

# Capital Taxation

**Stefanie Stantcheva**

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# GOALS OF THIS LECTURE

- (1) Understand basic concepts about capital income, savings, and wealth.
- (2) Discover some key empirical facts about capital and wealth.
- (3) Theory of capital taxation: series of (quite different) models.
- (4) New model: A simpler framework for optimal capital tax theory

## MOTIVATION

1) Capital income is about 25% of national income (labor income is 75%) but distribution of capital income is much more unequal than labor income

Capital income inequality is due to differences in savings behavior but also inheritances received

⇒ Equity suggests it should be taxed more than labor

2) Capital Accumulation correlated strongly with growth [although causality link is not obvious] and capital accumulation might be sensitive to the net-of-tax return.

⇒ Efficiency cost of capital taxation might be high.

## MOTIVATION

3) Capital more mobile internationally than labor

Key distinction is **residence** vs. **source** base capital taxation:

**Residence:** Capital income tax based on residence of owner of capital.

Most individual income tax systems are residence based (with credits for taxes paid abroad)

Incidence falls on owner  $\Rightarrow$  can only escape tax through evasion (tax heavens) or changing residence (mobility of persons)

Tax evasion of capital income through tax heavens is a very serious concern (Zucman QJE'13, '15)

**Source:** Capital income tax based on location of capital (most corporate income tax systems are source based)

Incidence is then partly shifted to labor if capital is mobile.

Example: Open economy with fully mobile capital and source taxation:  
Local GDP:  $wL + rK = F(K, L) = L \cdot F(K/L, 1) = L \cdot f(k)$  where  $k = K/L$  is capital stock per worker

Net-of-tax rate of return is fixed by the international rate of return  $r^*$  so that  $(1 - \tau_c)F_K(K, L) = (1 - \tau_c)f'(k) = r^*$  where  $k = K/L$  is capital stock per worker and  $\tau_c$  corp tax rate

As  $wL + r^*K = F(K, L)$ , wage  $w = F_L(K, L) = f(k) - r^* \cdot k$  falls with  $\tau_c$

4) Capital taxation is extremely complex and provides many tax avoidance opportunities

## SAVING FLOWS

Saving is a flow and wealth or net worth is a stock

Three saving flows:

- 1) **Personal saving:** individual income less individual consumption [fell dramatically in the US since 1980s, recent  $\uparrow$  since 2008]
- 2) **Corporate Saving:** retained earnings = after tax profits - distributions to shareholders
- 3) **Government Saving:** Taxes - Expenditures [federal, state and local]

Taxes on savings might affect different savings flows differently: savings subsidy through a tax credit can  $\uparrow$  individual savings but  $\downarrow$  govt saving [if govt spending stays constant]

## WEALTH AND CAPITAL INCOME IN AGGREGATE

**Definition:** Capital Income = Returns from Wealth Holdings

Aggregate US **Personal** Wealth  $\simeq 4 * \text{GDP} \simeq \$60 \text{ Tr}$

**Tangible assets:** residential real estate (land+buildings) [income = rents]  
and unincorporated business + farm assets [income = profits]

**Financial assets:** corporate stock [income = dividends + retained earnings], fixed claim assets (corporate and govt bonds, bank accounts) [income = interest]

**Liabilities:** Mortgage debt, Student loans, Consumer credit debt

Substantial amount of financial wealth is held indirectly through: pension funds [DB+DC], mutual funds, insurance reserves

## INDIVIDUAL WEALTH AND CAPITAL INCOME

Wealth =  $W$ , Return =  $r$ , Capital Income =  $rW$

$$W_t = W_{t-1} + r_t W_{t-1} + E_t + I_t - C_t$$

where  $W_t$  is wealth at age  $t$ ,  $C_t$  is consumption,  $E_t$  labor income earnings (net of taxes),  $r_t$  is the average (net) rate of return on investments and  $I_t$  net inheritances (gifts received and bequests minus gifts given).

Replacing  $W_{t-1}$  and so on, we obtain the following expression (assuming initial wealth  $W_0$  is zero):

$$W_t = \sum_{k=1}^t (E_k - C_k + I_k) \prod_{j=k+1}^t (1 + r_j)$$

## INDIVIDUAL WEALTH AND CAPITAL INCOME

$$W_t = \sum_{k=1}^t (E_k - C_k) \prod_{j=k+1}^t (1 + r_j) + \sum_{k=1}^t I_k \prod_{j=k+1}^t (1 + r_j)$$

1st term is **life-cycle** wealth, 2nd term is **inheritance** wealth

Differences in Wealth and Capital income due to:

- 1) Age
- 2) past earnings, and past saving behavior  $E_t - C_t$  [life cycle wealth]
- 3) Net Inheritances received  $I_t$  [transfer wealth]
- 4) Rates of return  $r_t$

[details in Davies-Shorrocks '00, Handbook chapter]

## WEALTH DISTRIBUTION

Wealth inequality is very large (much larger than labor income)

US Household Wealth is divided 1/3,1/3,1/3 for the top 1%, the next 9%, and the bottom 90% [bottom 1/2 households hold almost no wealth]

Financial wealth is more unequally distributed than (net) real estate wealth

Share of real estate wealth falls at the top of the wealth distribution

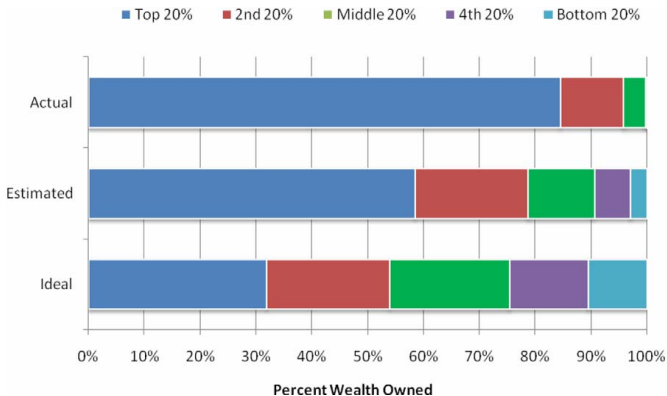
Growth of private pensions [such as 401(k) plans] has “democratized” stock ownership in the US

US public underestimates extent of wealth inequality and thinks the ideal wealth distribution should be a lot less unequal [Norton-Ariely '11]

Source: Norton and Ariely 2011

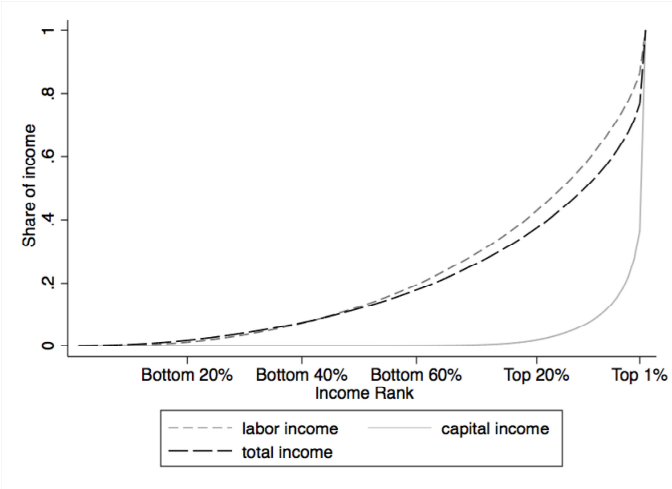
*Building a Better America*

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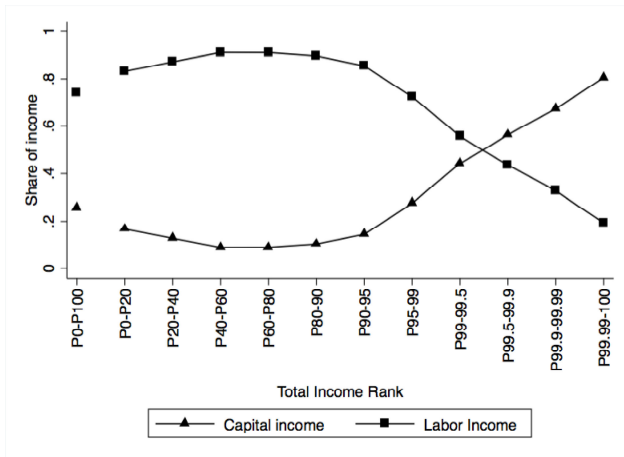


**Fig. 2.** The actual United States wealth distribution plotted against the estimated and ideal distributions across all respondents. Because of their small percentage share of total wealth, both the “4th 20%” value (0.2%) and the “Bottom 20%” value (0.1%) are not visible in the “Actual” distribution.

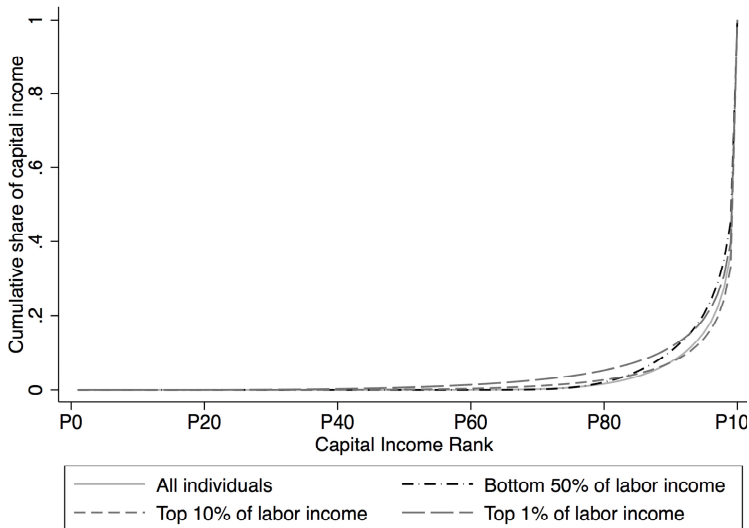
# FACT 1: K INCOME MORE UNEQUALLY DISTRIBUTED THAN L INCOME



## FACT 2: AT THE TOP, TOTAL INCOME IS MOSTLY CAPITAL INCOME



### FACT 3: TWO-DIMENSIONAL HETEROGENEITY, INEQUALITY IN K INCOME EVEN CONDITIONAL ON L INCOME



## WEALTH MEASUREMENT

In the US, wealth distribution much less well measured than income distribution because no systematic administrative source (no wealth tax). 3 methods to estimate wealth distribution:

### 1) **Surveys:** US Survey of Consumer Finances (SCF)

Top 10% wealth share has grown from 67% in 1989 to 75% in 2010

Top 1% wealth share has grown “only” from 30% in 1989 to 35% in 2010  
[Kennickell '09, '12]

Problems: small sample size, measurement error, only every 3 years, starts in 1989

**2) Estate multiplier method:** use annual estate tax statistics and re-weights individual estates by inverse of death probability [based on age×gender×social class]

