Lectures 9 and 10: Capital Taxation

Stefanie Stantcheva

Fall 2016

GOALS OF THIS LECTURE

(1) Understand basic concepts about capital income, savings, and wealth.

(2) Study recent new measurements and data about evolution of capital income and wealth.

(3) Theory of capital taxation: series of (quite different) models. Try to understand today, then re-read and see the different assumptions.

(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

$\Rightarrow$ 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.

$\Rightarrow$ 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 τ_c corp tax rate

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

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

MACRO FRAMEWORK

Constant return to scale aggregate production:

$Y = F(K, L) = rK + wL$ = output = income

K = capital stock (wealth), L = labor input

r = rate of return on capital, w is wage rate

rK = capital income, wL = labor income

$\alpha = rK/Y$ = capital income share (constant α when $F(K, L) = K^\alpha L^{1-\alpha}$ Cobb-Douglas), $\alpha \simeq 30\%$

$\beta = K/Y$ = wealth to annual income ratio, $\beta \simeq 4 - 6$

$r = (rK/Y) \cdot (Y/K) = \alpha/\beta$, $r = 5 - 6\%$

SAVING FLOWS

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

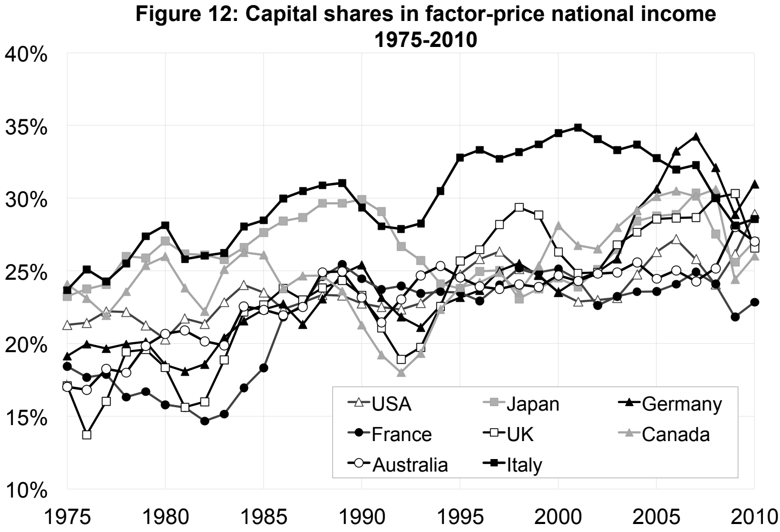
Three saving flows:

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

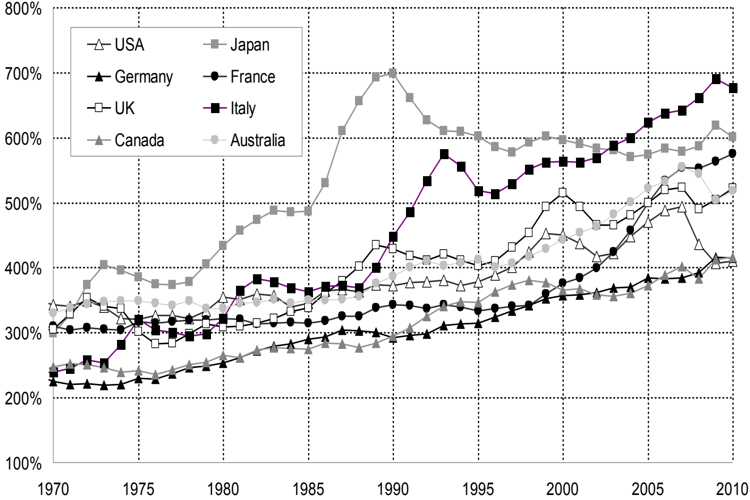
3) **Government Saving:** Taxes - Expenditures [federal, state and local]

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]



