and findings point towards a complex picture that needs to be taken into account when thinking about policies that aim to increase migrants' labor force participation. Family-based migration, in particular from African countries and Turkey, includes many individuals with low levels of education that are at least partly transmitted to their children, a process that is amplified by the concentration of the latter in disadvantaged schools. This is a key factor in explaining the poor labor market performance of many immigrants and, to a lesser extent, to individuals who were born in France, i.e. to the second generation. More educated migrants face challenges when they try to get their foreign credentials recognized and many refrain from even trying to do so. A shortage of other resources that are important for migrants' labor market integration, namely social ties to non-immigrants and proficiency in the host country language adds to this disadvantage. Gender differences are most pronounced in migrants' labor force participation and less so in access to (skilled) employment among those active on the labor market. This suggests that cultural factors play a role as well, which is especially the case for migrants from those countries where social norms are less supportive of female labor force participation. Ethnic discrimination, which is particularly strong against those groups that are also most disadvantaged in terms of their resource endowments, is a further barrier to their labor market integration.

SECTION 2

RECOMMENDATIONS

1. General Approach

Our diagnosis from the preceding section is as follows. Despite being based on good demographic developments such as an unprecedented increase in longevity, population aging puts the French pension system in a dangerous balance between financial and social unsustainability. The latter is amplified since the system is intransparent, incomprehensible for most and perceived as unfair by many. At the same time, the growing share of older people puts the increase of chronic conditions and the existing health disparities into the limelight. All this happens against a backdrop of an already low labor force participation, especially among older men, chronically ill and migrants, and a prospect of a declining growth of GDP per capita due to the declining ratio of workers per capita.

From an economists' point of view, it is evident that the main cure has to be increasing employment, especially among older men. This requires pension reform with an increase of the average retirement age, strengthening incentives to work past the earliest retirement age, and preventing employers and employees from taking early exit routes even before the earliest retirement age. Regarding economic success of such measures, there is ample evidence that changing the institutional setting of the labor market, ranging from the statutory retirement ages to the eligibility details for early retirement and the criteria for disability insurance, is very effective in changing labor supply at older ages (Börsch-Supan and Schnabel, 1998; Gruber and Wise, 2004; Börsch-Supan and Coile, 2020).

However, these policy changes are highly unpopular. Despite the substantial increase in life expectancy all over Europe, people are still largely unwilling to abandon early retirement. Resistance against institutional changes has been violent in places. According to an Odoxa survey released in December 2019, 66% of French people supported the strike actions in the winter of 2019/2020 and 57% blamed the government for the standoff.

42% thought that the only solution to end the standoff is to abandon the *âge pivot*, the increase of the age of a full replacement rate. Hence, reducing the generosity of early retirement is often seen as "touching the third rail of politics" (Safire, 2007) with a fatal shock delivered at the next election.

In order to be successful in spite of this resistance, our general strategy is to approach reform in a holistic way and to complement unpopular but necessary reform elements with more transparency, a closer relation between wages and pension benefits, and a substantially better protection of low earners from reform elements that might otherwise threaten their economic and social position. In times of population aging, no pension reform can avoid that there are losers of the reform. Our strategy is to ensure that there is also a sufficient number of winners, especially among relatively low earners.

While pension reform is in the center of our recommendations (point 2.), we stress the necessity to complement pension reform by measures to improve the labor market for older workers and to make working longer more attractive (3.). At the same time, it is necessary to strengthen health maintenance and to reduce health inequalities (4.). It also helps to better tap into the pool of people with migratory background that are not in employment since this could substantially contribute to a higher labor volume. Increasing the employment rate of migrants to that of French natives would have roughly 50% of the effect of increasing the employment rate of French natives aged 55-64 to that of their EU peers (5.).

The suite of accompanying reforms includes active labor market policies that address the low probability of finding a new job once older workers have lost their current job. Partial and flexible retirement needs to address the desire of many older workers to reduce working hours. Good health and further education are needed to keep older workers in their current jobs and enable them to take on new jobs; they are also needed to increase productivity. Staying healthy requires a change from the traditional priority of curation towards more emphasis on health maintenance and preventative care. The main challenge for immigrants is to better integrate them into the labor market. However, investing in employment services, further education, health, and integration is expensive. There is thus fiscal competition with pension expenditures. Finding the right balance between cost cutting and investment is another reason why pension reform and these investments should be to done synchronously.

This holistic and synchronous approach of pension, health and integration reform is essential not only for economic success but also to convince the French people that the proposed reform package will lead to better outcomes; that the joint effect of all reform elements is more than the sum of its parts; and that this reform package is not just another round of cutting benefits as previous pension reforms have been perceived.

A final element of our holistic strategy is to address perceptions which are only partially true. It is important not just to alter financial incentives but also social norms with respect to retirement and working when older. While social norms based on false perceptions can be gradually changed by information campaigns, it is also important to address the exceptions from the rule in which the perceptions are correct.

A first example is health which is good on average at ages between 55 and 67 such that for many people worries about strongly declining health in this age range are unwarranted (see previous section). However, it is also necessary to pay attention to the rise in chronic illnesses and the need to support those who already have these conditions which limit length and quality of life.

A second example is the perception that productivity peaks early in life such that older workers are much less productive than younger ones. While this is wrong (see previous section), the strong link between low job satisfaction and the desire to retire early is a warning signal to employers to keep motivation up, a quintessential driver of high productivity.

Third, most damaging is the false belief that older workers take jobs away from younger people and that increasing the retirement age would increase the already high youth unemployment in France. The opposite is the case (see previous section). Nevertheless, also here exist exceptions from the rule, especially in times of a strong recession. In the medium term, however, France as a country can increase the total number of jobs as other countries have done. France can create good jobs for both older *and* younger individuals, just as France has created jobs for both men *and* women in the past.

2. Pension Reform

In times of population aging, pension policy has three main levers: increasing contributions, increasing retirement ages, and cutting benefits. The French pension system (see Appendix 10 for a description) underwent a sequence of reforms between 1993 and 2014, which engaged all three levers. The government has increased the contribution rate several times, making it one of the highest in the OECD. The reforms are also inducing later exits from the labor market by increasing the number of service years necessary for benefit eligibility and by increasing the number of “best years” that enter the benefit computation. Finally, the reforms have cut benefits by changing wage indexation of both claims and benefits to price indexation, i.e., past earnings are now converted into today’s values by past inflation rather than by past wage growth, and future benefits of already retired people will increase with inflation rather than with the growth of wages. This has saved on costs but made the system vulnerable to business cycles and economic crises, e.g. the current economic downturn due to the Covid-19 pandemic, because the balance

between the system's revenues and expenditures now depends on the difference between the rate of inflation and the rate of productivity growth. Moreover, while leaving the replacement rate at the age of retirement largely intact, this policy severely reduces the replacement rates of pensioners in old age. The reforms have therefore created a dangerous balance between financial and political unsustainability. Hence, there is need for a structural reform.

Pension reform is also necessary to improve the system's design. Its fragmentation creates intragenerational inequities and is perceived as unfair since the same contribution creates different benefits across regimes. Its complexity makes it costly to administer and destroys the linkage between contributions and benefits which is fundamental for a pension system to be fair and efficient. The system of service quarters is arcane and unfair to many low income earners, workers with interrupted careers and, for these reasons, to women.

The reasons for pension reform amplify each other. To maintain financial sustainability, France needs higher productivity growth. This requires investments in health and education which are harder to afford with a very expensive pension system. Reducing expenditures, however, is politically almost impossible in a fragmented and incomprehensible system with a large number of small but powerful veto players.

There is no need to start from scratch. The government proposal (Projets de loi SSAX1936435L / SSAX1936438L), submitted to the Assemblée nationale on January 24, 2020 and largely based on the Delevoye plan of July 2019 (summarized in Appendix 11), is an excellent starting point because it is oriented at something that is known and has worked reasonably well, namely the AGIRC-ARRCO point system. A point system is easy to communicate if it is administrated in a transparent way. It can serve as a vehicle for a unified system that overcomes the unfairness of the special regimes, and for a gradual transition towards it. The core of this proposal – namely to turn the complex and fragmented current system into a universal point system that is familiar to the social partners (2.1) – is essential to really reform the system and to avoid the political blockade generated by the tendency of a fragmented system to preserve each subsystem's privileges.

However, the government proposal of January 2020 can and should be improved to make the system more efficient and at the same time reduce political resistance. The first enhancement is to introduce a simple and transparent relation between past earnings and accumulated points that does away with the distrusted purchase value of a point. There are also better ways to index future pension benefits than price indexation that cost the same and is less subject to economic vagaries. For instance, pension benefits can be indexed to wages minus the system dependency ratio (number of beneficiaries of the system divided by the number of contributors to the system) via a sustainability factor as has been done in Austria, Germany, Portugal and is scheduled for Spain. This creates an

adaptation to population aging similar to a prototypical notional defined contribution (NDC) system (2.2).

If longevity increases further – as is expected – retiring later is unavoidable for the average French worker. The government proposal of January 2020 defines a single pivotal age of full rate (*âge d'équilibre* corresponding to the *âge pivot* of the Delevoye plan) that is adapted to longevity. In reality, however, there is great heterogeneity of older employees in terms of health and job satisfaction. Hence, as a second enhancement, we therefore recommend introducing the notion of a "retirement window" rather than a single and universal age of full rate (2.3). Increasing the average age of labor market exit can then be achieved directly by indexing statutory ages such as the earliest eligibility age, indirectly by making the bonus for later retirement larger, or a combination of both mechanisms.

Third, we recommend improving the balancing mechanism that adapts the pension system to demographic and macroeconomic developments (2.4). Since there are two causes for long-term changes – baby boom/baby bust transition and increasing longevity – it is best to balance the system with a weighted mix of two mechanisms: reducing the growth of pension benefits (2.2) and increasing the average age of labor market exit (2.3). Resting the balancing mechanism on two shoulders will not overburden each single shoulder. The weights of the mix can be adjusted by an advisory council to match current circumstances, actuarial projections and the health of a reserve fund.

A fourth enhancement is an explicit mechanism for more redistribution (2.5). Every point system leads to low pension benefits for low earners. In France, low-wage earners are protected through the minimum pension and the validation of some periods without contributions, thereby covering certain social risks. We recommend to grant low earners additional "bonus points" that prevent coming near to old-age poverty. Since the sum of points influences the age at which a target replacement rate is reached, the bonus points also let workers with low earnings reach that age earlier than under the Delevoye plan and the government's January 2020 proposal. This is an important feature of our proposal that should increase its political acceptance.

Pension reform takes time to phase in. Hence, there is a need to move soon and before the financial pressures fully hit the pension system and the government budget in order to protect those near retirement and those already retired. This is why we recommend to revert to the Delevoye plan's 15-year transition rather the much longer transition discussed during the presentation of the government's plan in January 2020. The transition, however, is complex. Key aspects of the transition process are sketched in 2.6 and Appendix 12.

We do not recommend more radical reforms since they are neither feasible nor advisable due to economic reasons (e.g., a transition to a funded system), unlikely to be accepted by

the people (e.g., a notional defined contribution system) or unworkable (e.g., different parametric reforms for every single one of the currently 38 regimes).

Changing the current pay-as-you-go system to a funded system is not an option. Such a transition takes at least a generation. Moreover, we are in a particularly unsuitable point in time to start a transition for two reasons. First, the current generational structure with the baby boomers just entering retirement maximizes the transition burden for the younger generation. This burden emerges because the younger generation needs to build up its own savings while at the same time still paying contributions to finance the older generation's pensions. Second, the current situation of very low or even negative interest rates is likely to persist for the foreseeable future, most likely exacerbated by the aftermath of the Covid-19 crisis.

A much discussed alternative to a point system is a notional defined contribution (NDC) system. Such systems have been introduced, e.g., in Sweden and Italy. Blanchet et al. (2016) explored the implications of such a system for France and compared it with parametric reforms and the introduction of a universal point system. NDC systems set an annual contribution which is recorded in an individual account. The accumulated contributions are credited with notional interest. At retirement, the accumulated account reading is used to determine an annuity, i.e., an annual benefit depending on the notional rate of interest and the average life expectancy at the time of retirement. While a NDC system remains pay-as-you-go, it uses the nomenclature of a funded system. A proposal to change the German universal point system to a NDC system in 2003 was rejected by the government and the social partners because it sounded too much like a funded system and too "capitalist" to be accepted by the German population. Similar objections appear to be relevant in France.

2.1. Implement the core of the government's 2020 proposal to the Parliament

We recommend to implement the core element of the Delevoye plan and the government's January 2020 law proposal, namely the introduction of a universal point system into which the current schemes (Appendix 10, Figure 1) will be merged in a gradual transition. Specifically, the first defined-benefit pillar in the private sector (CNAV) as well as the profession-specific regimes should be gradually transferred into an AGIRC-ARRCO-type of point system.

This implies that contributed quarters will lose their dominant role in determining pension rights, and that the "system of quarters" will be turned into a "system of points". Points will become the main "currency" of the new system. Rather than only counting the 25 best years, the point system should honor the entire career, in line with the proposal's general

motto of “every euro earns the same pension” as a central achievement of the point system’s intragenerational aims. As we will explain in 2.5, this principle should hold notwithstanding additional help for those with low earnings financed by those with high incomes. Communication is needed to demonstrate that a readjustment of the service value of points (see 2.2) takes care of the false view that counting low earnings years will inevitably reduce the value of pension rights, bearing in mind that the current computations based on the best 25 years tend to favor high-earners. The crucial point of counting every year is that this increases the incentive to work longer once 25 years have been reached, even if the added years are paid the same or less than previous years, since it is the sum of points which determine the pension benefit and not the average over a fixed number of years.