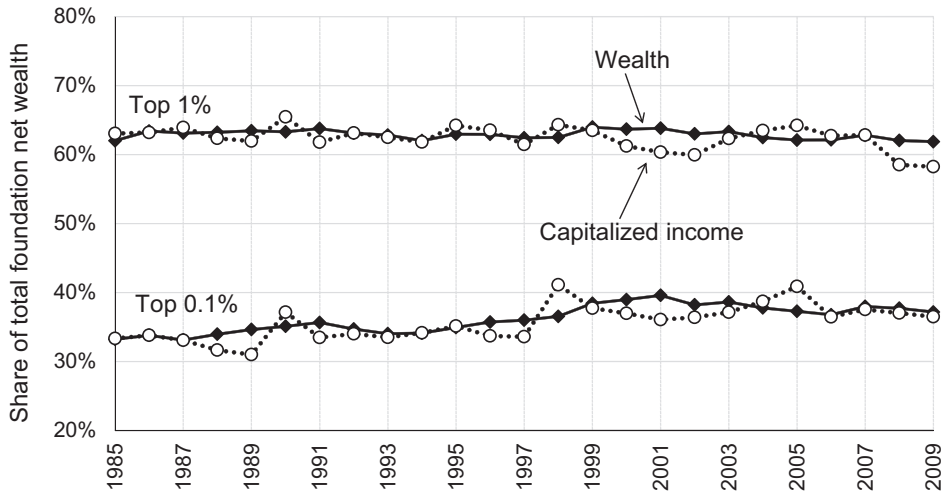
Kopczuk-Saez NTJ'04 create series 1916-2000 and find fairly small increases in wealth concentration in recent decades

Problems: social class effect on mortality not well known, significant estate tax avoidance, noisy measure of “young wealth”, estates cover only the super rich (top .1% in recent years)

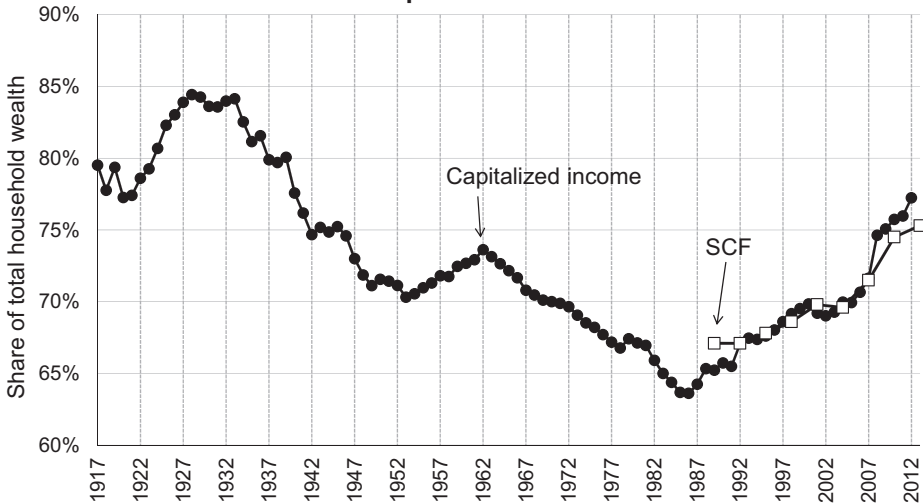
**3) Capitalization method:** use capital income from individuals tax statistics and estimates rates of returns by asset class to infer wealth: shows big increase in wealth concentration [Saez-Zucman '16]

**4) Using property tax records:** Historical records from the General Property Tax, [Dray-Landais-Stantcheva '22]. Use assessed values and assessment ratios to convert them into market value of wealth.

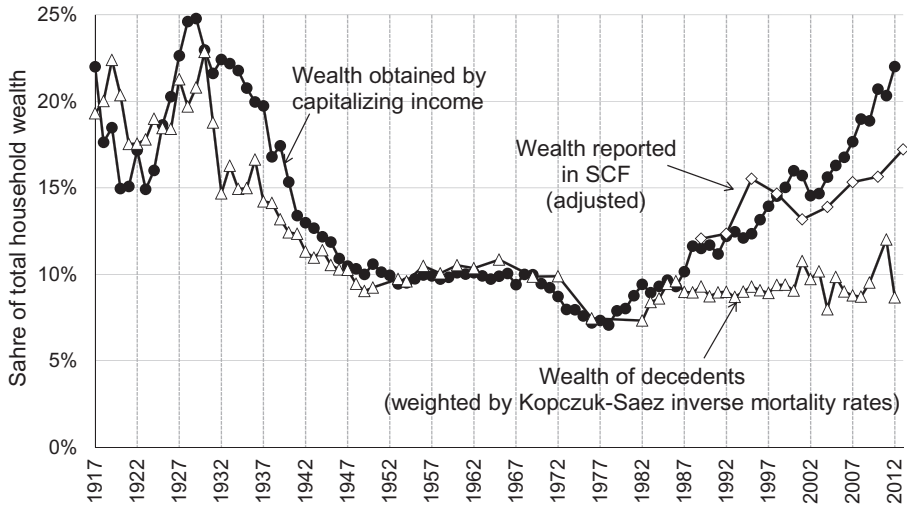
## A. Foundations top wealth vs. capitalized income shares



### A. Top 10% wealth share



### A. Top 0.1% wealth share: comparison of estimates



### B. Top 10-1% and 1% wealth shares

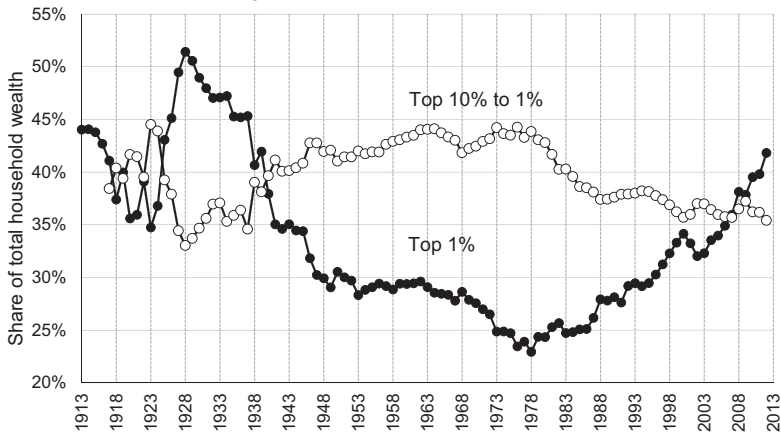
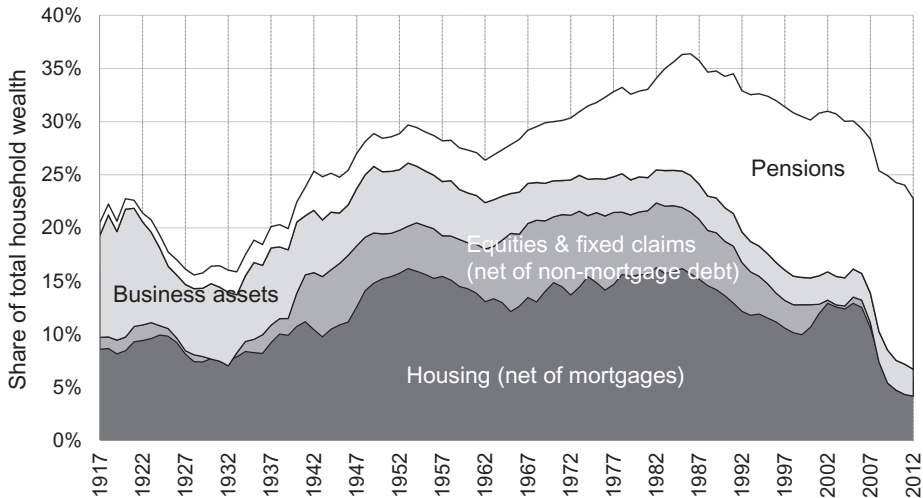


FIGURE VI

Top Wealth Shares in the United States, 1913–2012

## A. Composition of the bottom 90% wealth share



## B. Real average wealth of bottom 90% and top 1% families

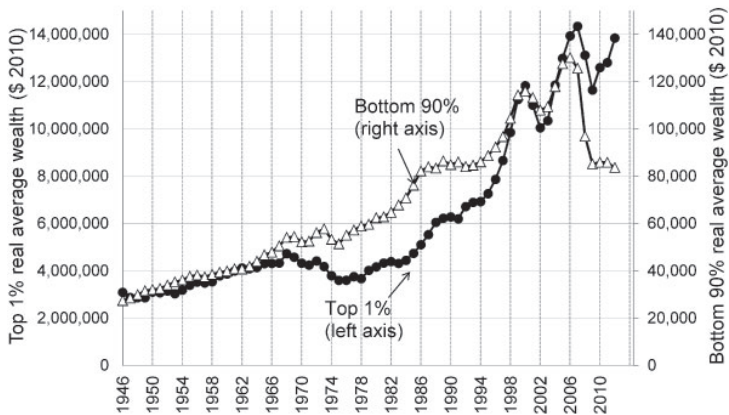
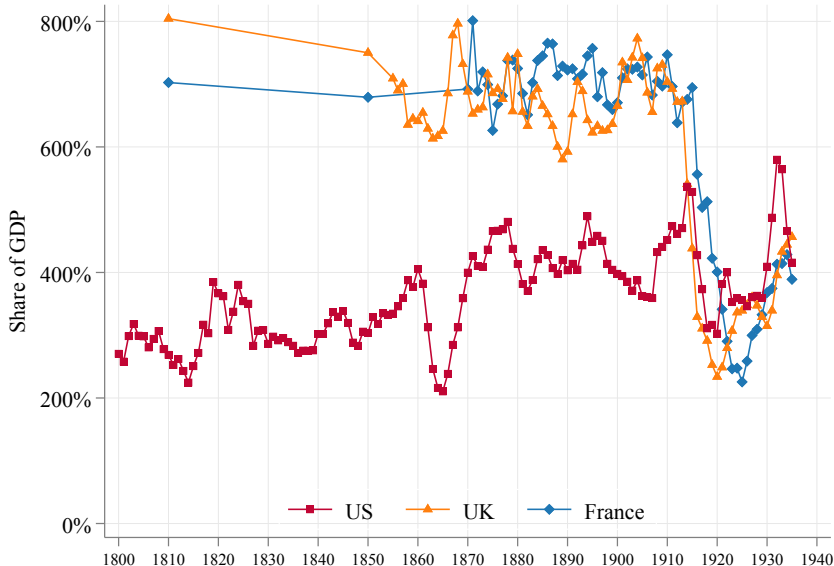


FIGURE VII

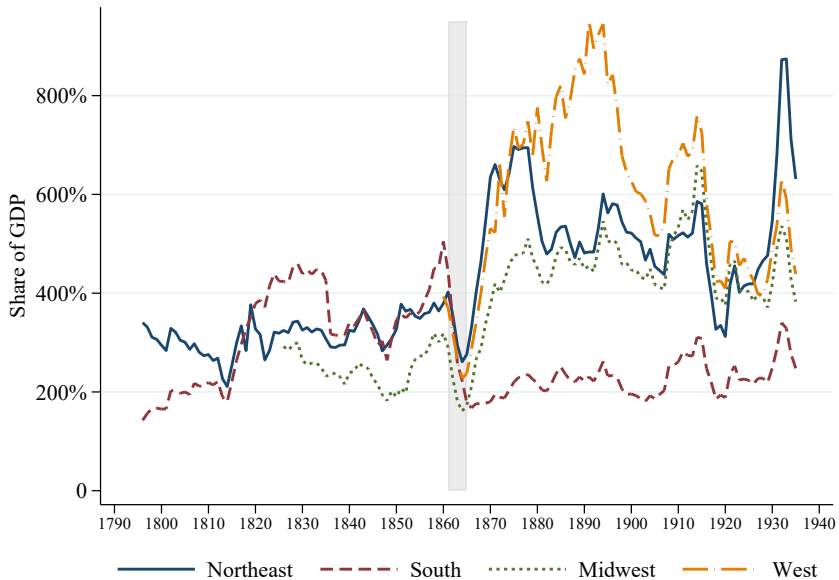
Wealth of the Bottom 90% of the Distribution