We strongly recommend that the contribution rate should not increase beyond the proposed rate of 28.12%, shared 40%/60% between employees and employers since the contribution rate is already very large and likely to create labor supply disincentives. Reform policy should rather increase the current relatively small tax and contribution bases in France which drives contribution rates associated with the French pension system up relative to other countries.

Elements of the Delevoye proposal that we recommend implementing include partial retirement (2.3), a reserve fund that will have a more prominent role in our proposal (2.4), improvements of the current digitalized information and accounting system with up-to-date pension information, and a more transparent and inclusive governance.

2.2. Pension benefit computation

The computation of pension benefits in a point system works, in principle, as follows in five stages. Stage 1: For each year during working life, contributions (which are proportional to earnings) are converted into points according to a first formula. Examples for such a formula are multiplying contributions with a “purchase value” or giving points in proportion to the ratio of individual earnings to average earnings. Stage 2: Points are accumulated until retirement. Again, there are alternatives. Examples are that all years count for the final number of accumulated points, that only the 25 years with the highest earnings count (“25 best”), or that only the last year counts (“final pay”). Stage 3: At retirement, the accumulated points are converted into initial pension benefits according to a second formula. Examples for such a formula are multiplying the accumulated points with a “service value” (linear schedule) or applying a scheme which gives for each point among a low number of accumulated points higher benefits than for a point among a large number of accumulated points (concave schedule). Stage 4: A final step of the initial benefit calculation is to apply “actuarial adjustments” that depend on the actual claiming age chosen. The later the claiming, the larger the initial benefit. Stage 5: After the initial pension has been determined, benefits in

payment need to be adjusted to economic circumstances. Examples are that they increase with inflation, with the growth of wages, or a weighted mix of these.

An important step either in Stage 1 or Stage 2 is to make contributions comparable across time by inflating past contributions to today's value. Contributions in earlier years can be inflated either by price or by wage inflation ("price or wage indexation"). If points are given in proportion to the ratio of individual earnings to average earnings, this corresponds to inflating past earnings to wage inflation. Since wages usually increase faster than prices due to productivity gains, wage indexation yields higher pension benefits than price indexation to those contributors with the same earnings throughout their career, relative to contributors who start with low and then increasing earnings.

Both pillars in the general regime, CNAV and AGIRC-ARRCO, currently value past earnings by the rate of inflation in order to compute the accumulated entitlements. This deviates from earlier legislation in the early 1990's in France and most other countries today where past earnings are valued according to wage growth. This change was motivated by saving costs, since prices usually increase slower than wages.

While this aim of cost saving has been reached, there are severe disadvantages of this policy. On the individual level, the policy had large distributional effects since it disadvantages earnings in the early stage of a career and makes pension benefits sensitive to the path of earnings, contradicting the "every euro earns the same pension" aim if "equal" is understood as relative to the average wage prevailing in any year. On the macroeconomic level, the cost savings and thus the sustainability of the French pension system are highly dependent on the difference between wage increases and inflation, hence productivity per worker. However, being neutral with respect to productivity, i.e., having expenditures and revenues moving together, is an important automatic stabilizer of pension systems (Börsch-Supan and Rausch, 2019).

The gradual transition back to wage indexation proposed by the government's plan is therefore a helpful contribution to sustainability. However, we recommend a more simple and intuitive way to do so by anchoring the points earned in a given year to the average wage. Rather than using an arbitrary "purchase value of a point" that raises suspicions about potential manipulation, we recommend to express earned points as a percentage of the average wage, i.e., workers receive 100 points in a year if they earn 100% of the average earnings in that year, 75 points if they earn 75% of average earnings, 150 points for 150% of average earnings, etc. An example for a similar indexation scheme is the German public pension system. It makes sure that the "every euro earns the same pension" aim is transparently implemented. While we are aware that this change foregoes an additional degree of freedom in steering intra- and intergenerational redistribution, it is exactly the transparency which addresses mistrust in the point system.

At retirement, the government's January 2020 plan proposes to convert points into initial pension benefits by multiplying the number of points by the "service value of a point". In line with the previous recommendation on converting earnings into points by relating them to the average wage, we recommend to set this service value in a way such that workers with average earnings throughout their careers receive the average pension (currently about €1,435) if they retire at age 64, i.e., the age that was planned as "age of full rate". An average career with a length of 43 years would yield 4,300 points. This suggests setting the initial service value at €4 per point, yielding an annual pension of €17,200, or €1,435 per month. Determining the future development of the service value is part of the balancing mechanism described in 2.4.

The Commission also recommends to give additional "bonus points" for workers with lower than average life-time earnings as will be detailed in 2.5. This will increase their benefits and allow them to reach a target replacement rate earlier.

Finally, after the initial pension has been determined, the pension system needs to define how these benefits change during retirement. The government's plan proposes to maintain the indexing of pension benefits by prices that was introduced to generate cost savings. Note that the leverage of the indexation method is smaller for future benefits than for past earnings since the latter applies to about 40 years while the former to only about 20 years on average. While price indexing preserves the purchasing power of pensioners, a disadvantage is that beneficiaries are increasingly detached from productivity gains that increase the purchasing power of younger individuals.

An alternative which we much prefer is the wage indexation modified by a "sustainability factor" described further below (2.4) which is also part of determining the initial pension benefit. The modification by the sustainability factor takes care of the criticism that pure wage indexation will drive pension expenditures up again. It would also directly link pension benefits with labor market policies that are successful in terms of increasing the employment rate since the sustainability factor would yield larger benefit growth if employment increases. This holds especially for higher labor force participation at older ages since it increases the numerator and decreases the denominator of the system dependency ratio at the same time. We prefer this alternative because it makes sure that all pensioners, whether new ones or those already some time in payment, are treated equally with respect to their replacement rate.

2.3. From a single pivotal age to a retirement window

Pay-as-you-go (PAYG) pension systems need an age of earliest eligibility for pension benefits (EEA) to prevent contributors from opting out of the system and thereby breaching the implicit contract between generations that is fundamental for the stability of a PAYG

system. The government proposal maintains the current minimum eligibility age of 62 although it foresees exceptions for less healthy workers.

The Delevoye plan also defined a single pivotal age of full rate (*âge pivot*, pivotal *full retirement age* or FRA) which is reached when a worker with a standardized career has accumulated the number of points that correspond to the "full replacement rate" – actually a target rate of return set at 5.5% (Delevoye, 2019, p.8). The government proposal maintains that this pivotal FRA will be set at age 64 for a standard worker retiring in 2025. If workers retire earlier, i.e., between the EEA and the pivotal FRA, they will receive a lower rate of return.

We do not agree with the prominent role of this pivotal FRA for several reasons. It is well defined for a standardized career. In reality, however, a given target rate of return or a given target replacement rate will be reached at different ages depending on the number of points accumulated relative to earnings, including the bonus points for low earners described in 2.5, which permit earlier retirement for low earners. Hence, there is no universal age of full rate, but individual ages that match a target replacement rate, depending on the individual employment history. Moreover, there is great heterogeneity of older employees in terms of health and job satisfaction (see previous section, 2.3 and 3.2). This heterogeneity is not reflected in the distribution of the actual claiming ages which has a very sharp spike (see Figure 16), generated by the large financial incentives to claim a pension exactly at the pivotal FRA (Bozio et al., 2020). We therefore recommend to accommodate a broader distribution of retirement ages by abandoning the notion of the *âge pivot* as a social norm, and by increasing the actuarial adjustments for later claiming, see below. While norms or "nudges" (Thaler and Sunstein, 2009) have value as general guidelines, the heterogeneity of individuals in a modern society also needs to be respected. We therefore recommend introducing the terminology of a "retirement window" which begins with the EEA, rather than anchoring retirement preferences at a single age valid for all workers. There is no need to define an end of this window from the perspective of pension policy and employers and employees should be encouraged to extend working contracts as long as both sides wish; however, this requires adapting the current employment protection legislation to contracts past a certain age. Such adaptations should respect the peculiarities of each sector and thus be left to the social partners.

Since the age when a worker reaches a target rate of return or a target replacement rate depends on the points accumulated over the career including possible bonus points and thus on individual circumstances, it will be important to communicate this age in the information letters. It should replace the "one size fits all" nudge in form of the *âge pivot* proposed in the Delevoye plan by an individualized nudge for each worker.

There is ample international evidence that the start of the retirement window is an important orientation point for early retirement, usually accompanied by a spike in the distribution of

claiming ages (Börsch-Supan, 2000; Gruber and Wise, 2004; Börsch-Supan and Coile, 2020). This is particularly pronounced in France (see Figure 16). We therefore recommend to adapt the earliest eligibility age to changes in longevity as part of the modified balancing mechanism described in the next subsection. It should be later if life expectancy increases, remain stable if it does not, and can be earlier should life expectancy decrease.

Setting the earliest retirement age for workers with very early career starts or painful work conditions (*pénibilité*) is a complex matter that should be decentrally regulated at the sector level by the social partners and their knowledge about working conditions. In order to avoid financial spillover effects on the entire pension system, claiming pensions before the general EEA should be financed by sectoral resources that are fully funded.

Within the "window of retirement", the financial incentives for later retirement should be increased to become closer to actuarially neutral. Currently, there are deductions before the full rate age (about 4% per year of earlier retirement) and credits after this age (5% per year of later retirement). This is much lower than actuarially neutral. These "actuarial adjustments" should start at about 4% at age 62 and increase to about 8% at age 67 and higher at later ages. The implications of this schedule on pension benefits should be part of the information letter. There is little evidence to decide whether these adjustments should remain anchored at an age within the retirement window with penalties if retiring before this age and premia if retiring after it, or should be framed positively as incentives to work longer beyond the EEA. The Swedish NDC system uses the anchor at EEA and the positive framing and has reached a much broader distribution of retirement ages than before this policy change (Swedish Social Insurance Agency Orange Report 2009).

The politically most controversial element of the government's January 2020 proposal was to use the pivotal FRA as the main mechanism to balance the system and to reach financial sustainability by adapting this age to changes in longevity. We strongly recommend replacing this as part of a broader balancing mechanism to be described in the following subsection.

2.4. A two-pronged balancing mechanism with a reserve fund

From a bird eye's view, a PAYG pension system is in balance if c*w*C = b*w*B or c/b = B/C where c denotes the contribution rate, w the average wage, C the number of contributors, b the average pension benefit as a percentage of the average wage (the replacement rate), and B the number of beneficiaries. The necessary balance between expenditures and revenues in a PAYG pension system can be reached by adjusting the revenues (via the system's contribution rate c), the benefits paid by the system (replacement rate b), or the average retirement age (affecting the system dependency ratio B/C). Since we recommend not to increase the contribution rate any further than stated in

the Delevoye plan, there is a choice between the last two adjustments. We recommend using a mixture of both.

As has been stressed in the previous Section (1.1), with a fertility rate close to replacement level, the financial pressures on pension finances are generated by two underlying forces: the retirement of the baby boomers and the expected further increase in longevity. We therefore recommend a balancing mechanism which adjusts both the replacement rate and the retirement age, each weighted according to the relative strength of the underlying demographic forces. This is part of the general strategy to reach sustainability not by the difference between inflation and wage growth, but by linking benefits and retirement age to the demographic fundamentals.

As first prong of the balancing mechanism, we recommend addressing the increase of the system dependency rate by reducing the replacement rate via a reduction of the service value of a point. If this were the only mechanism, then the system remains in balance in spite of an increasing system dependency ratio if $db/b = -d(B/C)/(B/C)$ where b denotes the replacement rate and B/C the system dependency ratio.

This adjustment mechanism directly addresses the retirement of the baby boomers with its implication of a rather fast increase of the system dependency ratio B/C. If France chooses to return to modified wage indexing of benefits (2.2), then pension benefits will still increase as long as $|dw/w| > |d(B/C)/(B/C)|$ where w denotes the prevailing wage. Modifying pure wage indexation by the percentage change of the system dependency ratio B/C (called “sustainability factor”) has been introduced in Austria, Germany, Portugal and is scheduled for Spain. An application for France is discussed in Blanchet et al. (2016).

The second cause for population aging is the expected further increase in longevity which also increases the system dependency ratio but much more slowly than the retirement of the baby boomers. As second prong of the balancing mechanism, we recommend addressing the longevity increase by shifting the retirement window up as life expectancy increases. This can, e.g., be done by the 2:1 rule (Börsch-Supan, 2007). This rule can be motivated as follows. If longevity increase were the only demographic change, then keeping the ratio between average career length and average duration in retirement constant would balance the pension system. Since a career is about 43 years and duration of retirement about 21 years, hence roughly 2:1, every 3 years of additional life expectancy should be divided 2:1 between a shift of the retirement window by two years and an extension of the retirement duration by one year. Changes in the retirement should be announced with a five-year lead in order to accommodate life-course planning.

The government’s January 2020 plan puts all the weight on this second mechanism and applies it to the pivotal age of full rate. Putting all the weight on this mechanism does not address well the retirement of the baby boomers which is caused by past changes in fertility

but has no direct relation to life expectancy. It will require relatively large increases in the retirement age since the retirement of the baby boomers is a relatively fast moving process while the changes in longevity are slow and gradual. We therefore deviate from the government proposal in several dimensions. In particular, we recommend a weighted mixture of both mechanisms where the weights have a default value that is determined by an actuarial calculation but can be overruled by an advisory council including the social partners, scientists, and all other stakeholders in the French pension system, similar to the Conseil d'orientation des retraites (COR), in order to take account of current circumstances. This can be realized as follows.