# WEALTH-TO-GDP RATIO in the US 1800-1930

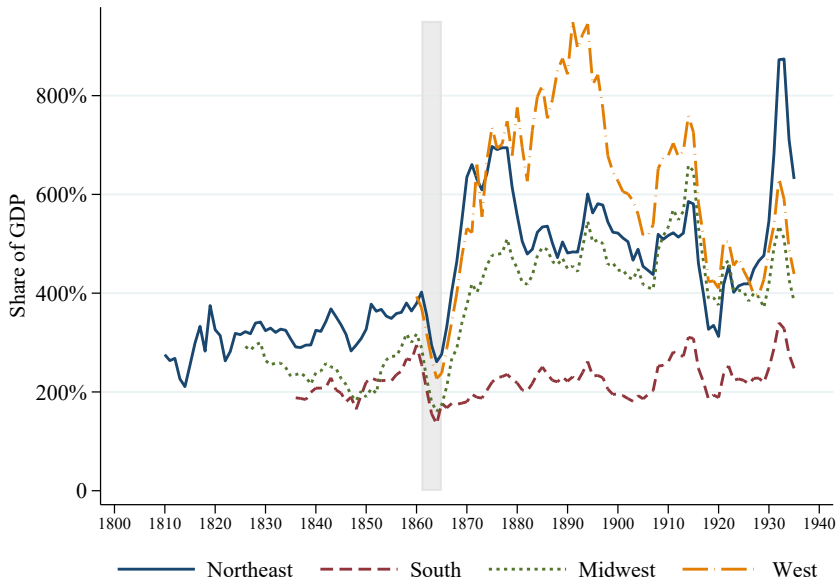


Sources: World Inequality Database and Piketty (2014) for France and the UK

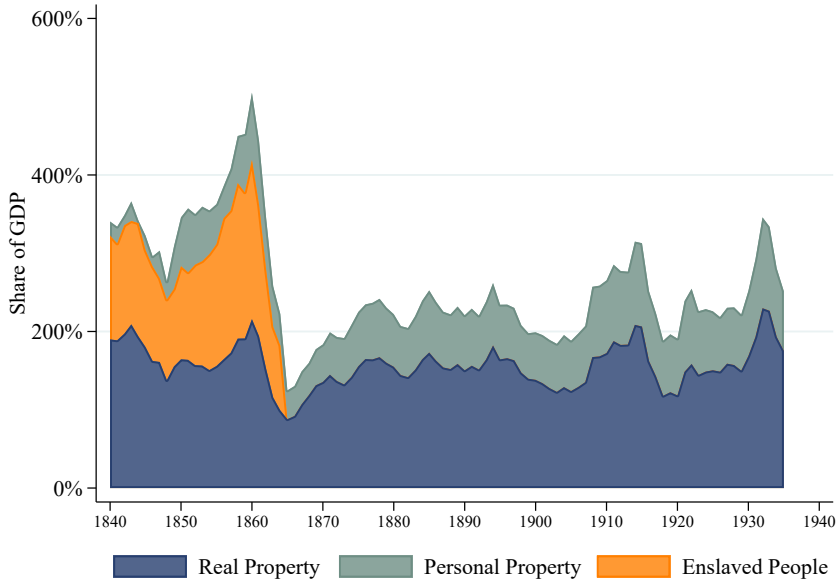
# WEALTH-TO-GDP RATIO BY REGION



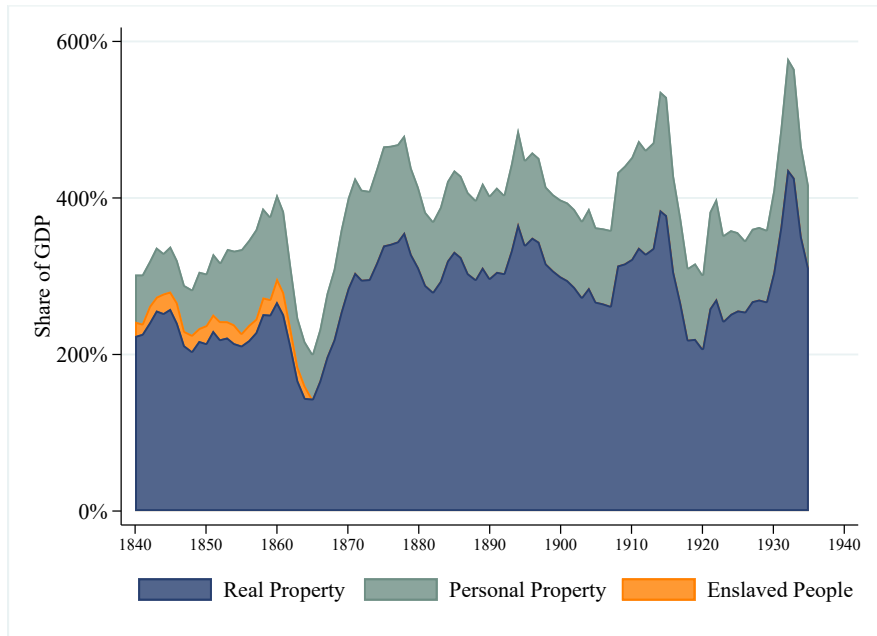
# WEALTH-TO-GDP RATIO BY REGION EXCLUDING ENSLAVED FROM PROPERTY



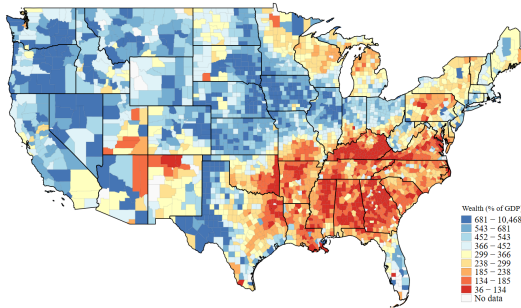
# COMPOSITION OF PROPERTY IN THE US



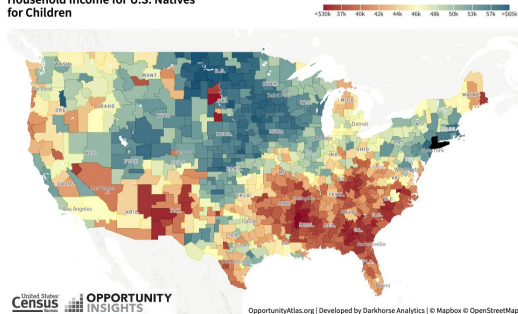
# COMPOSITION OF PROPERTY IN THE SOUTH



# WEALTH PERSISTENCE



Household Income for U.S. Natives for Children



## CAPITAL TAXATION IN THE US

Good US references: Gravelle '94 book, Slemrod-Bakija '04 book

1) **Corporate Income Tax** (fed+state): 21% Federal tax rate on profits of corporations [complex rules with many industry specific provisions]: effective tax rate much lower and incidence depends on mobility of capital

2) **Individual Income Tax** (fed+state): taxes many forms of capital income

Realized capital gains and dividends (dividends since '03 only) receive preferential treatment

Imputed rent of home owners, returns on pension funds, state+local government bonds interest are exempt

## FACTS OF US CAPITAL INCOME TAXATION

### 3) **Estate and gift taxes:**

Fed taxes estates above \$11.2M exemption for singles and \$22.4M for married, tax rate is 40% above exemption.

Charitable and spousal giving is exempt

Substantial tax avoidance activity through tax accountants

Step-up of realized capital gains at death (lock-in effect)

### 4) **Property taxes** (local) on real estate (old tax):

Tax varies across jurisdictions. About 0.5% of market value on average, like a 10% tax on imputed rent if return is 5%

Lock-in effect in states that use purchase price base such as California

## LIFE CYCLE VS. INHERITED WEALTH

Old view: Tobin and Modigliani: life cycle wealth accounts for the bulk of the wealth held in the US. Kotlikoff-Summers JPE'81 challenged the old view (debate Kotlikoff vs. Modigliani in JEP'88)

Why is this question important?

1) Economic Modeling: what accounts for wealth accumulation and inequality? Is widely used life-cycle model with no bequests a good approximation?

2) Policy Implications: taxation of capital income and estates. Role of pay-as-you-go vs. funded retirement programs

Key problem is that the definition of life-cycle vs. inherited wealth is not conceptually clean (Modigliani does not capitalize inherited wealth while Kotlikoff-Summers do)

## LIFE CYCLE VS. INHERITED WEALTH

Piketty-Postel-Vinay-Rosenthal EEH'14 (PPVR) propose better definition to resolve Modigliani vs. Kotlikoff-Summers controversy (see Piketty-Zucman Handbook chapter '14)

Individual wealth accumulation:

$$W_t = \sum_{k=1}^t (E_k - C_k) \cdot (1+r)^{t-k} = + \sum_{k=1}^t I_k \cdot (1+r)^{t-k}$$

If  $W_t > \sum_{k=1}^t I_k \cdot (1+r)^{t-k}$  then individual also saves out of labor income  $E_k$  and inherited wealth is  $\sum_{k=1}^t I_k \cdot (1+r)^{t-k}$

If  $W_t \leq \sum_{k=1}^t I_k \cdot (1+r)^{t-k}$  then individual consumes part of inheritances (in addition to labor income) and inherited wealth is  $W_t$

PPVR requires micro-data for implementation. If we assume uniform saving rate  $s$ , there is a simplified formula for share of inherited wealth  $b_y / [b_y + (1 - \alpha) \cdot s]$  with  $b_y$  bequest flow/national income and  $\alpha$  capital share

## LIFE CYCLE VS. INHERITED WEALTH

How do the shares of inheritance vs. life-cycle evolve over time? First measure is inheritance flow to national income

Inheritance share likely huge in the distant past: class society with rentiers vs. workers [Delong '03]

Inheritance share ↓ in 20th century but has ↑ recently in France (Piketty QJE'11, Piketty-Zucman '14 handbook chapter)

Post-war period was a time of fast population growth and fast economic growth ⇒ If  $n + g$  (growth) large relative to  $r$  (rate of return on wealth) ⇒ Inheritances play a minor role in life-time wealth

In general  $r > n + g$  in which case inheritances play a large role in aggregate wealth and wealth concentration is going back (Western countries moving in that direction, Piketty '14)

Source: Piketty QJE'11

**Annual inheritance flow as a fraction of national  
income, France 1820-2008**

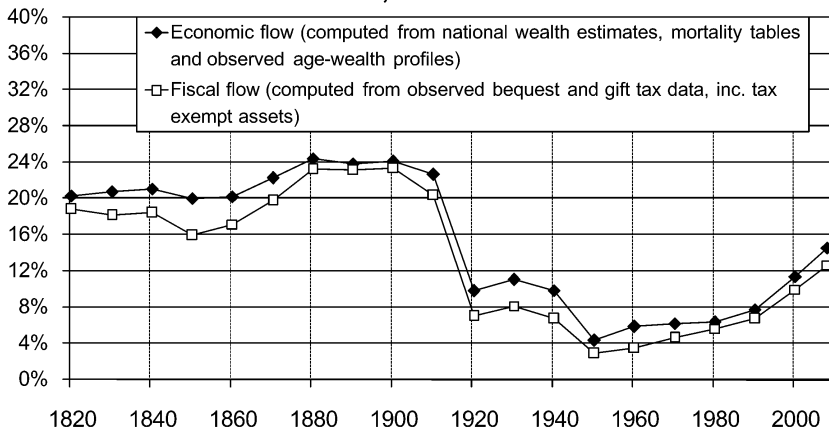
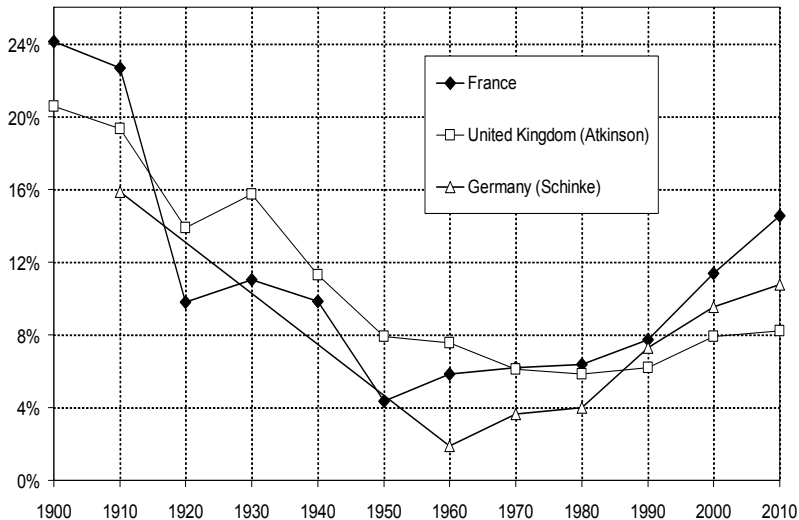


FIGURE I

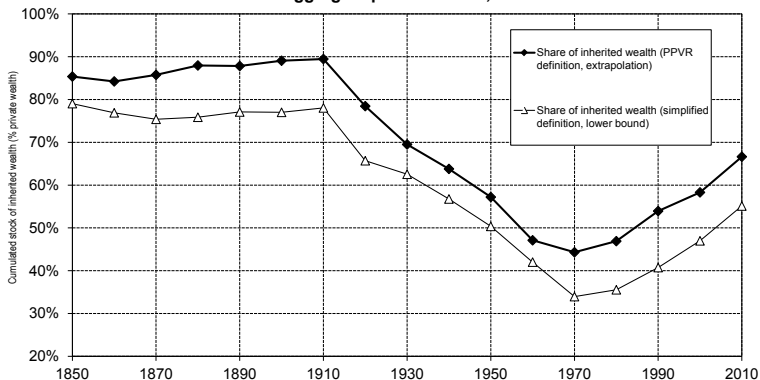
Annual Inheritance Flow as a Fraction of National Income, France, 1820–2008

Figure 11.12. The inheritance flow in Europe 1900-2010



Source: Piketty, Handbook chapter, 2014

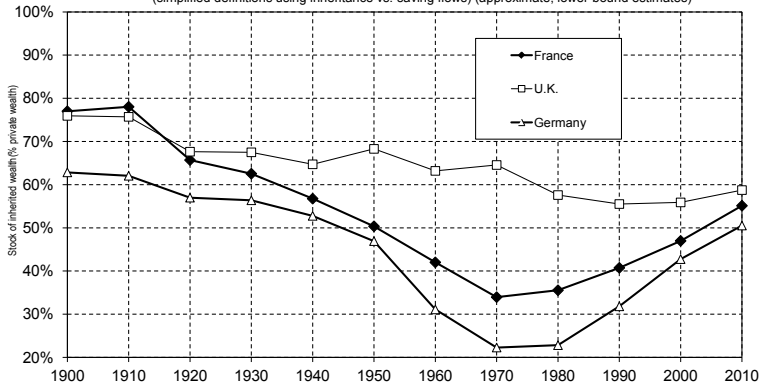
**Figure 4.4. The cumulated stock of inherited wealth as a fraction of aggregate private wealth, France 1850-2010**



Inherited wealth represents 80-90% of total wealth in France in the 19th century; this share fell to 40%-50% during the 20th century, and is back to about 60-70% in the early 21st century.

**Figure 4.6. The inheritance stock in Europe 1900-2010**

(simplified definitions using inheritance vs. saving flows) (approximate, lower-bound estimates)



The inheritance share in aggregate wealth accumulation follows a U-shaped curve in France and Germany (and to a more limited extent in the U.K. and Germany). It is possible that gifts are under-estimated in the U.K. at the end of the period.

## TAXES IN OLG LIFE-CYCLE MODEL

$$\max U = u(c_1, l_1) + \delta u(c_2, l_2)$$

No tax situation: earn  $w_1 l_1$  in period 1,  $w_2 l_2$  in period 2

$$\text{Savings } s = w_1 l_1 - c_1, c_2 = w_2 l_2 + (1 + r)s$$

Capital income  $rs$

Intertemporal budget with no taxes:

$$c_1 + c_2 / (1 + r) \leq w_1 l_1 + w_2 l_2 / (1 + r)$$

This model has uniform rate of return and does not capture excess returns

## TAXES IN OLG MODEL

Budget with consumption tax  $t_c$ :

$$(1 + t_c)[c_1 + c_2/(1 + r)] \leq w_1 h_1 + w_2 h_2/(1 + r)$$

Budget with labor income tax  $\tau_L$ :

$$c_1 + c_2/(1 + r) \leq (1 - \tau_L)[w_1 h_1 + w_2 h_2/(1 + r)]$$

Consumption and labor income tax are equivalent if

$$1 + t_c = 1/(1 - \tau_L)$$

Both taxes distort only labor-leisure choice

## TAXES IN OLG MODEL

Budget with capital income tax  $\tau_K$ :

$$c_1 + c_2/(1 + r(1 - \tau_K)) \leq w_1 h_1 + w_2 h_1/(1 + r(1 - \tau_K))$$

$\tau_K$  distorts only inter-temporal consumption choice

Budget with comprehensive income tax  $\tau$ :

$$c_1 + c_2/(1 + r(1 - \tau)) \leq (1 - \tau)[w_1 h_1 + w_2 h_2/(1 + r(1 - \tau))]$$

$\tau$  distorts both labor-leisure and inter-temporal consumption choices

$\tau$  imposes “double” tax: (1) tax on earnings, (2) tax on savings

## EFFECT OF $r$ ON SAVINGS

Assume that labor supply is fixed. Draw graph. Suppose  $r \uparrow$ :

- 1) Substitution effect: price of  $c_2 \downarrow \Rightarrow c_2 \uparrow$ ,  $c_1 \downarrow \Rightarrow$  savings  $s = w_1/l_1 - c_1 \uparrow$ .
- 2) Wealth effect: Price of  $c_2 \downarrow \Rightarrow$  both  $c_1$  and  $c_2 \uparrow \Rightarrow$  save less
- 3) Human wealth effect: present discounted value of labor income  $\downarrow \Rightarrow$  both  $c_1$  and  $c_2 \downarrow \Rightarrow$  save more

Note: If  $w_2/l_2 < c_2$  (ie  $s > 0$ ), 2)+3)  $\Rightarrow$  save less

Total net effect is theoretically ambiguous  $\Rightarrow \tau_K$  has ambiguous effects on  $s$

## SHIFT FROM LABOR TO CONSUMPTION TAX

Labor and consumption are equivalent for the individual if  $1 + t_c = 1/(1 - \tau_L)$  but savings pattern is different

Assume  $w_2 = 0$  and  $h_1 = 1$

$(1 + t_c)[c_1 + c_2/(1 + r)] = w_1$  with consumption tax

$c_1 + c_2/(1 + r) = (1 - t_L)w_1$  with labor tax

1) Consumption tax  $t_c$ :  $c_1^c = (w_1 - s_c)/(1 + t_c)$ ,  $c_2^c = (1 + r)s_c/(1 + t_c)$

2) Labor income tax  $\tau_L$ :  $c_1^l = w_1(1 - \tau_L) - s_L$ ,  $c_2^l = (1 + r)s_L$

Same consumption in both cases so  $s_L = s_c/(1 + t_c) \Rightarrow$  Save more with a consumption tax

## TRANSITION FROM LABOR TO C TAX

In OLG model and closed economy, capital stock is due to life-cycle savings  $s$

Start with labor tax  $\tau_L$  and switch to a consumption tax  $t_c$

The old [at time of transition] would have paid nothing in labor tax regime but now have to pay tax on  $c_2$

For the young [and future generations], the two regimes look equivalent so they now save more and increase the capital stock

However, this increase in capital stock comes at the price of hurting the old who are taxed twice

## TRANSITION FROM LABOR TO C TAX

Suppose the government keeps the old as well off as in previous system by exempting them from consumption tax

This creates a deficit in government budget equal to

$$d = \tau_L w_1 - t_c c_1 = t_c w_1 / (1 + t_c) - t_c c_1 = t_c s_L$$

Extra saving by the young is  $s_c - s_L = t_c s_L$  exactly equal to government deficit.

**Full neutrality result:** Extra savings of young is equal to old capital stock + new government deficit  $\Rightarrow$  no change in the aggregate capital stock

Full neutrality depends crucially on same  $r$  for govt debt and aggregate  $r$  [in practice: equity premium puzzle]

[Same result for Social Security privatization]

## OPTIMAL CAPITAL INCOME TAXATION

Complex problem with many sub-literatures: Banks and Diamond Mirrlees Review '09 provide recent survey

- 1) Life-cycle models [linear and non-linear earnings tax]
- 2) Models with bequests [many models including the infinite horizon model]
- 3) Models with future earnings uncertainty: New Dynamic Public Finance [Kocherlakota '09 book] (will cover this later).

Bigger gap between theory and policy practice than in the case of static labor income taxation

- 4) Saez and Stantcheva (2016) “A Simpler Theory of Optimal Capital Taxation”

## RAMSEY TAX IN LIFE-CYCLE MODEL

Best reference is King (1980) [volume Heal-Hughes]. Also Atkinson-Sandmo EJ '80, Sandmo '85 PE Handbook Chapter, Atkinson-Stiglitz '80, Chap 14-4.

Ramsey model with **representative** agent and **linear** taxes on labor and savings to raise exogenous amount of revenue

Individual maximization problem:

$$V(q, w(1 - \tau_L)) = \max_{c_1, c_2, l} u(c_1, c_2, l)$$

$$\text{st } c_1 + c_2/(1 + r(1 - \tau_K)) = wl(1 - \tau_L)$$

where  $q = 1/(1 + r(1 - \tau_K))$  and  $p = 1/(1 + r)$  are post-tax and pre-tax prices of  $c_2$

## RAMSEY CAPITAL INCOME TAX

Optimal tax rates can be obtained by solving the standard Ramsey problem:

$$\max_{\tau_K, \tau_L} V(q, w(1 - \tau_L)) \quad \text{st} \quad w/\tau_L + (q - p)c_2 \geq g \quad (\lambda)$$

where  $g$  is exogenous tax revenue requirement

Can apply the results from the 3 good Ramsey model

Derive FOC for  $\tau_K$  and  $\tau_L$

Can express them in terms of compensated elasticities

## RAMSEY CAPITAL INCOME TAX

Combining the two FOC to get rid of  $\lambda$ , you get:

$$\frac{r\tau_K}{1+r}(\sigma_{L2} - \sigma_{22}) = \frac{\tau_L}{1-\tau_L}(\sigma_{LL} - \sigma_{2L})$$

where  $\sigma_{LL} = (w(1-\tau_L)/l)\partial l^c / \partial(w(1-\tau_L)) > 0$  is the compensated elasticity of labor supply wrt net wage rate

$$\sigma_{22} = (q/c_2)\partial c_2^c / \partial q < 0$$

$$\sigma_{L2} = (q/l)\partial l^c / \partial q$$

$$\sigma_{2L} = (w(1-\tau_L)/c_2)\partial c_2^c / \partial(w(1-\tau_L))$$

Formula defines relative optimal rates of taxation on labor and capital (absolute levels depend on  $g$ )