Once a year, the service value of a point is adjusted to change the replacement rate according to only a fraction of the change in the system dependency ratio ($db/b = -\alpha * d(B/C)/(B/C)$). In addition, the beginning of the retirement window is shifted by only a fraction of the change in life expectancy ($dEEA/EEA = \beta * 2/3 * dLE/LE$, where the 2/3 correspond to the 2:1 rule and LE denotes life expectancy). The change of the service value is immediate, while the shift of EEA will become effective five years later. The weights α and β should be determined by annual actuarial calculations in a way such that the pension system remains balanced. Since an entire range of weights α and β will keep the system in balance, the actual choice of the weights should be made by the advisory council.

This balancing mechanism should be cushioned by two types of "safety stops". The first cushion are protective measures to shield low earners from the long-run decline in the replacement rate due to population aging. This will be discussed in the following subsection. The second cushion is a reserve fund that addresses short-run macroeconomic imbalances, such as AGIRC-ARRCO and other subsystems already have. Since adjustments of the replacement rate and the retirement age have economic and political costs, this reserve fund should keep the parameters of the pension system smooth through business cycles and other macroeconomic disturbances. Moreover, the balance of this reserve fund is useful as an indicator in order to estimate and communicate the size of the necessary adjustments of replacement rate and retirement age. The size of such a reserve fund depends on the desired extent and duration of stability. For example, to cover a one-year revenue decline of 8%, the reserve should be about one month's worth of revenues. To prevent a nominal decline of pension benefits during recessions of the magnitude of the 2008 financial crisis or the current Covid-19 crisis, a slightly larger reserve fund is needed.

There are simple rules how the balance of the reserve fund can be maintained. For example, weights α and β can be set in way that the projected level of the reserve fund over the coming year will not fall below a certain level, say 20% of its intended size. In turn, if the level of the reserve fund exceeds a certain level, say 150% of its intended size, the council may increase the service value of a point accordingly, delay the increase of EEA or, in the case of a reduction of life expectancy, reduce the EEA.

We recommend emphasizing the reserve fund as a prominent transparent and easily communicated yardstick of the short-run soundness of pension finances, in addition to regular actuarial projections with a long-term horizon (at least 50 years) as the Conseil d'orientation des retraites already does.

2.5. Redistribution

The current system is redistributive in favor of the lowest two deciles of life-time income mainly due to the minimum pension ("contributive minimum"), while the system provides roughly the same replacement rate for the remaining deciles (Appendix 10, Figure 6). This design has succeeded in one of the lowest old-age poverty rates in the OECD (see Figure 7, y-axis). There are many additional elements of redistribution which are non-contributory and give extra benefits due to specific circumstances (e.g. unemployment and family-related care). These redistributive elements are financed by the uncapped contribution (i.e., without corresponding benefits) for incomes above the social security threshold. The government's January 2020 proposal does not materially change the current elements of distribution but expresses them as additional points.

The redistributive design suffers from several shortcomings. First, the current redistributive elements are complex and not always transparent.

Second, this current design splits the French pension system into two parts. The first flat part is determined by the minimum pension which is set at between €645.50 and €705.36 per month depending on the accumulated quarters. It is "flat" in the sense that it is independent of life-time earnings as long as the pension income generated from that earnings is less than the minimum pension. People with larger life-time earnings are in the second part. This second part is characterized by a quasi-linearly increasing relation between pension benefits and life-time earnings until the "social security threshold" is reached. This design has the disadvantage that it discourages labor supply for earners in the flat part since additional earnings do not provide enough additional pension benefits. It works like a tax on additional income for these earners at a "clawback" rate which is not very far from 100%.

A third disadvantage is that there is no smooth transition from the minimum pension to the earnings-related part of the pension system, implying that employees, whose earnings are only little above the point of eligibility for the minimum pension, feel "in danger of poverty". Population aging will bring these retirees ever closer to the poverty line when replacement rates decline.

We therefore recommend going substantially beyond the government's proposal in terms of redistribution. Specifically, we recommend a smoother transition between the flat and the earnings-related parts of the pension system and to include in the redistribution scheme

of the French pension system those households, which have incomes that are too large to be eligible for the minimum pension, but still so small that a negative shock would bring them dangerously close to or even below the poverty" threshold.[1] We refer to these households as "in danger of poverty".

This recommendation is motivated by two international examples. A recent pension reform in Germany has addressed the incentive problem. It reduced the clawback rate to 90% and will provide an additional bonus benefit to workers in the third and fourth decile to create a linear bridge until it reaches the strictly earnings related part that is similar to the French system. The US Social Security system goes one step further and has established a concave relation between life-time earnings and pension benefits that gives low earnings a higher replacement rate than high earners throughout the entire life-time earnings distribution.

In the French pension system, a similar approach can be realized in a transparent way by introducing bonus points for earners in the lower four life-time income deciles while maintaining the minimum pension. These bonus points can be computed at the time of retirement according to a mostly concave schedule generated by a non-linearly increasing clawback rate as a function of life-time earnings. The bonus points should be financed by the uncapped social security contribution in a similar matter as the non-contributory elements of redistribution (e.g., points for unemployment and family-related care).

The bonus points will have an important side effect in terms of political acceptance because they permit low earners to reach the age for a target replacement rate earlier than in the current system and in the proposed plan. It will compensate at least partially for a worse health status (and thus lower life expectancy) that is common among low earners as shown in the previous Section (3.2).

2.6. Transition and actuarial projections

A structural pension reform as proposed here takes time to phase in. Nevertheless, the demographic pressures – especially the retirement of the baby boomers – dictate the timetable. There is a need to move soon and before the financial pressures fully hit the pension system and the government budget in order to protect those near retirement and those already retired. This is why we recommend to revert to the Delevoye plan's 15-year transition rather than the much longer one discussed when the government's plan was introduced in January 2020.

The transition should guarantee that "current retirees will not see their situation changed" as emphasized both by the Delevoye plan (Delevoye, 2019, p. 25) and the government's

[1] As defined by the 60% of the median income, according to the OECD definition.

January 2020 proposal. One should also protect individuals who are close to retirement because most of them will not be able to adjust their retirement plans to the new situation. One possibility is a simple transition model that will make parallel pension benefit calculations according to the new and the old system. Each new entering cohort will receive a pension which is x/15 times the benefit under the new system and (15-x)/15 times the benefit under the old system, where x increases each year from 1 to 15.

While the principles of such a transition are straightforward, there are many challenges in detail. Three dimensions need to be specified: mixing the old and the new benefit calculations for retirees, mixing the way in which past earnings are credited, and mixing the contribution rates for workers. Appendix 12 elaborates part of a transition plan and draws lessons from the Swedish transition in the 1990's. While the Swedish transition was between a single defined-benefit system to a single NDC-system, the French transition has to merge 38 different systems into a single one.

This report does not discuss how to merge the civil service's final pay regime into the universal point system. This is a particular challenge because civil servants are affected to different degrees by the favorable "final pay" rule (depending on the slope of their lifetime incomes) and by the penalizing exclusion of bonuses from the calculation base (depending on the level of bonuses). For instance, teachers who have low bonuses have to be compensated for their relatively low earnings level once their relatively high pensions are brought to the level of the general population. Hence, the public sector salary system would have to be reformed in lockstep with a pension reform, including the bonus system for civil servants, that varies greatly across public service sectors (Bozio, 2017).

Finally, we emphasize that the transition plan needs to undergo an extensive actuarial analysis which includes both the redistributive effects of the reform and the effects on long-term financial sustainability.

3. Accompanying Labor Market Policies to Support the Employment of Older Workers

Pension reform, especially an increase of the effective retirement age, needs accompanying labor market reforms to support employment of older workers, including those with chronic illness. Pension reforms elsewhere in the EU have been accompanied by labor market policy packages that support the extension of working life and support those who cannot work for health reasons. They aimed at improving job quality to retain experienced workers in their jobs, used active labor market policy instruments to re-employ unemployed older workers, and strengthened education and training measures to close the skill gap between older and younger workers.

Elements of these labor market policy packages are improvement of working conditions; actions at firm level to increase productivity and quality of life at work and employment subsidies specific to the over-54s; encouragement of flexible working times; organizational reform of job placement centers; development of specific training and education programs aimed at older workers and employers; support for the unemployed; wage subsidies to cover the wage gap if re-employed; disability insurance reform; research and development programs on understanding the consequences of aging on the labor market and identifying the needs of older workers and on absences and causes of occupational illnesses and accidents. The exact packages vary considerably in their composition, depending on the institutional details of existing social security arrangements and labor market institutions (see OECD 2019 and Appendix 13).

Evaluation of either a single policy within these sets of reforms or the package is challenging because they are often introduced simultaneously with each other and with pension reform. Evaluations that have been undertaken suggest that very comprehensive strategies can have a significant positive impact on increasing the average retirement age and participation levels of ageing workers within the workforce and a reduction in discrimination or stigma towards older workers as has been shown in Finland. Policies in Germany to adapt working conditions to the ageing of the workforce, to promote employee health and to increase employability have positive effects but mainly for the youngest seniors. Putting more of the costs of disability insurance onto employers led to a large reduction in the disability rolls and increased employment of older workers in the Netherlands.[1]

In France, the targets for such a package are not only those who should be encouraged to work past the earliest retirement age but also the high number of workers who exit the labor market at ages much before the earliest eligibility age. We highlight three reform areas: Improve job quality for the currently employed, strengthen job placement services and vocational training for the unemployed, and helping those with chronic illnesses. These reforms also relate to proposals in Chapter Two on inequality for the reform of the Pôle emploi and the creation of a new agency to address quality of employment.

3.1. "Good jobs" for older workers: flexible, part-time, motivating

The primary focus of labor market policies must be to retain these workers in their current jobs as long as possible. The evidence of low job satisfaction in France and its impact on early labor market exit (see previous section) signals that job quality needs to be improved to keep older workers from leaving their current job and exiting the labor market. Moreover,

[1] A review is provided in France Stratégie (2018), *Les seniors, l'emploi et la retraite*, by Prouet E. and J. Rousselon. See also Burkhauser, Daly, and Ziebarth (2016), Sternberger-Frey (2014), Avendano and Cyrus (2019), Hullegie and Koning (2018).

our productivity studies (2.3) show that exploiting the experience of older workers in their current jobs is essential for maintaining high labor productivity. Hence, while encouraging mobility may be important for younger employees, policies that “make good jobs” are important to retain older workers.

There is ample evidence that older workers appreciate more flexibility. One dimension is to work part-time rather than full time. We recommend strengthening the availability of part-time jobs by establishing the right to choose fewer working hours under well-defined circumstances. Part-time jobs are generally not liked by employers, due to fixed costs of jobs and the increase in organizational complexity. This does not only affect older workers, but also workers with families. A legal right to reduce working hours at older ages is a two-sided sword: it may keep workers longer in a given job and thus reduce early retirement but it may also decrease hours of workers who would otherwise work full time. Since there is evidence that many people like to stay in the labor force not primarily for reasons of money but to stay in contact and have a purpose in life, the former appears to outweigh the latter.

A related dimension of flexibility is partial retirement. This was part of the Delevoye proposal (*retraite progressive*) but should be strengthened. Partial retirement faces the same trade-off as the legal right for part-time work. Börsch-Supan et al. (2018a) show that a necessary condition for generating more labor volume with partial-retirement schemes is to increase the so-called “actuarial” bonus for working longer to be actually actuarial. Since this is not the case in most European countries, partial retirement and similar flexible retirement schemes have so far mostly reduced labor volume (Börsch-Supan et al., 2018b). Before widening the partial retirement options in France, the actuarial adjustments should be increased, as detailed in 2.3.

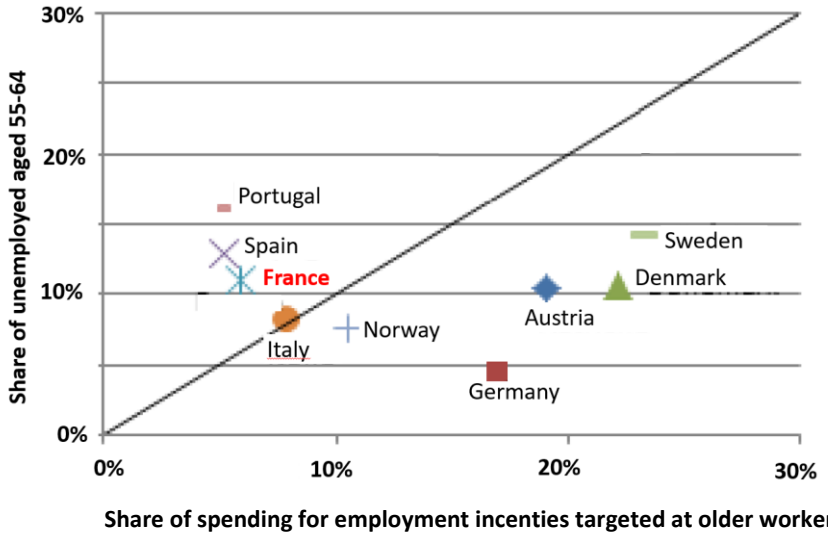
Another dimension is the type of work that older workers perform. Switching away from work that demands physical strength will enable those with musculoskeletal conditions to stay in the labour market longer and help prevent the rise in such conditions as these are often work condition related. More generally, there are many other characteristics of “good jobs” as discussed in Chapter Two on inequality in this report. Experienced older workers tend to demand more control over their jobs, which is an important element of job satisfaction. The previous section (2.3) provided evidence that lack of motivation among older workers with routine jobs resulted in a decline of productivity. A key element of motivation is reward for a worker’s effort which does not have to be monetary but can also be praise and encouragement. The lack of motivation has been shown to be a driver of early retirement (Siegrist et al., 2006). “Good jobs” depend on employers’ decisions. Changing them requires more than changing laws. A comprehensive pension reform does not only need negotiations with the social partners about the parameters of the pension system but also a coordinated effort by the government to overcome the false beliefs about productivity (Section 1, 2.3) and convince them that it pays off in terms of productivity to keep older workers in “good jobs”.