## RAMSEY CAPITAL INCOME TAX: DISCUSSION

Little known about cross elasticities so we might as well assume that they are zero [symmetric by Slutsky]  $\Rightarrow$  Optimal formula simplifies to:

$$-\frac{r\tau_K}{1+r}\sigma_{22} = \frac{\tau_L}{1-\tau_L}\sigma_{LL}$$

**Inverse elasticity rule** as in standard Ramsey model: If  $\sigma_{LL} \ll |\sigma_{22}|$  then  $\tau_K$  should be small relative to  $\tau_L$

**Key lesson:** What matters is the relative size of elasticities, not the number of distortions

## RAMSEY TAX: ENDOGENOUS CAPITAL STOCK

Full dynamic model:

Govt maximizes  $SW = \sum_t V_t / (1 + \delta)^t$

subject to  $\sum_t Tax_t / (1 + r)^t \geq \sum_t g_t / (1 + r)^t$

$\Rightarrow$  Optimal dynamic capital stock  $k$  is given by Modified Golden rule  
 $r = f'(k) = \delta$

Optimal  $k$  can be attained in steady state using debt policy [implicit in budget constraint]

In that case, optimal  $\tau_K, \tau_L$  given by same static Ramsey rule

Problems of dynamic efficiency (optimal  $K$  stock) and efficiency within a generation ( $\tau_L, \tau_K$ ) are orthogonal

## RAMSEY TAX: ENDOGENOUS CAPITAL STOCK

If the govt cannot use debt policy then optimal dynamic capital level may not be attained because savings equal capital  $s_t = K_t \Rightarrow$  tax formulas need to be modified: optimal tax rates reflect

(a) the trade-off between conventional [intra-generational] efficiency losses [static Ramsey]

(b) the failure to achieve the dynamic optimality condition on capital stock [inter-generational efficiency trade-off]

$\Rightarrow$  Effect on capital tax rate level is actually ambiguous

## RAMSEY CAPITAL INCOME TAX: REMARKS

- 1) No redistributive concerns: Can extend model to the multi-person case  $\Rightarrow$  Higher rate  $\tau_K$  if capital income concentrated among the rich (Park JPubE, 1991).
- 2) No bequests so this model does not capture an important aspect of wealth accumulation and justification for redistribution.
- 3) Only a two period model, if more periods are introduced (as in the Auerbach-Kotlikoff simulation model), then optimal tax formula would be more complex.

## LIFE-CYCLE MODEL: ATKINSON-STIGLITZ JPubE '76

Heterogeneous individuals and government uses nonlinear tax on earnings. Should the govt also use tax on savings?

$$V^h = \max U^h(v(c_1, c_2), l) \text{ st } c_1 + c_2 / (1 + r(1 - \tau_K)) = wl - T_L(wl)$$

If utility is weakly separable and  $v(c_1, c_2)$  is the same for all individuals, then the government should use only labor income tax and should not use tax on savings

$$\text{E.g.: } v(c_1, c_2) = u(c_1) + \frac{u(c_2)}{1+\delta}$$

Tax on savings justified within Saez (2002) framework if:

- (1) High skill people have higher taste for saving (e.g, high skill people have lower discount rate, better education)
- (2)  $c_2$  is complementary with leisure.
- (3) Inheritances (won't have same consumption patterns conditional on earned income).

## TAXATION OF INHERITANCES: WELFARE EFFECTS

Definitions: donor is the person giving, donee is the person receiving

Inheritances and inter-vivos transfers raise difficult issues:

(1) Inequality in inheritances contributes to economic inequality: seems fair to redistribute from those who received inheritances to those who did not

(2) However, it seems unfair to double tax the donors who worked hard to pass on wealth to children

⇒ Double welfare effect: inheritance tax hurts donor (if donor altruistic to donee) and donee (which receives less) [Kaplow, '01]

## MODELS OF BEQUESTS AND GIFTS

Individuals receive inheritances and inter-vivos gifts. Those arise because of:

- 1) Accidental bequests: uncertain life-time with imperfect annuity markets  
⇒ people die with positive wealth
- 2) Altruistic bequests/gifts: people care about utility of children  
[Barro-Becker dynastic model is most famous example]
- 3) Warm glow bequests/gifts: people enjoy making transfers to children (the bequest itself enters utility).
- 4) Manipulative / social norms bequests: bequests used to extract services from heirs or pressure from heirs to leave bequests [equal estate division Wilhelm AER'96, spousal pensions Aura JpubE'05]

## ESTATE TAXATION IN THE UNITED STATES

Pre-2018: Estate federal tax imposes a tax on estates above \$5.5M exemption (only about .1% of deceased liable), tax rate is 40% above exemption (2013+)

2018 to 2025: exemption threshold is \$11.18M for singles, \$22.36M for married.

Charitable and spousal giving are fully exempt from the tax

E.g.: if Bill Gates / Warren Buffet give all their wealth to charity, they won't pay estate tax

Support for estate tax is pretty weak ("death tax") but public does not know that estate tax affects only richest

Support for estate tax increase shots up from 17% to 53% when survey respondents are informed that only richest pay it (Kuziemko-Norton-Saez-Stantcheva '13 do an online survey experiment)

# TREATMENT EXAMPLE: INFORMATION ABOUT THE ESTATE TAX

Besides the income tax, the government can also level the playing field with **the federal estate tax**.

The **Federal Estate Tax** (also known as the **Death Tax**) applies when a deceased person leaves **more than \$5 million** in wealth to his or her heirs. Wealth left to a spouse or charitable organizations is exempt from estate tax.



**Only 1 person out of 1000 is wealthy enough to face the estate tax.**

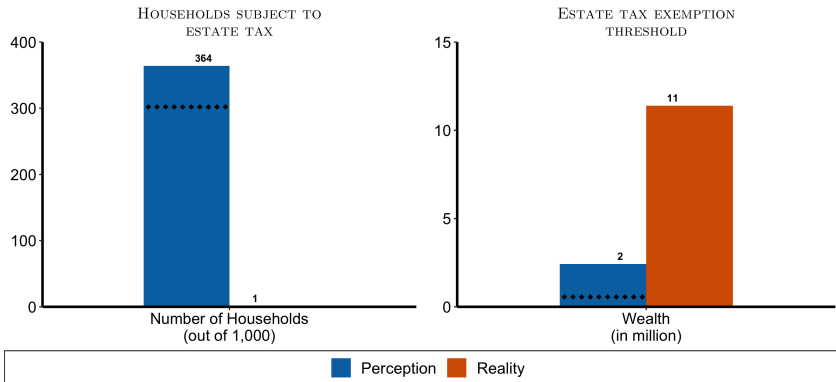
Average Americans do not have anything close to \$5 million in wealth, so the estate tax does not affect them and they can pass on their property to their children tax-free.

**Eliminating** the estate tax would allow the very richest families to pass down all of their wealth to their children tax-free. Hence, children of rich people would also start off very rich themselves.

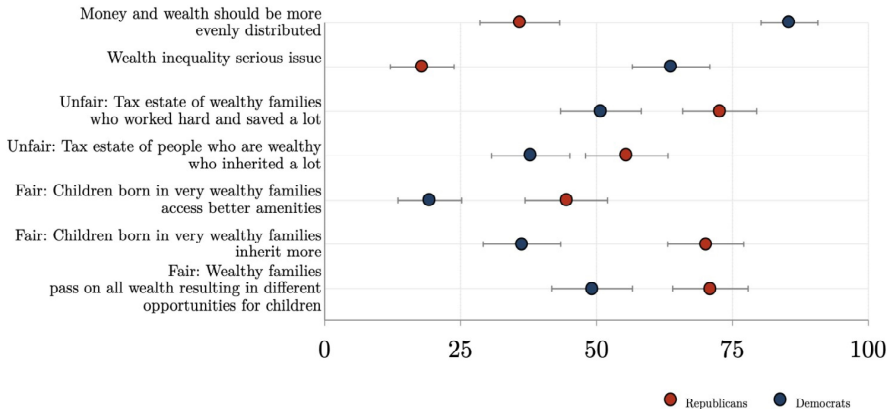
**Increasing** the estate tax is a way to level the playing field between the children of wealthy parents and children of middle-class parents.



# PEOPLE GREATLY OVERESTIMATE SHARE OF HOUSEHOLDS WHO PAY THE ESTATE TAX & UNDERESTIMATE EXEMPTION THRESHOLD



# FAIRNESS CONSIDERATIONS ABOUT THE ESTATE TAX



## TAXATION OF INHERITANCES: BEHAVIORAL RESPONSES

Potential behavioral response effects of inheritance tax:

- (1) reduces wealth accumulation of altruistic donors (and hence tax base) [no very good empirical evidence, Slemrod-Kopczuk 01]
- (2) reduces labor supply of altruistic donors (less motivated to work if cannot pass wealth to kids) [no good evidence]
- (3) induces donees to work more through income effects (Carnegie effect, decent evidence from Holtz-Eakin, Joulfaian, Rosen QJE'93)

Critical to understand why there are inheritances to decide on optimal inheritance tax policy. 4 main models of bequests: (a) accidental, (b) bequests in the utility, (c) manipulative bequest motive, (d) dynastic

## ACCIDENTAL BEQUESTS

People die with a stock of wealth they intended to spend on themselves:  
Such bequests arise because of imperfect annuity markets

Annuity is an insurance contract converting lump sum amount into a stream of payments till end of life [insurance against risk of living too long]

Annuity markets are imperfect because of adverse selection [Finkelstein-Poterba EJ'02, JPE'04] or behavioral reasons [inertia, lack of planning]

Public retirement programs [and defined benefit private pensions] are in general mandatory annuities

Newer defined contribution private pensions [401(k)s in the US] are in general not annuitized

## ACCIDENTAL BEQUESTS

Bequest taxation has no distortionary effect on behavior of donor and can only increase labor supply of donees (through income effects)  $\Rightarrow$  strong case for taxing bequests heavily

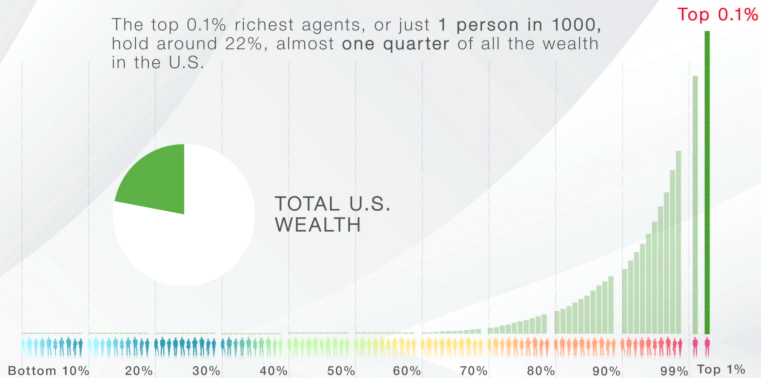
Kopczuk JPE '03 makes the point that estate tax plays the role of a “second-best” annuity:

Estate tax paid by those who die early, and not by those who die late  $\Rightarrow$  Implicit insurance against risk of living too long

Kopczuk-Lupton REStud'07 shows that only 1/2 of people accumulate wealth for bequest motives

# ESTATE TAX: REDISTRIBUTION TREATMENT (I)

The top 0.1% richest agents, or just 1 person in 1000, hold around 22%, almost one quarter of all the wealth in the U.S.



# ESTATE TAX: REDISTRIBUTION TREATMENT (II)

Revenues from the estate tax go to fund other tax cuts, transfers, or government programs that help less wealthy families.