One obstacle for keeping older workers in their jobs is the seniority wage which is higher in France than on average in the OECD. The average wage gap between an older worker (age 55-64) and a younger worker (age 25-54) is 20% in France, twice as much as the OECD average (France Stratégie, 2018, p. 58), although the authors stress that earlier exit of the low-skilled from the labor market plays a role in this differential. In Sweden with a very high old-age labor force participation, the differential is only 8%, but in Germany it reaches the same level as in France. While this seniority wage gap has decreased since 2006, it could be part of a negotiation strategy with the social partners to increase old-age employment. The current equilibrium – relatively high seniority wages and early retirement – does not only waste human capital but also creates high contribution rates and thus burdens the younger generation. Later retirement in proportion to the increased longevity and a flatter wage profile can keep life-time income and relative leisure time equal for the older generation but maintain human capital and reduce contribution rates.

3.2. Active labor market policies for older workers: job placement and further education

While keeping older workers in their current jobs and thereby preserving their experience must be the primary aim of labor market policies, reforms are also needed to address the relatively high old-age unemployment and non-employment of discouraged job seekers. This requires active labor market policies. Figure 36 shows that France targets a lower share of its budget for employment incentives at older workers than other countries with a similar share of older workers within their unemployed population, e.g. Austria and Denmark.

Figure 36 – Share of spending for employment incentives targeted at older workers, and share of older workers within the unemployed population, 2016



Source: France Stratégie (2018), p. 71, and OECD LFS data (2016)

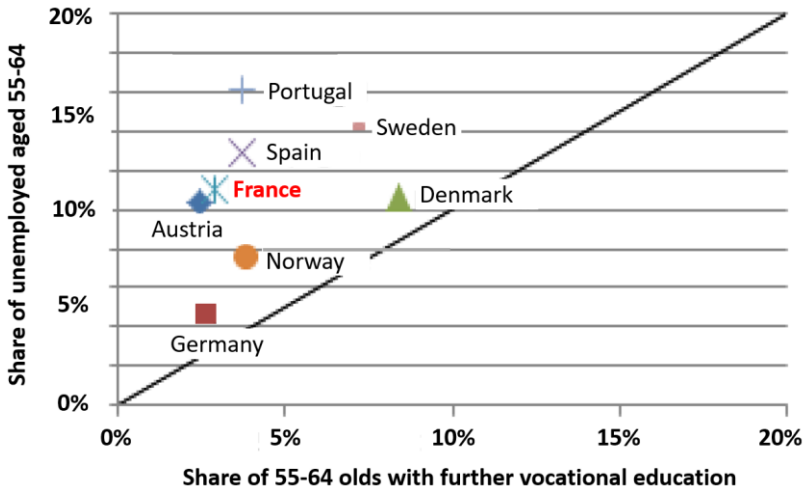
The evidence in the previous section (Figures 19 through 23) shows that unemployment is often the first step to labor market exit even before the earliest eligibility age. It is therefore important to break this dynamic path. Germany introduced several active labor market policies (ALMPs) between 2002 and 2007. Their success in terms of increasing old-age employment was remarkable, especially since early retirement has been made harder after 2013 and the statutory retirement age has been increasing since 2011. Not only did unemployment decline in Germany but also non-employment, while employment of old men strongly increased (see Figure 14).

The cornerstone of the German ALMPs was a re-organization of the federal employment office into a very effective of job placement agency with a strong focus on geographic decentralization. We recommend creating a similarly efficient scheme of employment agencies (e.g., as part of the Pôle emploi reform suggested in Chapter Two on inequality of this report) through which job placements can be organized as well as efforts to re-train the unemployed and, more generally, an extension of further education (see below).

Other elements of the German reform package – meant to offset the harsher rules for unemployment insurance – are limited-duration subsidies to older previously unemployed workers who take up a job with a salary lower than their previous salary. We recommend similar temporary subsidization schemes for France. A third key element regarding older workers was the possibility to hire older workers on a temporary rather than permanent contract in order to reduce the risk for employers and the introduction of “mini-jobs” with more lenient employment protection and subsidized social security contributions (including pensions and health insurance). Currently, in Germany, about half of the mini-jobs currently held by retirees are bridge jobs which constitute a form of partial retirement. Surveys show that the two main motives for retirees to hold these jobs are to “earn something on top of the pension” and “remain in contact with people” (National Academies of Sciences, Engineering and Medicine, forthcoming).

A second area in which active labor market policies have been successful is further education in general and training and re-tooling efforts specifically for older unemployed individuals. The numerical skills level of French workers declines thus very rapidly in France from younger to older cohorts (France Stratégie, 2018). However, authors indicate that skills differentials relate to cohort effects more than age effects, a phenomenon which goes beyond numerical skills. This may reflect the recency of education and the lack of updating it. France targets a relatively lower share of its budget for vocational training programs at older workers, in comparison with countries share of older workers within the unemployed population (e.g., Denmark), see Figure 37. The law that exempts older workers looking for a job from participating in training programs may be counterproductive.

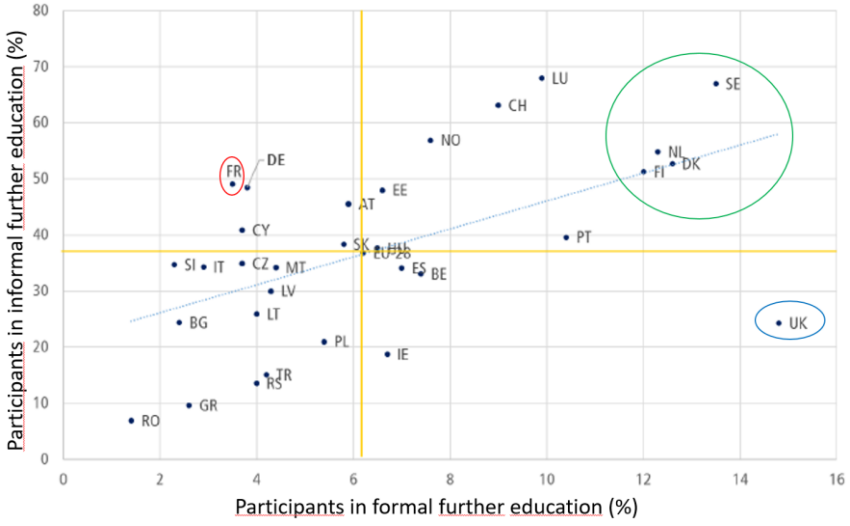
Figure 37 – Share of spending for further vocational education targeted at older workers, and share of older workers within the unemployed population, 2016



Source: France Stratégie (2018), p. 70, and OECD LFS data (2016)

Moreover, further education is a life-long exercise to be effective also in old age. Based on the Adult Education Survey in 2011, which records further education for all ages, only 51% of French workers of all ages had any further education compared with 72% in Sweden. In addition, Sweden invested much more in formal further education as opposed to France, which has put more stress on informal education (Figure 38).

Figure 38 – Formal and informal further education



Note: The Scandinavian countries and the Netherlands (green circle) and the UK (blue) have a much higher employment of older workers than France.

Source: Research Institute for the Economics of Education and Social Affairs Berlin, 2016

Schneider et al. (2007) evaluated the training measures in Germany using the policy changes as instruments to infer causal effects. They show that participation in training programs had a positive impact on employment prospects already before the reform. Results for the relative short observation period since the reform are pointing to a further increase of effectiveness. The driving force behind this seems to come from reducing the duration of training programs but intensifying them, which has decreased the lock-in effect[1] without affecting the program effect.

McCall, Smith and Wunsch (2016) evaluate French adult training programs and find room for improvement: "The evidence for France confirms that public–employment-service-provided training mostly has negligibly effects on participants' employment rates and only sometimes positive effects. However, even in the absence of positive effects on the exit rate from unemployment, the studies provide robust evidence that training increases, post-unemployment, employment stability". The importance of a long-term view is echoed by Card, Kluve and Weber (2018) in their general assessment of active labor market policies. They summarize that training programs "have small (or in some cases even negative) short term impacts, coupled with larger impacts in the medium or longer run (2-3 years after completion of the program)."

3.3. Policies to improve employability of workers with chronic illness

The need to improve in-work policies directed to those with chronic illness (OECD, 2010) is apparent when undertaking pension reforms that increase the average age of retirement. Otherwise, there is a danger that reforms to pensions will be accompanied by increased levels of unemployment and disability claims and greater inactivity amongst more vulnerable individuals (Avendano and Cylus, 2019). Policies to support those with chronic illness to work need to take into account that the impact of a chronic illness on employment is not homogeneous. Having a longstanding illness or health problem does not necessarily limit the activities individuals can do, as indicated in Figure 33. It will depend on the type of chronic illness, the type of work they do and the other options open to them other than work. Thus a "one size fits all" approach to policy is not likely to be effective.

Reviews of best practice based on international evidence indicate that strategy to improve the health capacity of older workers needs to combine three different types of policy and interventions (Avendano and Cyrus, 2019; Nazarov et al., 2019). The first are workplace-based health and wellness interventions to promote health and increase the work capacity of older workers. The second are employer accommodation practices to help older workers with health problems to stay in work. The third are to address features of the disability

[1] The "lock-in effect" refers to people being prevented from searching for a job since they are locked in training programs.

insurance system to ensure that older workers who experience functional problems do not leave the labour force.

Workplace-based health interventions

The workplace is argued to be underused for interventions to provide older adults with chronic conditions the resources they need to continue working (Pitt-Catsouphes et al. 2015). Avendano and Cyrus (2019) concluded that primary prevention through the workplace appears to be an effective strategy for improving workers' health capacity and reducing modifiable risk factors such as physical inactivity and poor nutrition and that evidence suggests that improvements in health status and decreased risk factor exposure can quickly reduce health care costs for employers. Workplace-based Health and Wellness programmes can achieve this primarily through three types of intervention (1) screening to identify potential health risks through ergonomic or health risk assessments (2) lifestyle interventions targeted to chronic disease risk factors, such as exercise and healthy food programmes; and (3) on-the-job education programmes that encourage healthier lifestyles. Evidence from a variety of (often small scale) trials find such workplace-based health interventions can lead to positive changes in employment status, work ability and sick leave rates for people with a variety of chronic conditions, can reduce modifiable risk factors such as physical inactivity and nutrition and also reduce costs for employers (Centers for Disease Control and Prevention, 2013). The extent to which these can be successfully scaled up has been less studied.

Employer accommodation policies

Policies and regulations that aim to improve the work environment for those with chronic illness have been increasingly used in a range OECD countries. They focus on "workability" and aim to establish the extent to which a specific disability or condition interferes with work performance and then to mitigate this. Nevertheless, despite enthusiasm for such policies across the OECD, many have not been evaluated at scale (Avendano and Cyrus, 2019). The lessons from the more robust evidence are first, workplace interventions to date have had more impact for workers with musculoskeletal disorders than with mental health problems or cancer. Second, workplace interventions that combine multiple components are more likely to be effective than interventions that focus on a single dimension. Third, changes to the work environment, including work structure, are critical to improving workability for older workers. Fourth, government has an important role to play in designing effective legislation to ensure the spread of such policies and financial incentives to support employer-based actions without creating more red-tape for employers (Avendano and Cyrus, 2019).

French policy has been to focus primarily on employment for those with cancer, but a number of current smaller initiatives at regional level have broadened the scope to include

other conditions. There are also two large employers involved in implementing initiatives (Delpeyrat and SNCF). Given the newness of the French initiatives, our recommendations are that these are continued and evaluated and that any new policies are only implemented in a way that incorporates the lessons from international evidence and permits robust evaluation.

Disability insurance and rehabilitation

Disability insurance has two potentially contradictory goals. On the one hand, it aims to ensure that workers with a disability do not face economic hardship and thus provide compensation for income losses due to reduced work capacity. On the other hand, disability insurance programmes also aim to avoid exclusion and encourage participation in employment, e.g. by rehabilitation measures. There is a large variation across OECD countries in their policies to achieve these goals, which results in vastly different outcomes in terms of both income protection and labour force participation of workers with disabilities. Over time, the direction of policy in the OECD has been to reduce the compensation dimension (OECD 2010, 2013) and expand on integration (Böheim and Leoni, 2017). Our recommendations are to follow this change and to focus policy on labor market integration and rehabilitation. This requires strengthening the degree of employer obligations towards their employees, extending the duration and intensity of vocational rehabilitation, and increasing the work incentives for beneficiaries.

Evaluation of disability reforms is hampered by the fact that they often introduced at the same time as pension reforms which increase the retirement age, and the institutional details of the system vary considerable across countries. In a recent comparison of reforms in four countries (Switzerland, Sweden, Norway and the Netherlands) in a review for the OECD, Heming and Prinz (2020) drew the following lessons:

- The case of the Netherlands, which placed the burden for reduction of disability strongly on employers by making them liable for the insurance premiums for their workers, demonstrates that employer incentives are critical. Further, support for a reform that (substantially in the case of the Netherlands) increases employer costs for sickness and disability can be obtained when all parties agree that the outcomes are inacceptable and unsustainable. Hullegie and Koning (2018) also evaluate the Dutch reforms and conclude that the reforms improved the labour market position of workers who experience a health shock (they were less likely to receive disability income insurance and more likely to remain employed).
- The Swiss case shows that greater early identification of problems, matched with new early intervention services, is critical. Losing time is costly because a return to work is unlikely as soon as workers have shifted their mindset to inactivity. More recent reform in Switzerland targeted at disability beneficiaries shows that bringing long-term beneficiaries back into the labour market is much less promising than preventing.