# ESTATE TAX: REDISTRIBUTION TREATMENT (III)

Leveling the playing field through the estate tax is even more important since children from wealthy families already start with many more advantages in life, such as:



better schools



better health



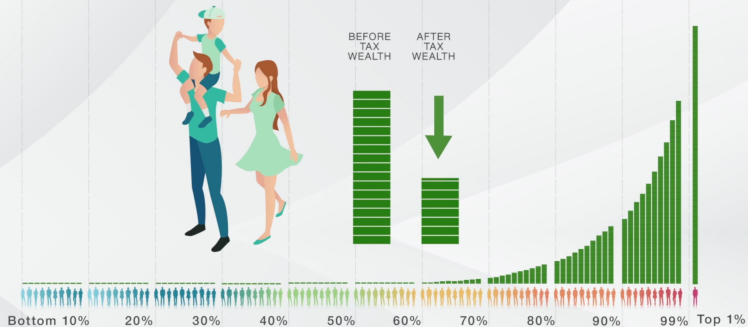
better neighborhoods



better social and professional networks

# ESTATE TAX: EFFICIENCY TREATMENT (I)

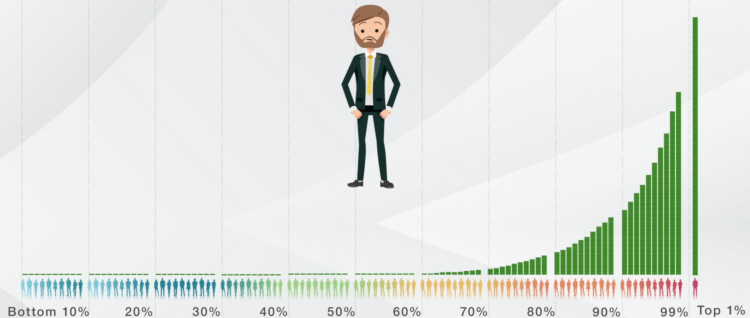
When the estate tax is higher, wealthy parents may decide to **work less** or **start fewer businesses** since the wealth they create to transmit to their kids will be lower after tax.



## ESTATE TAX: EFFICIENCY TREATMENT (II)

When the estate tax is higher, wealthy parents may also want to hide more of their wealth from the tax authorities.

There are many sophisticated tax evasion and avoidance channels and loopholes.



# ESTATE TAX: EFFICIENCY TREATMENT (III)

But there are also economic benefits from a higher estate tax:  
When wealthy children receive less after-tax wealth handed down from their parents, they will work more on their own.



# ESTATE TAX: ECONOMIST TREATMENT (I)

To sum up, like all taxes, the estate tax has **economic costs and benefits**.

An estate tax makes the wealth distribution **more equal and fair** and levels the playing field between children from poor and wealthy families.

The **right level of the estate tax** will be the one that balances its costs and benefits.

RAISE TAXES



LOWER TAXES

## INFINITE HORIZON MODEL: CHAMLEY-JUDD

Govt can collect taxes using linear labor income tax or capital income taxes that vary period by period  $\tau_L^t, \tau_K^t$

Goal of the government is to maximize utility of the dynasty

$$V_0 = \sum_t u(c_t, l_t) / (1 + \delta)^t \text{ st } \sum_t q_t c_t \leq \sum_t q_t w_t (1 - \tau_L^t) l_t + A_0 \quad (\lambda)$$

$$q_0 = 1, \dots, q_t = 1 / \prod_{s=1}^t (1 + r_s (1 - \tau_K^s)), \dots$$

With constant tax rate  $\tau_K$  and constant  $r$ : Before tax price:  $p_t = 1 / (1 + r)^t$   
and after-tax price  $q_t = 1 / (1 + r(1 - \tau_K))^t \Rightarrow$

Price distortion  $q_t / p_t$  grows exponentially with time

## CHAMLEY-JUDD: RESULTS

Chamley-Judd show that the capital income tax rate always tends to zero asymptotically: no capital tax in the long-run:

Two equivalent ways to understand this result:

- (1) A constant tax on capital income creates an exponentially growing distortion which is inefficient
- (2) The PDV of the capital income tax base is infinitely elastic with respect to an increase in  $\tau_K$  in the distant future [Piketty-Saez '13]

Intuition:  $u_c(c_{t+1})/u_c(c_t) = (1 + \delta)/(1 + r(1 - \tau_K)) \Rightarrow$  savings decisions infinitely elastic to  $r(1 - \tau_K) - \delta$

If  $r(1 - \tau_K) > \delta$ , accumulate forever. If  $r(1 - \tau_K) < \delta$ , get in debt as much as possible.

## ISSUES IN INFINITE HORIZON MODEL

- 1) Taxing initial wealth is most efficient [as this is lump sum taxation]  $\Rightarrow$  solutions typically bang-bang: tax capital as much as possible early, then zero
- 2) Chamley-Judd tax is not time consistent: the government would like to renege and start taxing capital again
- 3) Zero-long run tax result is not robust to using progressive income taxation [Piketty, '01, Saez JpubE'13]
- 4) Dynastic model requires strong homogeneity assumptions (in discount rates) to generate reasonable steady states [unlikely to hold in practice. Saez and Stantcheva JPubE'18]
- 5) Introducing stochastic shocks in labor/preferences in dynastic model leads to finite elasticities (and reasonable optimal tax rates) [Piketty-Saez ECMA'13]

## A SIMPLER MODEL OF CAPITAL TAXATION

For exposition: Exogenous and uniform labor income  $z$

Heterogeneous discount rate  $\delta_i$  (assume  $\delta_i > r$ )

Exogenous and uniform rate of return  $r$  on wealth  $k$ , income:  $rk$

Time invariant tax  $T_K(rk)$

Initial wealth  $k_i^{init}$ , exogenous.

Individual  $i$  has instantaneous utility  $u_i(c, k) = c + a_i(k)$

linear in consumption  $c$  and increasing and concave in wealth  $k$ .

Maximizes:

$$U_i = \delta_i \cdot \int_{t=0}^{\infty} [c_i(t) + a_i(k_i(t))] e^{-\delta_i t}$$

s.t.  $\frac{dk_i(t)}{dt} = rk_i(t) - T_K(rk_i(t)) + z_i(t) - c_i(t)$

## SOLVING THE INDIVIDUAL'S MAXIMIZATION PROBLEM

$$U_i = \delta_i \cdot \int_{t=0}^{\infty} [c_i(t) + a_i(k_i(t))] e^{-\delta_i t}$$

$$\text{s.t. } \frac{dk_i(t)}{dt} = rk_i(t) - T_K(rk_i(t)) + z_i(t) - c_i(t)$$

$$\text{Hamiltonian: } c_i(t) + a_i(k_i(t)) + \lambda_i(t) \cdot [rk_i(t) - T_K(rk_i(t)) + z_i(t) - c_i(t)]$$

$$\text{FOC in } c_i(t) : \lambda_i(t) = 1 \Rightarrow \text{constant multiplier}$$

$$\text{FOC in } k_i(t) : a'_i(k_i(t)) + \lambda_i(t) \cdot r \cdot (1 - T'_K) = -\frac{d\lambda_i(t)}{dt} + \delta_i \cdot \lambda_i(t)$$

$$\Rightarrow a'_i(k_i(t)) = \delta_i - \bar{r} \quad \text{where} \quad \bar{r} = r \cdot (1 - T'_K)$$

## STEADY STATE

Utility for wealth puts limit on impatience to consume ( $\delta_i > \bar{r}$ )

MU for wealth  $a'_i(k) = \delta_i - \bar{r}$  = value lost in delaying consumption

Wealth accumulation depends on heterogeneous preferences  $a_i(\cdot)$ ,  $\delta_i$ , and net-of-tax return  $\bar{r}$  (substitution effects, no income effects)

$\Rightarrow$  Heterogeneity in (non-degenerate) steady-state wealth.

At time 0: jump from  $k_i^{init}$  to  $k_i(t)$  (consumption quantum Dirac jump):

$$U_i = \underbrace{rk_i(t) - T_K(rk_i(t)) + z_i(t)}_{c_i(t)} + a_i(k_i(t)) + \delta_i \cdot (k_i^{init} - k_i(t))$$

Dynamic model equivalent to a static model:

$$U_i = c_i + a_i(k_i) + \delta_i \cdot (k_i^{init} - k_i) \quad \text{with} \quad c_i = rk_i - T_K(rk_i) + z_i$$

Announced vs. unannounced tax reforms have same effect.

## WEALTH IN UTILITY

Technical reason: to smooth otherwise degenerate steady state ( $\delta_i = \delta = \bar{r}$ )

Possible, but more complicated is uncertainty (in paper).

Entrepreneurship: “cost” of managing wealth,  $-h_i(k)$  (return  $r_i > \delta_i$ ).

Wealth brings non-consumption utility flows: Weber’s “*spirit of capitalism*.”

Keynes (1919, 1931) “*love of money as a possession*”, “*the virtue of the cake [savings] was that it was never to be consumed.*”

Social status (measure of ability, performance, success)

Power and political influence.

Philanthropy and moral recognition, warm glow bequests.

Empirical evidence in favor of wealth in the utility:

Caroll (2000): helps explain top wealth holdings.

## ISOMORPHISM WITH STATIC LABOR TAXATION MODEL

$$U_i = c_i + a_i(k_i) + \delta_i \cdot (k_i^{init} - k_i) \quad \text{with} \quad c_i = rk_i - T_K(rk_i) + z_i$$

is mathematically isomorphic to static labor income model:

$$U_i = c_i - h_i(z_i) \quad \text{with} \quad c_i = z_i - T_L(z_i)$$

Optimal K tax analysis isomorphic to optimal L income tax theory.

Differences of degree rather than of kind, quantitative differences.

Key differences (e.g.: uncertainty, shocks to productivity vs. taste) reflected in estimable elasticities.

In general model, slow adjustment will be reflected in lower elasticity.

Bypasses transitional dynamics, greatly simplifies K tax analysis

Like labor supply decisions (not instantaneous, e.g. human capital investment).

## GOVERNMENT OPTIMIZATION

Government sets a time invariant budget balanced  $T_K(\cdot)$  to maximize its social objective

$$\int_i g_i \cdot U_i(c_i, k_i) di \quad \text{with} \quad g_i \geq 0 \quad \text{social marginal welfare weight}$$

Optimal  $T_K(\cdot)$  depends on three key ingredients:

- (1) **Social preferences:**  $g_i$  = value of \$1 extra given to  $i$  ( $\int_i g_i = 1$ ).
- (2) **Efficiency costs:** Elasticity  $e_K = (\bar{r}/k) \cdot (dk/d\bar{r})$  measures how wealth  $k$  responds to  $\bar{r} = r \cdot (1 - T'_K)$
- (3) **Distribution of capital income:**  $H_K(rk)$  (for nonlinear tax).

# OPTIMAL LINEAR CAPITAL TAXATION AT RATE $\tau_K$

$k^m(\bar{r}) \equiv \int_i k_i di$  average wealth (depends on  $\bar{r}$  with elasticity  $e_K$ ).

Revenues  $\tau_K k^m(\bar{r})$  rebated lump-sum.

$\tau_K$  maximizes  $SWF = \int_i g_i \cdot U_i(c_i, k_i) di$  with

$$U_i = \underbrace{rk_i \cdot (1 - \tau_K) + \tau_K \cdot rk^m(\bar{r})}_{c_i} + z_i + a_i(k_i) + \delta_i \cdot (k_i^{init} - k_i)$$

Standard optimal tax derivation (using envelope theorem for  $k_i$ ):

$$\frac{dSWF}{d\tau_K} = rk^m \cdot \underbrace{\int_i g_i \cdot \left(1 - \frac{k_i}{k^m}\right)}_{\text{Mechanical Revenue net of Welfare Effect}} - rk^m \cdot \underbrace{\frac{\tau_K}{1 - \tau_K} \cdot e_K}_{\text{Behavioral Effect}}$$

Optimal  $\tau_K$  such that  $dSWF / d\tau_K = 0$ .

## OPTIMAL LINEAR CAPITAL TAX $\tau_K$

$$\tau_K = \frac{1 - \bar{g}_K}{1 - \bar{g}_K + e_K} \quad \text{with} \quad \bar{g}_K = \frac{\int_i g_i \cdot k_i}{\int_i k_i} \quad \text{and} \quad e_K = \frac{\bar{r}}{k^m} \cdot \frac{dk^m}{d\bar{r}} > 0$$

Zero capital tax result:  $\tau_K = 0$  only if:

$\bar{g}_K = 1$  (no inequality in  $rk$ , or no redistributive concerns  $g_i \equiv 1$ ), or

$e_K = \infty$ .

$\tau_K > 0$  as long as  $g_i$  decreasing in  $k_i$ , or wealth concentrated among low  $g_i$  agents.

$\tau_K = 1/(1 + e_K)$  is revenue-maximizing in Rawlsian case:  $g_i = 0$  if  $k_i > 0$ .

Top revenue maximizing rate:  $\tau_K = 1/(1 + a_K^{top} \cdot e_K^{top})$  with  $a_K^{top}$  the Pareto tail parameter for top bracket.

Quantitative evaluation needs empirical estimate for  $e_K$ .

## OPTIMAL NONLINEAR CAPITAL TAX

$$T'_K(rk) = \frac{1 - \bar{G}_K(rk)}{1 - \bar{G}_K(rk) + \alpha_K(rk) \cdot e_K(rk)}$$

- 1)  $\bar{G}_K(rk) \equiv \frac{\int_{\{i: rk_i \geq rk\}} g_i di}{P(rk_i \geq rk) \int_i g_i di}$  is the average  $g_i$  above capital income level  $rk$
- 2)  $\alpha_K(rk)$  the local Pareto parameter of capital income distribution
- 3)  $e_K(rk)$  the local elasticity of  $k$  wrt to  $1 - T'_K(rk)$  at income level  $rk$

Capital income is very concentrated (top 1% capital income earners have 60%+ of total capital income)

⇒ Asymptotic formula:

$T'_K(\infty) = (1 - G_K(\infty)) / (1 - G_K(\infty) + \alpha_K(\infty) \cdot e_K(\infty))$  relevant for most of the tax base

# EQUITY CONSIDERATIONS: THE ANT AND THE GRASSHOPPER



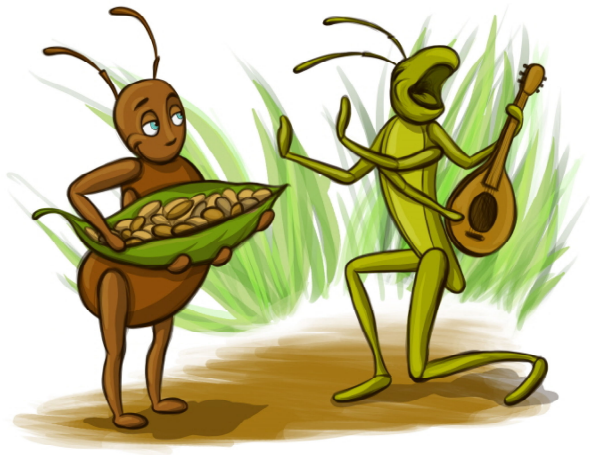
Credit: Adelya Tumasyeva

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## EQUITY CONSIDERATIONS FOR CAPITAL TAXATION: GENERALIZED WELFARE WEIGHTS

### (1) Inequality in wealth deemed fair and wealth is not a tag

Equality of opportunity argument: grasshopper had same savings opportunities as ant, conditional on labor earnings.

Capital accumulated by sacrificing consumption, why punish saving behavior?

What if ant had higher work (grain harvesting) ability?  $\rightarrow$  role for nonlinear labor income tax.

$\rightarrow g_i$  independent of and uncorrelated with  $k_i \rightarrow \tau_K = 0$ .

## EQUITY CONSIDERATIONS FOR CAPITAL TAXATION: GENERALIZED WELFARE WEIGHTS

### (2) Inequality in wealth viewed as unfair

Even conditional on labor earnings, high wealth comes from higher patience  $\delta_i$  or higher valuation of wealth  $a_i$  – unfair heterogeneity, like earnings ability.

or parental wealth ( $k_i^{init}$ ) – ant's parents left extra grain.

or higher returns  $r_i$  (luck) – ant speculated on grain-forward derivatives.

→  $g_i$  decreasing in  $k_i$  →  $\tau_K > 0$ .

## EQUITY CONSIDERATIONS FOR CAPITAL TAXATION: GENERALIZED WELFARE WEIGHTS

### (3) Wealth as a tag

May or may not care about  $k$  per se ( $g_i$  may not depend on  $k_i$  directly).

But wealth may be tag for aspects that enter  $g_i$  negatively: parental background (see Saez-Stantcheva), ability.

Having more grain means more likely to come from rich family.

$\bar{G}_K(rk)$  is representation index of agents from poor background at income  $rk$ .

$\rightarrow \text{corr}(g_i, k_i) < 0 \rightarrow \tau_K > 0$ .

## ADDING IN LABOR INCOME RESPONSES & LABOR TAXATION

Add in choice of labor income, with potentially arbitrary heterogeneity in disutility  $h_i(z)$ .

$$U_i = rk_i + z_i - T(rk_i + z_i) + a_i(k_i) + \delta_i \cdot (k_i^{init} - k_i) - h_i(z_i)$$

$$T'_L(z) = \frac{1 - \bar{G}_L(z)}{1 - \bar{G}_L(z) + \alpha_L(z) \cdot e_L(z)}$$

- 1)  $\bar{G}_L(z) \equiv \frac{\int_{\{i:z_i \geq z\}} g_i d_i}{P(z_i \geq z) \int_i g_i d_i}$  is the average  $g_i$  above labor income level  $z$
- 2)  $\alpha_L(z)$  the local Pareto parameter of capital income distribution
- 3)  $e_L(z)$  the local elasticity of  $k$  wrt to  $\bar{r}$  at income level  $rk$

Separable labor and capital taxes each set according to Mirrlees (1971) and Saez (2001) formulas.

## JOINT PREFERENCES IN CAPITAL AND LABOR AND CROSS-ELASTICITIES

Agent's dynamic problem is again equivalent to maximizing:

$$U_i = c_i + v_i(k_i, z_i) + \delta_i(k_i^{init} - k_i) \quad \text{with} \quad c_i = \bar{r}k_i + z_i - T_L(z_i)$$

Choice  $(c, k, z)$  is such that:

$$v_{iz}(k_i, z_i) = 1 - T'_L(z_i), \quad v_{ik}(k_i, z_i) = \delta_i - \bar{r}, \quad c_i = \bar{r}k_i + z_i - T_L(z_i)$$

Optimal capital tax (at any, possibly non-optimal  $\tau_L$ ):

$$\tau_K = \frac{1 - \bar{g}_K - \tau_L \frac{z^m}{k^m} e_{Z,(1-\tau_K)}}{1 - \bar{g}_K + e_K}$$

$$\text{with} \quad \bar{g}_K = \frac{\int_i k_i g_i}{k^m}, \quad e_{Z,(1-\tau_K)} = \frac{dz^m}{d(1-\tau_K)} \frac{(1-\tau_K)}{z^m}$$

# COMPREHENSIVE NONLINEAR INCOME TAXATION

$$T(rk + z)$$

Govt uses solely comprehensive taxation  $T(y)$  with  $y_i \equiv rk_i + z_i$

$$U_i = rk_i + z_i - T(rk_i + z_i) + a_i(k_i) + \delta_i \cdot (k_i^{init} - k_i) - h_i(z_i)$$

Standard Mirrlees' formula applies to comprehensive income tax problem

$$T'(y) = \frac{1 - \bar{G}_Y(y)}{1 - \bar{G}_Y(y) + \alpha_Y(y) \cdot e_Y(y)}$$

$$\text{with } \bar{G}_Y(y) \equiv \frac{\int_{\{i: y_i \geq y\}} g_i d_i}{P(y_i \geq y) \int_i g_i d_i}$$

$\alpha_Y(y)$  local Pareto parameter for  $y$  distribution,

$e_Y(y)$  local elasticity of  $y$  with respect to  $1 - T'$ .

## TAX SHIFTING AND COMPREHENSIVE TAXATION

Suppose individual  $i$  can shift  $x$  dollars from labor income to capital income at utility cost  $d_i(x)$

Reported labor income  $z_L$  and capital income  $z_K$  are elastic to tax differential  $\tau_L - \tau_K$

If shifting elasticity is infinite, then  $\tau_L = \tau_K$  is optimal

If shifting elasticity is finite, then optimal  $\tau_L, \tau_K$  closer than they would be absent any shifting

If shifting elasticity is large then  $e_K$  can appear large, but wrong to set  $\tau_K$  at  $1/(1 + e_K)$  in that case

## HETEROGENEOUS RETURNS

**Heterogeneous returns**  $r_i$  important in practice:

Same sufficient stats formula, but replace:

$$\bar{g} = \frac{\int_i g_i \cdot r_i k_i}{\int_i r_i k_i} \quad \text{and} \quad e_K = \frac{(1 - \tau_K)}{\int_i r_i k_i} \cdot \frac{d \int_i r_i k_i}{d(1 - \tau_K)}$$

Values of  $e_K$  (responsiveness of  $k$  to taxes) and  $\bar{g}_K$  (social judgment about capital income) could be affected.

## DIFFERENT TYPES OF CAPITAL ASSETS

Could have  $\neq$  elasticities (housing vs. financial assets)

Different social judgments or distributional characteristics  $\bar{g}_K^j$ .

Formulas hold asset by asset, determined by:  $\bar{g}_K^j$ ,  $e_K^j$ , and cross-elasticities  $e_{K^s, (1-\tau_K^j)}$ .

$$\tau_K^j = \frac{1 - \bar{g}_K^j}{1 - \bar{g}_K^j + e_K^j}$$

$$\bar{g}_K^j = \frac{\int_i g_i \cdot k_i^j}{\int_i k_i^j}, \quad e_K^j = \frac{\bar{r}^j}{k^{m,j}} \cdot \frac{dk^{m,j}}{d\bar{r}^j} > 0, \quad e_{K^s, (1-\tau_K^j)} = \frac{\bar{r}^j}{k^{m,s}} \cdot \frac{dk^{m,s}}{d\bar{r}^j}$$

## DIFFERENT TYPES OF CAPITAL ASSETS

Could have  $\neq$  elasticities (housing vs. financial assets)

Different social judgments or distributional characteristics  $\bar{g}_K^j$ .

Formulas hold asset by asset, determined by:  $\bar{g}_K^j$ ,  $e_K^j$ , and cross-elasticities  $e_{K^s, (1-\tau_K^j)}$ .

$$\tau_K^j = \frac{1 - \bar{g}_K^j - \sum_{s \neq j} \tau_K^s \frac{k^{m,s}}{k^{m,j}} e_{K^s, (1-\tau_K^j)}}{1 - \bar{g}_K^j + e_K^j}$$

$$\bar{g}_K^j = \frac{\int_i g_i \cdot k_i^j}{\int_i k_i^j}, \quad e_K^j = \frac{\bar{r}^j}{k^{m,j}} \cdot \frac{dk^{m,j}}{d\bar{r}^j} > 0, \quad e_{K^s, (1-\tau_K^j)} = \frac{\bar{r}^j}{k^{m,s}} \cdot \frac{dk^{m,s}}{d\bar{r}^j}$$

## CONSUMPTION TAXATION: THE POLICY DEBATE

Can a consumption tax be better than a wealth tax and more progressive than a tax on labor income?