- A key lesson from Sweden is that employee incentives and enforced regulations can work very effectively. When sick pay was reduced in the 1990's, in the course of a severe economic downturn, absence rates fell dramatically; even just a 10 percentage-point decrease in the sick pay compensation rate had a large effect. When sick pay regulations were overhauled ten years ago, with new eligibility criteria that support a much swifter return to the labour market, sickness trends underwent further dramatic change.
- Another Swedish lesson is that a cultural shift is possible: the degree of change in sickness and disability in Sweden in the past decade is unparalleled.

While these lessons are drawn from a comparison across these relatively similar systems, they also appear generalisable to other settings. First, policies need the support of both employers and the government. Second, using financial incentives for employers appears to have an impact on disability claims, but it is also clear that putting all the risk upon employers imposes a heavy burden on employers, particularly those in small and medium-sized enterprises.

4. Health System Reforms to Increase Use of Preventative Care and Improve Chronic Disease Management

We propose a small set of healthcare system policies which complement our overall aim of reforming pensions. These will impact not only on those in the generation currently approaching retirement age but also on younger individuals, as they will be the future generations of older workers. They will be subject to later retirement under our proposed pension reforms and to support this, efforts are needed to tackle the rise in chronic illness which limits ability to work and whose incidence and impacts are socially unequally distributed.[1]

This increase cannot be dealt with by the health system alone. Many of the important and high-payoff preventive activities lie outside clinical medicine. Healthcare policies are complementary to a range of other policies, many of which are in operation in France (for example, bans on tobacco consumption, advertising of harmful products, so-called "sin taxes", public education programmes and efforts to reduce urban pollution).

But the French healthcare system is characterized by a low level of expenditure on prevention and interventions designed to combat the rise in chronic conditions relative to

[1] We do not address long-term care as this has been the subject of the so-called "Rapport Libault" (March 2019). Lack of long-term care outside the home may affect the labour market participation of household members of those needing such care.

comparator EU countries (Appendix 15). Various reforms for the French healthcare system since the mid-2000's have tried to tackle this and the issue has been subject to several policy proposals.[1] These stress that making serious headway in tackling chronic health needs intersectoral approaches and joined up actions, better governance and use of a wide set of policies at different spatial and administrative levels.

We support this strategy but argue that to deliver better care for the chronically ill and to give greater incentives for prevention activities, financial incentives for providers and consumers of health care need to be strengthened and new methods to deliver care for those with, and at risk of, chronic illnesses need to be encouraged. With this focus, we recommend:

- A major extension of the use of pay for performance in the treatment and prevention of chronic illness (4.1).
- An acceleration in the use of payments for bundles of treatments which are given to patients over a period of time, reducing the extent of fee-for-service payments (4.2).
- The creation of a basket of medical care for prevention activities which will be fully reimbursed by the French health insurance system (4.3).
- Changing the regulatory and financial position of telemedicine to increase the volume of delivery of preventative and chronic condition care remotely (4.4).

We now discuss each of these in more detail.

4.1. Greater use of payment related to performance

Pay for performance (P4P) schemes in healthcare link payment to providers to the delivery of improvements in care. These are most frequently quality improvements. They are increasingly used to replace traditional fee-for-service payments or fixed payments which are not related to performance or outcomes. While P4P schemes have not in the short run led to "breakthrough" improvements in quality of medical care, reviews of P4P in healthcare (for example, Cashin et al., 2014) argue that moving to P4P plays a broader role as an instrument for improving clarification of the goals of providers, improved processes for purchasing health services, improved measurement of provider activity and performance, and a more informed dialogue between purchasers and providers.

Our proposals build on a growing number of measures that have been taken within the French healthcare system to use payment for performance for providers of primary and preventative care. The most important of these is the ROSP (*rémuneration sur objectifs de*

[1] See National Health Strategy Contribution of the High Council of Public Health (HCSP, 2017), CNS (2018), Plan Priorité (2018), and also Jusot et al. (2017), Legal and Vicard (2015), Perronin (2016).

santé publique) scheme (Appendix 15). We propose that payment for performance initiatives are widened to cover treatment and prevention of a larger set of chronic and preventable conditions than the 31 covered in the present ROSP scheme.

We do not prescribe the exact design of the P4P schemes (and note there are many examples already discussed in recent French healthcare policy). Instead we advocate the following research-based key principles in their design (Eijkenaar, 2013): (1) defining performance broadly rather than narrowly; (2) ensuring that incentives for patient selection are minimised for example, by risk adjustment for outcome and resource use measures; (3) involving providers in programme design; (4) favouring group incentives over individual incentives; (5) using either rewards or penalties depending on the context; (6) more frequent, lower-powered incentives; (7) absolute targets rather than relative targets and multiple targets rather than single targets; (8) having P4P as a permanent element of the overall provider payment system.

In addition, we advocate local experimentation in the nature of the scheme. This will allow schemes to be tailored to local conditions, so that the selection of activities to be rewarded can focus on the health needs of the local population, and the exact nature of the payment schemes can reflect the current configuration of primary care in the local area. Experimentation allows a range of policies to be tested at a relatively low cost that can then be scaled up if successful and dropped if not. This recommendation builds on Article 51 (Loi de financement de la sécurité sociale - LFSS, 2018) which has legally allowed a combination of bottom-up experiments in payment schemes in French healthcare, with scaling-up conditional on positive evaluation, and top-down experiment common to all (Appendix 15).

4.2. Accelerate use of payment for bundles of treatments

The use of payment for a bundle of treatments are particularly suited to the treatment of chronic diseases, as these need treatment over time, and for patients requiring care for several health conditions, which is an increasing feature of aging (see Figure 27). The current system relies heavily on fee-for-service for individual items, which increases costs and, coupled with less than full insurance at point of use, reduces demand in price-sensitive users of care.

There are two steps to creating treatment bundles. The first is a switch from fee-for-service to prospective payment. The second is to group treatments together into bundles and set the payment for the bundle. Payments can be set at the patient level for treatment over a duration of time or at the population level. They can be defined to cover all treatments in a particular setting – as in the use of capitation payments in the UK National Health Service which are used to pay for care from family doctors (GPs) – or for particular types of

condition and “care pathways” for that condition (in France these are being used experimentally for hip replacement).

Bundled payments give incentives to providers to coordinate care at the patient level, resulting in greater efficiency of production (for example, avoiding duplication of treatment and use of unnecessary treatments). They may also lead to greater patient involvement in their own care, which should in turn improve outcomes. The risks include patient selection by providers of easier-to-treat patients, free-riding by providers on each other when there are multiple providers involved in delivering a bundle, incentives to under-treat because payment is fixed, and complexity of the payment system.

These issues have been addressed in social insurance systems that share attributes of the French system (HCSP, 2017) and a greater movement in this direction in France has been proposed (DREES, HCSP and CNAM reports) and is legally allowed under Article 51 (LFSS). We propose an extension of prospective bundled payments beyond the current EDS small-scale pilots, which are focused on hospital care for total hip replacements, total knee replacements and colectomy for cancer. It will also build on the current PEPS[1] in fixed payment for out-of-hospital groups of healthcare professionals. We propose that this method of payment should be extended to care for chronic illnesses, such as type II diabetes and common mental health conditions, such as generalised anxiety and depression. Both conditions impose large costs on individuals and society.

This would mean first defining a set of treatments for these conditions, where inclusion in the set is based on evidence on effectiveness. The second step is to set a prospective payment for that bundle. This payment should be linked to measures of the quality of care, as in the present EDS and IPEP[2] experiments. The eventual aim is that a large proportion of care for individuals with chronic conditions will be reimbursed in this way.

4.3. A pre-defined basket of fully insured preventative care treatments

We propose the creation of a pre-defined basket of preventative care treatments which would be free at the point of demand. This basket would be made up of all treatments for preventive care products which have been shown to have medical and economic benefits for clearly identified indications, regardless of in which setting (primary, community, secondary) they are provided in the healthcare system. Coverage of services included in this basket would be fully financed by social security.

[1] Acronym for: *Paiement en équipe de professionnels de santé en ville*.

[2] Acronym for: *Incitation à une prise en charge partagée.*

Defining a basket on the basis of evaluation will limit expenditure by social security to those items shown to be cost-effective. The basket could be defined and regularly updated by the Haute Autorité de santé (HCSP, 2017).

At present, some preventative treatments, such as screening, are subject to co-payments. These are intended to limit moral hazard by consumers to reduce excess consumption but they may also limit appropriate consumption. If certain kinds of prevention reduce the likelihood of disease, and thus in turn reduce the demand for curative treatment, and an individual's insurance premiums or taxes are negligibly affected by their personal use of preventive and treatment services, they should be at least partially insured (Newhouse, 2020). Otherwise individuals will not account for the financial consequences of the reduction in their future use of treatment services and will under-consume preventive services relative to the social optimum (Ellis and Manning, 2007; Goldman and Philipson, 2007; Chernew et al., 2008). Although the evidence on the size of demand elasticities for preventative and curative care is not very extensive, a recent review (Rezayatmand et al., 2012) concluded that out-of-pocket payments decrease the utilization of preventive services. This, and other international evidence (e.g. Brot-Goldberg et al., 2019), suggests that preventative care should have less cost sharing that curative care, rather than more.

Curative care has high insurance coverage in the French system. However, there are gaps in this insurance coverage. In recognition of this, care for 31 chronic conditions now has zero copayments under the *Affections de longue durée* (ALD) scheme already in operation (Appendix 15). The same approach should be taken for preventative care items which are deemed to be effective and therefore are included in the basket.

4.4. Increase delivery of preventative and chronic care remotely

Telemedicine is the use of telecommunications technology to provide health care services to persons who are at some distance from a provider. A range of benefits from telemedicine have been identified. The most common of these are more cost-effective care, improved quality of care and reduction of inequalities in access, saving of patient time and avoiding travel costs and more patient centered care (Cravo Oliveira Hashiguchi, 2020). Despite a number of initiatives, the current position in France is that the use of telemedicine is restricted and lagging behind many other European countries (Cour des comptes, 2017). However, the Covid-19 pandemic indicates that the system in France can change quite rapidly. Emergency law introduced in late March 2020 relaxed the regulations on use of telemedicine and changed the insurance coverage from 70% coverage by social security and 30% complementary insurance to 100% social security coverage. The result has been a dramatic rise in the use of teleconsultations (Appendix 15).

This response illustrates that large and sudden shocks can help movement to a new adoption equilibrium as it gives multiple players simultaneous incentives to switch to the

new technology (e.g. physicians, patients and hospital managers). Key players in any such switch are national and local regulators. The rapid change during the Covid pandemic suggests that regulatory barriers have been part of the reason for the slow diffusion of telemedicine (Cutler et al., 2020; Keesara et al., 2020). While in France there have been several regulatory changes which allow greater use of telemedicine, the experience of the pandemic suggests more is needed to use telemedicine to deliver preventative and care for chronic illnesses. It is both necessary to extend the set of activities that can be treated this way and change the financial incentives for both providers and users.[1]

At present, a narrow set of activities are allowed to be treated by telemedicine. There should be a regulatory switch to adopt a similar approach to Netherlands, Finland, Iceland and Norway where telemedicine is legally treated as another way of delivering health care (a "telemedicine is medicine" approach), and thus one regulated by general healthcare legislation (Cravo Oliveira Hashiguchi, 2020). Other changes include allowing electronic prescribing (Cour des comptes, 2017) and no requirement for patients seeking reimbursement of real-time video consultations from their health insurers to have consulted the physician face-to-face in the previous 12 months (as pre-Covid-19). While this may ensure that there is continuity of care, this limits the type of care that can be taken as telemedicine. Services were shown to be successfully delivered virtually in several settings for chronic conditions (for example, mental health services for generalised anxiety and depression may only be required intermittently). Dropping this requirement would allow the expansion of treatments for chronic conditions and prevention to be delivered remotely.

Items delivered by telemedicine can be subject to P4P and may be part of a set of bundled treatments which received a single payment. For items outside any P4P scheme or a bundled payment set (which may initially be a large set), we propose that the recommendations of the Cour des comptes (2017) report on telemedicine are followed. Telemedicine would be remunerated by means of two prospective flat rate payments (as in a diagnostic related group-DRG system). The first would be a single payment for a course of treatment by the same health professional for the benefit of the same patient over a given period or for a time-limited episode of care. The second would be a single payment for use of equipment. A flat rate payment reduces incentives for too much service provision, but in order that providers participate, the rate will have to be set relative to face-to-face consultations in order to incentivise providers to participate. Initially setting these to be the same, alongside a payment for the use of equipment, would give providers an incentives to make greater use of virtual consultations. To give further incentives, rates of coverage for in-hospital treatment for those procedures where

[1] These changes are a permanent extension of a July 2020 proposal from CNAM, "La télémédecine, une pratique en voie de généralisation".

telemedicine could be used should be lowered to encourage the substitution of telemedicine wherever it is medically relevant.

On the demand side we recommend retaining the removal of any co-payment for services delivered by telemedicine. These services would be 100% covered by social security. As the elasticity of demand for telemedicine in France is not known, we cannot predict at this stage what changes in demand might be and the cost implications of this. But given the current tilting of the French healthcare system towards curative care, we argue that giving incentives for increases in access to preventive care delivered remotely outweighs possible costs of over-use. This can be assessed once data is available on utilization rates.

Increasing the use of telemedicine will also help address the long-standing issues of geographical disparity in the location of medical services in France (the so-called “medical deserts”). This is particularly a problem for primary care, where despite many efforts to promote the supply of medical practitioners, there remain areas which are particularly under-served. Areas which are particularly underserved are poorer rural areas (with higher than average age populations) and those around cities (often with younger, more disadvantaged populations). Extending telemedicine is therefore also a policy to tackle the geographical inequality in public services which has been discussed in Chapter Two on inequality.

In advocating the extension of telemedicine, it needs to be recognized that there are concerns over the quality of health-related information that are available to individuals on social media and other platforms. Whilst legitimate (as evidenced by the rise in the Anti-VAX movement on social media), there has also been a steady increase in the last decade in the amount of validated information made available by national health authorities on health conditions and medical treatments. There is a recognition by medical professionals that the internet is fundamentally changing the relationship between medical providers and their patients (Amaral-Garcia et al., forthcoming). This is a reason to educate medical professionals on how to build on patient knowledge and deal with patients who have false information. In addition, there is concern about that those who have less resources will not be able to access telemedicine services. However, many remote services can be accessed by telephone and do not require large amounts of technology on the part of the user of services. We therefore consider neither concern to be a reason to limit use of an important new mode of healthcare delivery suited to the treatment of long-term conditions and delivery of prevention services.

5. Reforms in Integration Policies

Policy reforms have to take into account the multifaceted causes of migrants’ labor market disadvantage. There are three important starting points for policies that are tailored to immigrants and their children: first, more coherent policies – especially for recent

immigrants – that support the recognition of existing and the achievement of new skills and credentials; second, policies counteracting the intergenerational transmission of low levels of education by improving access to better schools for the second generation; and third, policies that aim at documenting and tackling labor market discrimination.

5.1. More coherent policies that support recognition of existing and achievement of new skills and credentials

The problem of low overall skill level of immigrants to France is amplified by the non-recognition of educational degrees. The problems surrounding foreign qualification recognition has been recognized by Aurélien Taché et al. (2018) in his sweeping recommendations to update French integration policy. He states that the recognition of partial qualification is essential for immigrant integration, which could take into account prior study and experience, outline the missing competencies and direct immigrants to appropriate training to round out their qualification. He also advocates for closer cooperation between the body issuing the qualification evaluation and the professional bodies that regulate a given occupation. But the problem seems to lie deeper given that most migrants with higher levels of qualification do not even try to have their credentials recognized. This may be partly related to the fact that they are not eligible in the sense that they possess at least three years of experience directly related to the qualification desired. But it also reflects a lack of information about the possibility to have one's credentials recognized, even if only partly.

Some information and the tools (e.g., to submit educational certificates online) can be found on the internet but there is much room for improvements here. Available information is still too difficult to find and does not look very inviting. A signpost welcoming new immigrants that is available in the most important immigrant languages and is not limited – like much of existing information – to new talent, students and tourists would make a difference here. This information could also target certain subgroups such as women and inform them about women-only language classes and childcare options.

The achievement of language skills is another challenge for newcomers and settled migrants and key for their labor market integration. France has recently increased the duration of language lessons for migrants who are not proficient in French to 400 hours (and under certain circumstances to 600 hours). This number should be further increased and include occupation-specific language training. Child support should be provided to increase course participation, in particular among women. Germany can serve as an example here.[1] Not only do immigrants receive more hours of language instruction, but language classes are also partially specific to certain occupational fields, e.g. medical

[1] See the informational flyer "Vocational language courses" produced by BAMF.

occupations. These occupation-specific language classes particularly target migrants who already have some basic language skills and who are searching for a job, who are trying to have their occupational degree acknowledged or who have a job and need to improve their occupation-specific language skills. In these classes migrants learn specific vocabulary, as well as skills like writing professional emails or job applications. They are free for unemployed migrants and childcare is partly provided.

Quasi-experimental evidence suggests that participation in language classes has a sizeable positive effect on newcomers' labor market integration: "An increase by 100 hours of [language] training raises the probability of participating in the labor force between 14.5 and 26.6 percentage points" (Lochmann et al., 2018, p. 17). Against the backdrop of Lochmann et al.'s research, such occupation-specific language classes play several essential roles. Not only do they support the acquisition of language skills that are needed in order to find adequate employment, they also put migrants, especially new migrants, in contact with others from the same occupational segment and thus provide access to relevant information, e.g. about vacancies or about ways to have their degrees acknowledged. Ideally these classes partly compensate for a lack of informal networks that represent a particularly challenging endeavor for immigrants' labor market entry.

An attempt to increase the labor force participation of migrants by roughly 20 percentage points should be compared to the exercise done in the previous section for natives (see Figure 15). We showed that closing the gap between the French and the average European employment rate would essentially stabilize the system dependency ratio and therefore the main challenge of population aging. Table 2 in Section 1 (2.1) shows that this would require a 10 percentage-point increase in the employment rate among men aged 55-64. These are about 4.2 million individuals. The same effect could be achieved if 2.1 million migrants (about a third of the current stock of migrants) would receive an additional 100 hours of language training. Realistically, however, one has to take into account that about 75% of the immigrants currently living in France have good French language skills. Moreover, the effectiveness of language training will probably be at the lower bound of Lochmann et al. for those who already live for some time in France. Taken together, general language training with its integrative side effects roughly corresponds to 60% of the necessary employment increase among men aged 55-64 shown in Table 2 (Section 1, 2.1). In turn, a higher number of hours and occupation-specific training could add to this figure. The latter might also ameliorate the problem of over-qualification.

5.2. Counteracting intergenerational transmission of low levels of education through better access to better schools

Intergenerational transmission is a powerful force and children whose parents have a low socio-economic status often face considerable disadvantage already when they start

school. Many children of immigrants belong to this group even though most of them are French and information on students' racial and ethnic background is frequently unavailable. As outlined above, this disadvantage in terms of children's competencies is amplified by the fact that children of immigrants often attend the most disadvantaged public schools. This does partly but not exclusively reflect residential segregation. Even though the public debate focuses strongly on the few areas were concentration of immigrants is extreme (Préteceille, 2011), only a small share of immigrants lives in neighborhoods where they are the majority. Most immigrants are exposed to moderate levels of residential segregation but many privileged parents try to avoid school catchment areas by opting out of the public school system and sending their children to private schools instead. As a consequence, extreme levels of segregation can be found in schools that by far surpass levels of residential segregation. Private schools receive considerable state funding. Available evidence suggests that making these funds dependent on a better mixing of students by social status might be a more promising path than rezoning public schools (Oberti and Savina, 2019). The latter strategy faces not only fierce opposition from more privileged parents but also practical problems if the disadvantaged areas are large. Additional funds obtained this way could be redirected to disadvantaged schools. Note, however, that programs to additionally support such schools exist for decades (e.g. Priority Education Zone/Priority Education Network) but "have not succeeded in closing the economic and cultural gap between advantaged and disadvantaged schools" (ibid., p. 3138). Given the importance of informal learning opportunities and the availability of role models, extra funding for disadvantaged school needs to go hand in hand with incentives for schools, including private ones, to make a greater effort to increase the schools' social mix. Since many disadvantaged families are immigrant families, the latter group would benefit from this even if not directly targeted by such a policy. Well-trained and motivated teachers that provide orientation and guidance are another important component in improving the education and skills of children with an immigration background and helping them to make the right choices (see Chapter Two on inequality).

5.3. Detecting and reducing discrimination

Reducing ethnic discrimination is another important starting point for improving migrants' labor market integration. Discrimination has many sources and depending on its cause in a particular situation, different strategies may work. Discrimination can be expected to decline when it becomes too costly, e.g. if discriminators experience competitive disadvantages because they are less successful in hiring the most productive job applicants, or if there is a realistic risk that discrimination is detected and persecuted. In an extensive and novel meta-study on labor market discrimination in Europe and North America, the authors identify France as a country with particularly high rates of discrimination and conclude that: "(f)ew constraints are placed on employers' ethnic

consideration in hiring in France, which is largely due to the absence of monitoring or measurement along these lines" " (Quillian et al., 2019, p. 489). This absence is related to the idea that collecting information on a French-born person's ancestry – e.g. by asking about his or her parents' place of birth – is not in line with the principles of the French republic.

Unless discrimination is blatant and open, individual acts of discrimination (such as not hiring an applicant due to her skin color) are difficult, if not impossible, for the victims to detect. Audit studies help to assess the frequency of discrimination at a certain stage in the application process for a job, for example being invited to a job interview, but they say little about the cumulative effects of discrimination on integration on both the individual and organizational level.

On the *individual level*, analyses of survey data can provide indirect evidence for discrimination by comparing individuals that are similar with respect to labor market relevant characteristics (e.g. education, language proficiency, family situation etc.) but differ with respect to their origin. Availability of such data is limited in France. In order to enable more research about the relative importance of the different factors contributing to migrants' labor market disadvantage, a new panel study is needed that:

– surveys a large enough random sample of the same individuals every or every other year (panel design);
– includes native-born individuals *and* immigrants (including recent and settled migrants) and collects proxy information on their children (unless they are old enough to join the panel themselves);
– adds refreshment samples in regular intervals;
– oversamples first and second generation immigrants from the largest origin groups;
– collects, among other information, data on the different factors that influence migrants' labor market participation such as education, gender role orientations, religiosity, language proficiency in French, social ties and networks, experiences of discrimination;
– provides questionnaires in the most important immigrant languages to enable migrants that are not proficient in French to take the survey and enables survey participation in different interview modes to avoid bias.

Furthermore, as a first and comparatively easy to implement step, data on parental place of birth should also be included in the French census. This would also improve knowledge about school and residential segregation Previous research has shown that the share of individuals at unease with reporting data on parental place of birth is very low (Simon, 2017, p. 2330).

On the *organizational level*, collecting data on the composition of the workforce is needed in order to identify labor market segments, organizations and ranks where employees with a migration background are under-represented. While under-representation does not necessarily reflect discrimination, hiring procedures in large firms with a particularly severe problem of under-representation could be monitored more closely. This could be done, for example, by conducting audit studies in larger organizations that examine discriminatory procedures more directly. Monitoring and reporting alone can be expected to sharpen awareness about the under-representation of certain groups and send a signal to employees, policy makers and society that it is taken seriously. Based on this sort of data and on information about the applicant pool, organizations can be encouraged to set hiring goals for members of disadvantaged immigrant groups. This can be a first step towards building "structures establishing responsibility" for increasing workplace diversity. This strategy has proven more efficient than tackling individual stereotypes, e.g. by offering mandatory anti-bias trainings, or by providing mentoring for minority members (Kalev et al., 2006). To implement – and move beyond – the recommendations from the CNIL in 2007, collecting objective data about an individual's ancestry (most importantly nationality and parents' place of birth) as a measure of diversity would be an important step (*Mesure de la diversité et protection des données personnelles. Les dix recommandations de la CNIL*, 2007). The suggestions of the COMEDD report in 2010 about a mandatory annual "comparative situation report" (*rapport de situation comparée*) that documents the status of origin groups in the main HR processes (recruitments, promotions, contract types, access to trainings etc.) should be implemented (Héran, 2010). Thus, polices like this, which originally aimed at providing equal opportunities to men and women, can serve as a blueprint for addressing origin-based discrimination (even though the latter is more complex), for instance by defining broad categories of countries of origin. To ensure data quality and avoid selective subsamples, it is important that this is obligatory in larger firms and for all government contractors. Appropriate measures should be taken to ensure data protection, such as forbidding the storage of this data in individual employee files. With France becoming so diverse, it is time to acknowledge that disadvantage is not disappearing with birth in the republic (Simon, 2017) and to overcome the reluctance to collect much needed data on (parental) place of birth that is so far missing.

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APPENDIX

APPENDIX

MEMBERS OF THE COMMISSION

RAPPORTEURS

Olivier Blanchard

Robert M. Solow Professor of Economics Emeritus at the Massachusetts Institute of Technology, Fred Bergsten Senior Fellow au Peterson Institute for International Economics

Olivier Blanchard joined the Peterson Institute for International Economics as the first C. Fred Bergsten Senior Fellow in October 2015. A citizen of France, he has spent most of his professional life in Cambridge, Massachusetts. After obtaining his Ph. D. in economics from the Massachusetts Institute of Technology (MIT) in 1977, he taught at Harvard University, and returned to the MIT in 1982. He was Chair of the Economics Department from 1998 to 2003. In 2008, he became the Economic Counselor and Director of the Research Department at the International Monetary Fund. He remains the Robert M. Solow Professor of Economics Emeritus at MIT. He is a macroeconomist, who has worked on a wide range of issues such as the role of monetary policy, the nature of speculative bubbles, the determinants of unemployment, transition in former communist countries, and forces behind the recent global financial crisis. He is a former Editor of the *Quarterly Journal of Economics* and the *NBER Macroeconomics Annual* and founding Editor of *American Economic Journal: Macroeconomics*.