Bill Gates: *“Imagine three types of wealthy people. One guy is putting his capital into building his business. Then there’s a woman who’s giving most of her wealth to charity. A third person is mostly consuming, spending a lot of money on things like a yacht and plane. While it’s true that the wealth of all three people is contributing to inequality, I would argue that the first two are delivering more value to society than the third. I wish Piketty had made this distinction, because it has important policy implications.”*

## CONSUMPTION TAXATION IN OUR MODEL

Consider linear consumption tax at (inclusive) tax rate  $\tau_C$  so that:

$$\frac{dk_i(t)}{dt} = r(1 - \tau_K)k_i(t) + z_i(t) - T_L(z_i(t)) - c_i(t)/(1 - \tau_C)$$

Agents care about real wealth  $k^r = k \cdot (1 - \tau_C)$ .

Even with wealth-in-utility,  $\tau_C$  equivalent labor tax + tax on initial wealth (Kaplow, 1994, Auerbach, 2009).

Thought experiment: equal labor income.

With  $\tau_C$ , wealthy look like pay more taxes, but paid less when accumulated more nominal wealth. Real wealth inequality unaffected.

With 2-dim heterogeneity: labor tax not sufficient (Atkinson-Stiglitz).

$\Rightarrow \tau_C$  cannot address steady-state capital income inequality

## METHODOLOGY FOR COMPUTING OPTIMAL TAX RATES

Suppose constant elasticity of labor, capital, and total income ( $e_L, e_K, e_Y$ ) and that choice at zero tax represents preference type:  $(\theta_i, \eta_i)$ .

Based on the IRS micro data, use pairs  $(z_i, rk_i)$  to invert individual choices to obtain  $(\theta_i, \eta_i)$ .

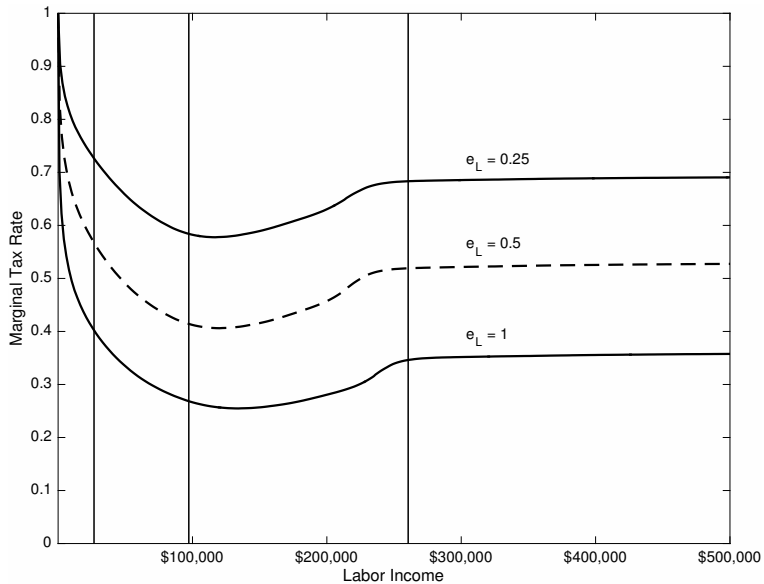
Non-parametrically fit type distributions and empirical Pareto parameters.

Solve for optimal  $T'_K$ ,  $T'_L$ , and  $T'_Y$  using sufficient stats formulas.

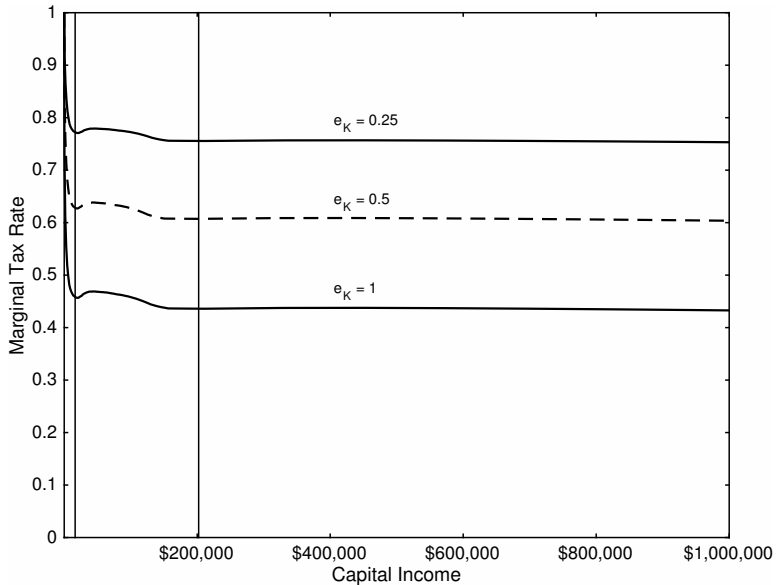
For capital – our simpler theory provides a much easier way to compute optimal tax rates based on the data.

Simulations set  $g_i = \frac{1}{\text{disposable income}_i}$  and use several values for elasticities.

# OPTIMAL LABOR INCOME TAX RATE $T'_L(z)$

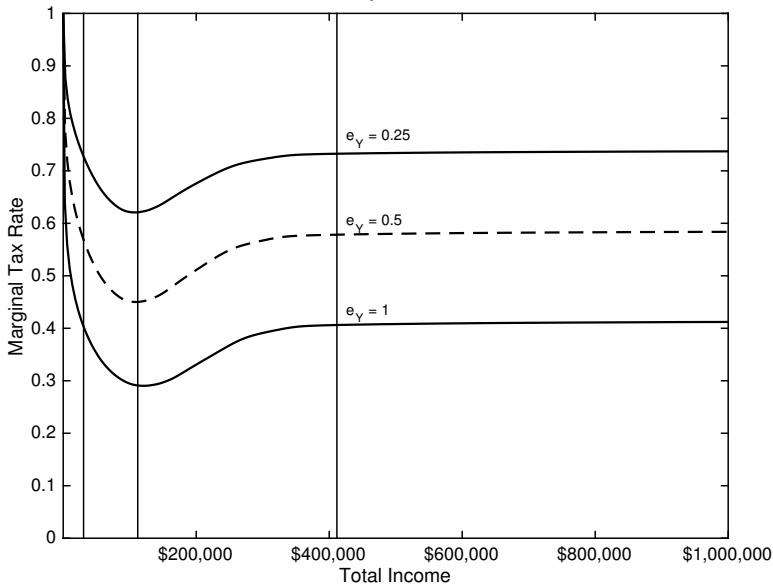


# OPTIMAL CAPITAL INCOME TAX RATE $T'_K(rk)$



# OPTIMAL TAX RATE ON COMPREHENSIVE INCOME TAX

$$T'_Y(y)$$



## THE GENERALIZED MODEL

Utility is

$$V_i(\{c_i(t), k_i(t), z_i(t)\}_{t \geq 0}) = \delta_i \cdot \int_{t=0}^{\infty} u_i(c_i(t), k_i(t), z_i(t)) e^{-\delta_i t} dt$$

with  $u_i(\underset{+}{c}, \underset{+}{k}, \underset{-}{z})$  **concave in  $\mathbf{c}$** , concave in  $k$ , concave in  $z$

$\Rightarrow$  consumption smoothing  $\Rightarrow$  sluggish transitional dynamics (a sum of anticipatory and build-up effects).

Convergence to steady state no longer instantaneous:

$$u_{ik} / u_{ic} = \delta_i - \bar{r}, \quad u_{ic} \cdot (1 - T'_L) = -u_{iz} \quad \text{and} \quad c = rk + z - T(rk, z).$$

Social welfare:

$$SWF = \int_i \omega_i V_i(\{c_i(t), k_i(t), z_i(t)\}_{t \geq 0})$$

## OPTIMAL LINEAR CAPITAL TAX IN THE STEADY STATE

Given  $\tau_K$  and  $\tau_L$ , rebated lump-sum  $\rightarrow$  convergence to steady state.

At time 0, start from steady state, consider unanticipated small reform  $d\tau_K$ , with elasticities:

$$e_K(t) = dk^m(t)/d\bar{r}(\bar{r}/k^m(t)) \rightarrow e_K.$$

$$e_{L,(1-\tau_K)} = dz^m/d\bar{r}(\bar{r}/z^m).$$

Optimal linear capital income tax in steady state:

$$\tau_K = \frac{1 - \bar{g}_K - \tau_L \frac{z^m}{k^m} e_{L,1-\tau_K}}{1 - \bar{g}_K + \bar{e}_K}$$

If fast responses  $\bar{e}_K \approx e_K$ , quantitative results of simpler model hold.

Slow adjustment:  $\bar{e}_K < e_K$ .

But is it reasonable to exploit short-run sluggishness?

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If fast responses  $\bar{e}_K \approx e_K$ , quantitative results of simpler model hold.

Slow adjustment:  $\bar{e}_K < e_K$ .

But is it reasonable to exploit short-run sluggishness?

## COMPARISON WITH PREVIOUS DYNAMIC MODELS

$e_K$  steady state: Chamley-Judd model:

Infinite (degenerate) steady state elasticity  $e_K = \infty$ .

Aiyagari and wealth-in-utility have  $e_K < \infty$ .

$e_K^{ante}$  anticipation elasticity:

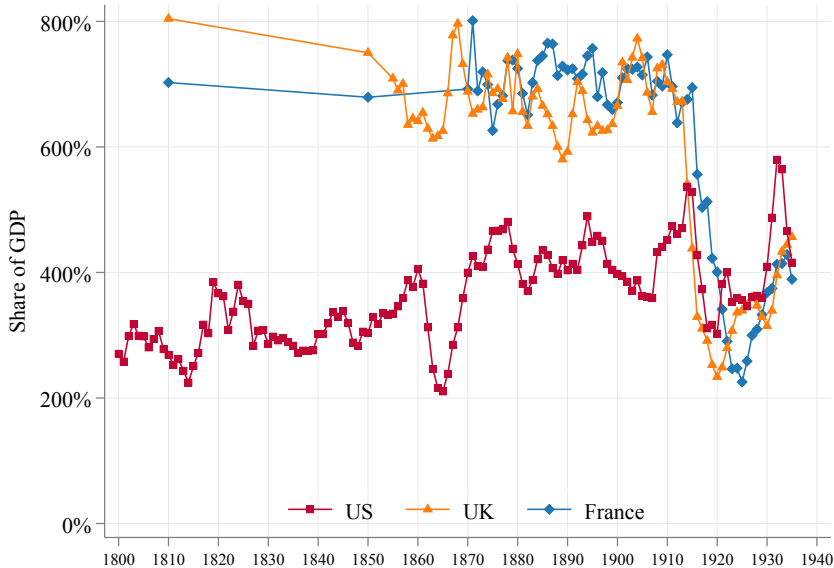
If reform announced infinitely in advance,  $e^{ante} = \infty$ , always, with full certainty.

Reasonable?

$e^{ante} < \infty$  if uncertainty (Aiyagari).

$e_K^{post}$  adjustment to reform: sluggish in all models, except with no transitional dynamics (linear utility).

# WEALTH-TO-GDP RATIOS IN THE US VS. FRANCE & THE UK



Sources: World Inequality Database and Piketty (2014) for France and the UK

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