Jean Tirole

Honorary Chairman of the Board, Fondation Jean-Jacques Laffont/Toulouse School of Economics (TSE) and Institute for Advanced Study in Toulouse (IAST), Visiting Professor at the Department of Economics, Massachusetts Institute of Technology

Jean Tirole was born in Troyes, in France. After having studied engineering at the École polytechnique and École nationale des ponts et chaussées in Paris, he turned his interests to economics and mathematics. In 1981, he received his doctorate in economics from the Massachusetts Institute of Technology (MIT). Jean Tirole is Honorary Chairman of the

Toulouse School of Economics (TSE) and Scientific Director of TSE-Partenariat. He is also a founding member of the Institute for Advanced Study in Toulouse (IAST) and he is affiliated with MIT, where he holds a visiting position. His research covers macro-economics, industrial regulation, business management, finance, and psychology-based economics, etc. Jean Tirole has published over 200 articles in international reviews, as well as 12 books. Published in English in 2017, his latest book entitled *Economics for the Common Good* (Princeton University Press) is accessible to a wide audience and available in a number of other languages. He is the laureate of numerous international distinctions, including the 2007 CNRS gold medal and the 2014 Sveriges Riksbank prize in economic sciences in memory of Alfred Nobel.

HEAD AUTHORS

Chapter One – Climate Change

Christian Gollier

Professor and Executive Director of the Toulouse School of Economics

Christian Gollier is the Executive Director of the Toulouse School of Economics (TSE), which he founded with Jean Tirole in 2007. He has published over 100 articles in international scientific journals and several books, such as *The Economics of Risk and Time* (MIT Press, 2001), which won the Paul A. Samuelson Award, *Pricing the Planet's Future* (Princeton University Press, 2012) and *Ethical Asset Pricing and the Good Society* (Columbia University Press, 2017). In 2019, he published *Le Climat après la fin du mois* (Presses universitaires de France), which received several awards. In addition to his activities as a researcher, Christian Gollier participated in the drafting of the 4th and 5th Intergovernmental Panel on Climate Change (IPCC) in 2007 and 2013. He is president of the European Association of Environmental and Resource Economists (EAERE). He taught at the University of California, San Diego (USA), at HEC (Paris), and at École polytechnique. He held a visiting professorship in the Department of Economics at Harvard University (Autumn 2012) and at Columbia University (2015-2016). His research ranges from the fields of the economics of the uncertain, environmental economics, finance, consumption, insurance, and cost-benefit analysis, with a particular interest in long-term effects.

Mar Reguant

Associate Professor at Northwestern University, Illinois

Mar Reguant is an Associate Professor of Economics at Northwestern University, Illinois. She previously worked at the Standford Graduate School of Business. She received a Ph. D. at the MIT in 2011. Her research uses high-frequency data to study the impact of

auction design and environmental regulation on electricity markets and energy-intensive industries. She is a Research Associate at the National Bureau of Economic Research (NBER) and director of the Industrial Organization Programme at the Centre for Economic Policy Research (CEPR). She was awarded a Sloan Research Fellowship in 2016, the Sabadell Prize for Economic Research in 2017, a PECASE award in 2019, and the EAERE Award for Researchers in Environmental Economics under the Age of Forty in 2019. Mar Reguant was recently awarded an ERC Consolidator Grant to study the economics of the energy transition.

Chapter Two – Economic Inequality and Insecurity

Dani Rodrik

Ford Foundation Professor of International Political Economy at the John F. Kennedy School of Government at Harvard University

Dani Rodrik is Ford Foundation Professor of International Political Economy at the John F. Kennedy School of Government at Harvard University. He joined the Kennedy School in July 2015 after two years at the Institute for Advanced Study as the Albert O. Hirschman Professor in the School of Social Science. He is co-director of the Economics for Inclusive Prosperity (*EfIP*) network and President-elect of the International Economic Association. He is affiliated with the National Bureau of Economic Research and the Centre for Economic Policy Research (London) among other research organisations. Professor Rodrik's research focuses on globalisation, economic growth and development, and political economy. He is the recipient of numerous awards, including the inaugural Albert O. Hirschman Prize of the Social Science Research Council and the Princess of Asturias Award for Social Sciences. He was included in *Prospect* magazine's World's Top 50 Thinkers list (2019) and in *Politico* magazine's 50 list (2017). His newest book is *Straight Talk on Trade: Ideas for a Sane World Economy* (Princeton University Press, 2017). He is also the author of *Economics Rules: The Rights and Wrongs of the Dismal Science* (W. W. Norton & Company, 2016) and *The Globalization Paradox: Democracy and the Future of the World Economy* (W. W. Norton & Company, 2011).

Stefanie Stantcheva

Professor of Economics at Harvard University and co-Editor at the Quarterly Journal of Economics, *founder of the Social Economics Lab*

Stefanie Stantcheva is an economist studying taxation, inequality, social economics and innovation. She runs large-scale "Social Economics Surveys and Experiments" to explore the determinants of our social preferences, attitudes, and perceptions. She received her Ph. D. in Economics from the MIT in 2014 and was a Junior Fellow at the Harvard Society

of Fellows 2014-2016 before joining the Harvard Department of Economics in 2016. Today, she is Professor of Economics at Harvard University. Since May 2018, she has been a member of the French Council of Economic Advisers (Conseil d'analyse économique). Since January 2020, she is a co-Editor at the *Quarterly Journal of Economics*. Stefanie Stantcheva has also founded the Social Economics Lab which applies large-scale online surveys in many countries to understand how people think, how they form their perceptions, beliefs, and attitudes, and how their views on economics and social policies emerge.

Chapter Three – Demographic Change

Axel Börsch-Supan

Director at the Max Planck Institute for Social Law and Social Policy, Munich and Professor of Economics at the Technical University of Munich

Axel Börsch-Supan studied Economics and Mathematics in Munich and Bonn. He holds a Ph. D. degree from the MIT. After being an Assistant Professor of Public Policy at the JFK-School of Government at Harvard University (1984-1987), and a Professor of Economics at Dortmund University (1987-1989), he became Professor of Macroeconomics and Economic Policy at the University of Mannheim (1989-2011), then Professor of Economics at the Technical University of Munich. He is a member of the Max Planck Society since January 2011, and Director at the Max Planck Institute for Social Law and Social Policy (Max-Planck-Institut für Sozialrecht und Sozialpolitik) since July 2011. As such, he also heads the Munich Center for the Economics of Aging (MEA). He was Chairman of the Council of Advisors to the German Economics Ministry (2004-2008), and was a member of the German President's Commission on Demographic Change. He has served as a consultant to many governments, the OECD, the World Bank, among others. Axel Börsch-Supan is Coordinator of SHARE (Survey of Health, Aging and Retirement in Europe) and Research Associate at the National Bureau of Economic Research (NBER) in Cambridge, Massachusetts.

Claudia Diehl

Professor of Sociology at the University of Konstanz

Claudia Diehl holds a chair in microsociology at the University of Konstanz since 2013 and is Co-Speaker of the Cluster of Excellence "The Politics of Inequality" funded by the German Research Foundation (DFG). She is currently working on integration processes among new immigrants in Europe and on xenophobia and ethnic discrimination. She received her Ph. D from the University of Mannheim in 2001 and has been a Professor at the University of Göttingen before her appointment in Konstanz. She was a member of the Expert Council of German Foundations on Integration and Migration and has recently been appointed to the scientific commission of the Standing Conference of the Ministers of Education and Cultural

Affairs of the Länder in the Federal Republic of Germany. Her publications include a special issues on early integration patterns of recent migrants in Europe and on female migrants' labour market integration, an edited volume on ethnic educational inequality in Germany, and numerous journal articles on migration, integration, and ethnic discrimination.

Carol Propper

Professor of Economics at Imperial College Business School

Dame Carol Propper CBE is Professor of Economics at Imperial College Business School in the Department of Economics and Public Policy. Her research focuses on the impact of incentives on the quality of health care delivery and health system productivity and, more widely, on the design and consequences of incentives within the public sector and the boundary between the state and private markets. She was Associate Dean for Faculty and Research at Imperial Business School 2016-2019, co-Director and Director of the Centre for Market and Public Organisation at the University of Bristol (1998-2009) and co-Director of the Centre for the Analysis of Social Exclusion at London School of Economics (1997-2007). She is the current President of the Royal Economic Society, a Fellow of the British Academy, and International Fellow of the US National Academy of Medicine. She has been Deputy Editor of VOX EU since 2016. Her research has been published in a wide number of leading economics journals and has received international awards.

OTHER MEMBERS

Philippe Aghion

Professor at the Collège de France and at the London School of Economics

Philippe Aghion is a Professor at the Collège de France and at the London School of Economics, and a fellow of the Econometric Society and of the American Academy of Arts and Sciences. His research focuses on the economics of growth. With Peter Howitt, he pioneered the so-called Schumpeterian Growth paradigm which was subsequently used to analyze the design of growth policies and the role of the state in the growth process. Much of this work is summarized in their joint book *Endogenous Growth Theory* (MIT Press, 1998) and *The Economics of Growth* (MIT Press, 2009), in his book with Rachel Griffith on *Competition and Growth* (MIT Press, 2006), and in his survey "What Do We Learn from Schumpeterian Growth Theory" (joint with Ufuk Akcigit and Peter Howitt.) In 2001, Philippe Aghion received the Yrjo Jahnsson Award of the best European economist under 45. In 2009, he received the John Von Neumann Award; in 2016, he received the Global Entrepreneurship Award. In March 2020, he shared the BBVA "Frontier of Knowledge Award" with Peter Howitt for "developing an economic growth theory based on the innovation that emerges from the process of creative destruction."

Richard Blundell

Professor, holder of the David Ricardo Chair of Political Economy at University College London

Professor Sir Richard Blundell CBE FBA holds the David Ricardo Chair of Political Economy at University College London where he was appointed Professor of Economics in 1984. He is a graduate of the University of Bristol and London School of Economics. He is Director of the ESRC Centre for the Microeconomic Analysis of Public Policy at the Institute for Fiscal Studies (IFS), where he was Research Director, from 1986 to 2016. He has held visiting professor positions at UBC, MIT, Chicago, Northwestern, TSE and Berkeley. He is a Fellow of the Econometric Society (1991), Fellow of the British Academy (1996), Honorary Member of the American Academy of Arts and Science (2002) and Foreign Fellow of the National Academy of Science (2019). In 2004, he was President of the European Economics Association. He was President of the Econometric Society in 2006 and President of the Royal Economic Society 2011-2013. He has been on the editorial board of many academic journals. His published papers on microeconometrics, consumer behaviour, savings, labour supply, taxation, public finance, innovation, and inequality have appeared in academic journals. He was an editor and panel member of the Mirrlees Review: Tax Reform for the 21st Century. He is now an Editor and panel member of the IFS-Deaton Review of Inequalities.

Laurence Boone

OECD Chief Economist, G20 Finance Deputy and Head of the Economics Department

Laurence Boone is the OECD Chief Economist, G20 Finance Deputy and Head of the Economics Department. Before joining the OECD, she was the Chief Economist at AXA Group and the Global Head of Multi-Asset Client Solutions & Trading and Securities Finance, AXA Investment Managers, in France. She used to be an Independent Director of Kering's board and remains a member of the Strategic Committee of Agence France Trésor. Prior to this, she was Special Advisor and Sherpa to the President of the French Republic; Chief Economist and Managing Director at Bank of America Merrill Lynch; Managing Director and Chief Economist France at Barclays Capital, Economist at the OECE, Economist at the CEPII (Centre d'études prospectives et d'informations internationales), France, and Quantitative Analyst for Merrill Lynch Asset Management. She is a member of the Cercle des économistes as well as of SDA Bocconi. She taught at École polytechnique, ENSAE (the National School of Statistics), École normale supérieure and Sciences Po (Paris School of International Affairs). She has a Ph. D in applied econometrics from the London Business School; a MSc in econometrics and macroeconomic modelling from Reading University; a Master's Degree in economics from

the University of Paris X Nanterre and a postgraduate diploma (DEA) in modelling and quantitative analysis from the University of Paris X Nanterre.

Valentina Bosetti

Chairwoman of Terna SpA and Professor at the Economics Department of Bocconi University, Milan

Valentina Bosetti is Chairwoman of Terna SpA and Professor at the Economics Department of Bocconi University, Milan, where she teaches environmental and climate change. She is a Senior Researcher at the RFF-CMCC European Institute on Economics and the Environment. Valentina Bosetti holds a Ph. D in computational mathematics and operation research from the University of Milan (Università Statale di Milano) and a Master's Degree in environmental and resources economics from University College London. She was a Senior Researcher at Fondazione Eni Enrico Mattei during the period 2003-2018 and has collaborated with the Euro-Mediterranean Centre on Climate Change (CMCC) since 2006. She has been a member of the European Association of Environmental and Resource Economists Council and Chairwoman of the Italian Association of Environmental and Resource Economists. She has published several papers in the field of climate change economics and innovations in clean energy technologies. She has received two prestigious European Research Council grants, the first on innovation in clean energy technologies and the second to research the uncertainties and risk related to climate change. She was coordinator for the 5th Assessment Report of the IPCC, and she will be Lead Author for the 6th IPCC Assessment Report.

Daniel Cohen

Head of the Economic Department at École normale supérieure, Paris

Daniel Cohen is Professor of Economics and Head of the Economic Department at École normale supérieure, Paris. He is Professor, founding member Professor, and a founding member of the Paris School of Economics and Director of the Centre pour la recherche économique et ses applications (CEPREMAP). He was a member of the Conseil d'analyse économique (CAE) for the French Prime Minister from 2010 to 2012 and Advisor for the Development Centre of the OECD. He is President of the Scientific Counsel of the Fondation Jean-Jaurès. A graduate of the École normale supérieure, associate professor of mathematics, he holds a postgraduate doctorate and a state doctorate in economics. He has published several books, including *Private Lending to Sovereign States* (Economica, 1989; The MIT Press, 1991), *Our Modern Times* (Flammarion, 1999; MIT Press, 2002) and *The Wealth of the World and the Poverty of Nations* (Flammarion, 1997; MIT Press, 1998), which receives two prizes : Livre d'économie 2000, and Léon Faucher from Académie des sciences morales.

Peter Diamond

Institute Professor at the Massachusetts Institute of Technology

Peter Diamond received a Ph. D. in economics from the MIT in 1963. He was Assistant Professor of Economics at the University of California, Berkeley, until 1966, when he returned to MIT as an Associate Professor. He became a full Professor in 1970 and then acceded to a series of chaired positions. He first gained attention in the 1960's for his work on the economic ramifications of national debt and on optimal taxation together with James Mirrlees. He was a corecipient, with Dale T. Mortensen and Christopher A. Pissarides, of the 2010 Nobel Prize in Economic Sciences "for their analysis of markets with search frictions." The theoretical framework collectively developed by the three men — which describes the search activity of the unemployed, the methods by which firms recruit and formulate wages, and the effects of economic policies and regulation — became widely used in labour market analysis. In 2010-2011, he was nominated three times by President Barack Obama to serve on the Federal Reserve Board; in each case, however, Senate Republicans prevented a vote on his confirmation, and he eventually withdrew his name from consideration. He wrote several books, such as *Reforming Pensions: Principles and Policy Choices* (Oxford University Press, 2008) and *Pension Reform: A Short Guide* (Oxford University Press, 2009), both with Nicholas Barr, and *Saving Social Security: A Balanced Approach* (Brookings Institution Press, 2004) with Peter Orszag.

Emmanuel Farhi

Professor of Economics at Harvard University

A designated member of the Commission Blanchard-Tirole, Emmanuel Farhi passed away on July 23, 2020, in Cambridge, Massachusetts, at the age of 41. He was the Robert C. Waggoner Professor of Economics at Harvard University. His research focused on macroeconomics, finance, international economics, and public finance. He was a Research Associate at the National Bureau of Economic Research and at the Center for Economic Policy Research. He was a former member of the Conseil d'analyse économique to the French Prime Minister. He was awarded the 2009 Bernacèr prize for the best European economist under the age of 40 by the Observatory of the European Central Bank, the 2011 Malinvaud prize by the French Economic Association, the 2013 Best Young Economist prize by *Le Monde* and the Cercle des économistes, and the 2013 Banque de France and Toulouse School of Economics prize in Macroeconomics and Finance. In 2014, he was named one of the 25 best economists under 45 by the IMF. He grew up in France where he attended the École normale supérieure and the École des Mines. He was awarded his Ph. D. by the MIT in 2006.

Nicola Fuchs-Schündeln

Professor of Macroeconomics and Development at Goethe University, Frankfurt

Nicola Fuchs-Schündeln is Professor of Macroeconomics and Development at Goethe University, Frankfurt. Prior to joining the faculty of Goethe University in 2009, she was a faculty member at Harvard University. She received her Ph. D. in economics from Yale University in 2004. Her current research focuses on the analysis of household saving and labour supply behaviour, labor market integration, and the endogeneity of economic preferences. She is currently Chairwoman of the *Review of Economic Studies* and the German Economic Association. She received the 2018 Gottfried Wilhelm Leibniz Prize of the German Science Foundation, the highest scientific award in Germany, and the 2016 Gossen Prize of the German Economic Association. In 2018, she was also awarded an ERC Consolidator Grant, and in 2010 an ERC Starting Grant. Nicola Fuchs-Schündeln is a member of the Scientific Advisory Board of the German Federal Ministry for Economic Affairs and Energy and of the Franco-German Council of Economic Experts. She holds many affiliations in international research networks.

Michael Greenstone

Milton Friedman Distinguished Service Professor in Economics, Director of the Becker Friedman Institute and the interdisciplinary Energy Policy Institute at the University of Chicago

Michael Greenstone is the Milton Friedman Distinguished Service Professor in Economics, as well as the Director of the Becker Friedman Institute and the Energy Policy Institute at the University of Chicago. Previously, he served as the Chief Economist for President Obama's Council of Economic Advisers, where he co-led the development of the US Government's social cost of carbon, and the 3M Professor of Environmental Economics at MIT. Michael Greenstone is an elected member of the American Academy of Arts and Science, a fellow of the Econometric Society, a Carnegie Fellow, an occasional contributor to the *New York Times*, and a former editor of the *Journal of Political Economy*. His research is focused on uncovering the benefits and costs of environmental quality and society's energy choices. As a co-director of the Climate Impact Lab, he is producing empirically grounded estimates of the local and global impacts of climate change. He also created the award-winning Air Quality Life Index® that reports the gain in life expectancy communities will experience from improvements in air quality. Additionally, he co-founded Climate Vault, an association that leverages markets to provide institutions and people the least expensive, verifiable means to help solve the climate challenge. Michael Greenstone received his Ph. D. from Princeton University and B.A. with High Honors from Swarthmore College.

Hilary Hoynes

Professor of Economics and Public Policy, Haas Distinguished Chair in Economic Disparities, University of California, Berkeley

Hilary Hoynes is a Professor of Economics and Public Policy and holds the Haas Distinguished Chair in Economic Disparities at the University of California, Berkeley where she also co-directs the Berkeley Opportunity Lab. She is a member of the American Academy of Art and Sciences, the National Academy of Social Insurance and is a Fellow of the Society of Labor Economists. Her research focuses on poverty, inequality, food and nutrition programs, and the impacts of government tax on low income families. She currently serves on the National Academy of Sciences Committee on National Statistics. Previously, she was a member of the National Academy of Sciences Committee on Building an Agenda to Reduce the Number of Children in Poverty by Half in 10 Years, a member of the American Economic Association's Executive Committee and the Federal Commission on Evidence-Based Policy Making, the American Economic Association's Executive Committee, the Advisory Committee for the National Science Foundation, and the National Advisory Committee of the Robert Wood Johnson Foundation Scholars in Health Policy Research Program. Dr. Hoynes received her Ph. D. in Economics from Stanford University in 1992.

Paul Krugman

Distinguished Professor of Economics at the Graduate Center of the City University of New York, Centenary Professor at the London School of Economics and columnist for The New York Times

Paul Krugman is a Distinguished Professor of Economics at the Graduate Center of the City University of New York, having previously been Professor of economics at the MIT and Princeton University. He is also Centenary Professor at the London School of Economics and columnist for *The New York Times.* In December 2008, Paul Krugman received the 2008 Nobel Memorial Prize in Economic Sciences, honoring his work in international trade patterns. Prior to his appointment at Princeton, he served on the faculty of MIT; his last post was Ford International Professor of Economics. He has also taught at Yale and Stanford Universities, and prior to that he was the Senior International Economist for the President's Council of Economic Advisers, under Ronald Reagan. He is a Fellow of the Econometric Society, a Research Associate of the National Bureau of Economic Research, and a member of the Group of Thirty.

Thomas Philippon

Max L. Heine Professor of Finance at New York University, Stern School of Business

Thomas Philippon is the Max L. Heine Professor of Finance at New York University, Stern School of Business. He was named one of the “top 25 economists under 45” by the IMF in 2014. He has won the 2013 Bernácer Prize for Best European Economist under 40. Thomas Philippon has studied various topics in macroeconomics and finance: systemic risk, crisis resolution mechanisms, the dynamics of corporate investment and household debt, and the size of the finance industry. His recent work has focused on the Eurozone crisis, financial regulation, and the market power of large firms. He was previously a Board Member of the French prudential regulatory authority from 2014 to 2019, and the Senior Economic Advisor to the French Finance Minister in 2012-2013. He graduated from École polytechnique, received a Ph. D. in economics from MIT, and joined the New York University in 2003.

Jean Pisani-Ferry

Professor, holder of the Tommaso Padoa-Schioppa chair of the European University Institute in Florence

Jean Pisani-Ferry holds the Tommaso Padoa-Schioppa chair of the European University Institute in Florence. He is a Senior Fellow at Bruegel, the European think tank, and a Non-Resident Senior Fellow at the Peterson Institute (Washington DC). He is a Professor of Economics with Sciences Po (Paris).

Adam Posen

President of the Peterson Institute for International Economics

Adam Posen has been President of the Peterson Institute for International Economics since January 2013. Over his career, he has contributed to research and public policy regarding monetary and fiscal policies in the G20. He was one of the first economists to seriously address the political foundations of central bank independence and to analyze Japan's Great Recession as a failure of macroeconomic policy. While at the Federal Reserve Bank of New York, he co-authored *Inflation Targeting: Lessons from the International Experience* (Princeton University Press, 1999). From 2009 to 2012, he served a three-year term as an external voting member of the Bank of England’s rate-setting Monetary Policy Committee (MPC). He received a Ph. D. from Harvard University.

Nick Stern

IG Patel Professor of Economics and Government, Chairman of the Grantham Research Institute on Climate Change and the Environment and Head of the India Observatory at the London School of Economics

Nick Stern is the IG Patel Professor of Economics and Government, Chairman of the Grantham Research Institute on Climate Change and the Environment at the London School of Economics. He was President of the British Academy (2013-2017), and was elected Fellow of the Royal Society in 2014. He has held academic appointments in the UK at Oxford, Warwick and the LSE and abroad including at the MIT, the École polytechnique and the Collège de France in Paris, the Indian Statistical Institute in Bangalore and Delhi, and the People's University of China in Beijing. He was Chief Economist of the European Bank for Reconstruction and Development (1994-1999), and Chief Economist and Senior Vice President at the World Bank (2000-2003). He was Second Permanent Secretary to Her Majesty's Treasury (2003-2005), Director of Policy and Research for the Prime Minister's Commission for Africa (2004-2005), Head of the *Stern Review on the Economics of Climate Change* published in 2006 and Head of the Government Economic Service (2003-2007). He is a cross-bench life peer (non-political party) and a member of the House of Lords since 2007.

Lawrence Summers

Charles W. Eliot University Professor and President Emeritus at Harvard University

Lawrence H. Summers is the Charles W. Eliot University Professor and President Emeritus of Harvard University. During the past two decades, he has served in a series of senior public policy positions in Washington D.C., including the 71st Secretary of the Treasury for President Clinton, Director of the National Economic Council for President Obama and Vice President of Development Economics and Chief Economist of the World Bank. He received a Bachelor of Science degree from the MIT in 1975 and was awarded a Ph. D. from Harvard in 1982. In 1983, he became one of the youngest individuals in recent history to be named as a tenured member of Harvard University faculty. In 1987, Lawrence Summers became the first social scientist ever to receive the annual Alan T. Waterman Award of the National Science Foundation (NSF), and in 1993, he was awarded the John Bates Clark Medal, given every two years to the outstanding American economist under the age of 40.

Laura Tyson

Professor of the Graduate School at the Haas School of Business and Social Impact, University of California, Berkeley

Laura d'Andrea Tyson is a Distinguished Professor of the Graduate School at the Haas School of Business and Social Impact, University of California, Berkeley. She also chairs the Board of Trustees at UC Berkeley's Blum Center for Developing Economies, which aims to develop solutions to global poverty. She is the former Faculty Director of the Berkeley Haas Institute for Business and Social Impact, which she founded in 2013. She served as Interim Dean of the Haas School from July to December 2018, and served previously as dean from 1998 to 2001. Laura Tyson was a member of President Clinton's cabinet between 1993 and 1996. She served as Chair of the President's Council of Economic Advisers from 1993 to 1995 and as Director of the White House National Economic Council from 1995 to 1996. She was the first woman to serve in these positions. She is currently the co-chair of the Governor's Council of Economic Advisers in California. Much of her recent research focuses on the effects of automation on the future of work. She is the co-organizer of WITS (Work and Intelligent Tools and System), an interdisciplinary faculty research group at UC Berkeley on the impacts of digital technologies and artificial intelligence on working, earning, and learning. Laura Tyson is a senior external adviser at the McKinsey Global Institute and a senior fellow at the Berggruen Institute. She has also devoted considerable policy attention to the links between women's rights and national economic performance. At the World Economic Forum (WEF), she is a member of the Global Future Council for Equity and Social Justice. She is the co-author of the WEF Annual Global Gender Gap Report and the co-author of *Leave No One Behind*, a report for the United Nations' High-Level Panel on Women's Economic Empowerment (2016).

Copy Editors

Olivier de Broca, Gladys Caré and Anaïs Teston, France Stratégie

Climate, inequality and ageing are three crucial issues for the future and prosperity of nations, beyond the ability to overcome the Covid-19 crisis. Accordingly, in early 2020 the French President, Emmanuel Macron, asked Olivier Blanchard and Jean Tirole to set up a commission of French and foreign experts to propose responses to these major challenges.

In collaboration with the members of the commission, dedicated teams prepared in-depth analyses of each of the three challenges: Mar Reguant and Christian Gollier on climate; Stefanie Stantcheva and Dani Rodrik on inequality; Axel Börsch-Supan, Claudia Diehl and Carol Propper on ageing.

The other members of the commission are Philippe Aghion, Richard Blundell, Laurence Boone, Valentina Bosetti, Daniel Cohen, Peter Diamond, Emmanuel Farhi, Nicola Fuchs-Schündeln, Michael Greenstone, Hilary Hoynes, Paul Krugman, Thomas Philippon, Jean Pisani-Ferry, Adam Posen, Nick Stern, Lawrence Summers and Laura Tyson.

In its report submitted to the French President, the commission proposes a global analytic framework. It draws recommendations for better economic policies and for France and Europe to respond more effectively to these three major challenges.

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