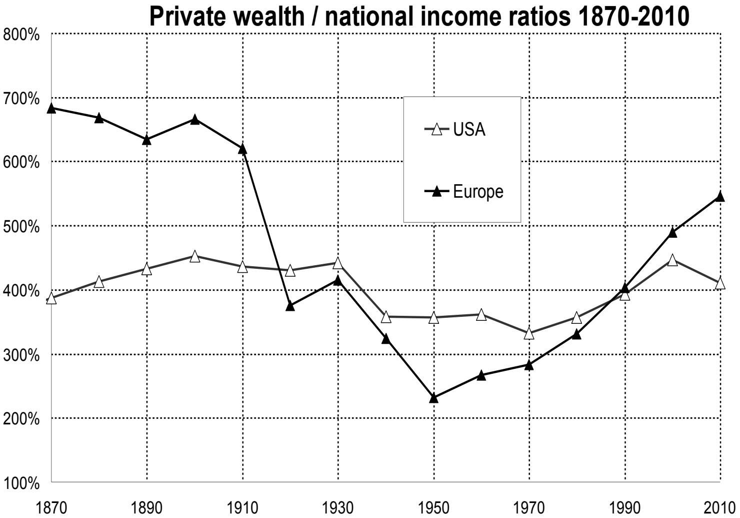
Source: Piketty and Zucman (2014)

Private wealth / national income ratios, 1970-2010



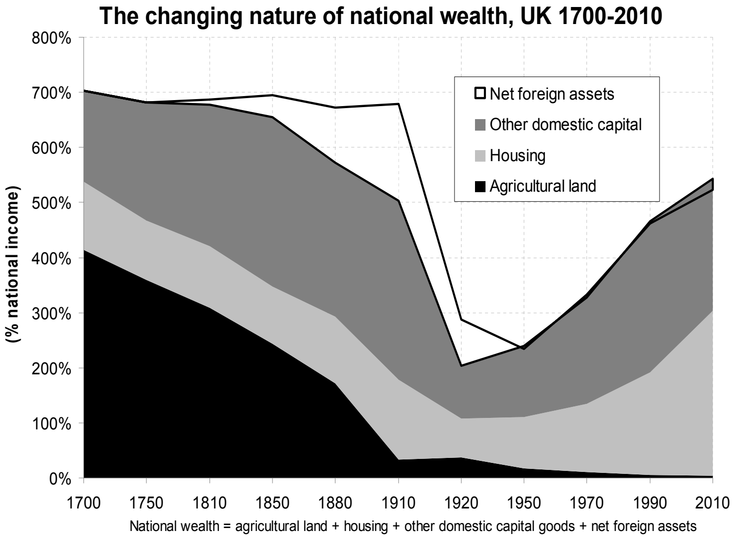
Authors' computations using country national accounts. Private wealth = non-financial assets + financial assets - financial liabilities (household & non-profit sectors)

Source: Piketty and Zucman '13

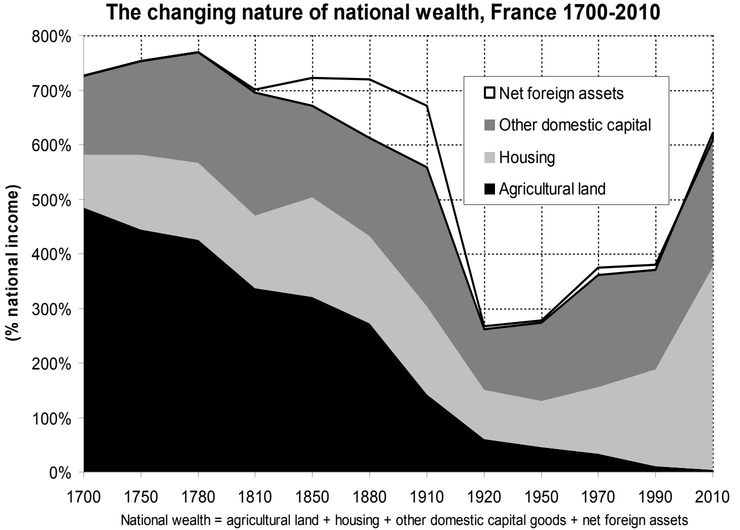


Authors' computations using country national accounts. Private wealth = non-financial assets + financial assets - financial liabilities (household & non-profit sectors)

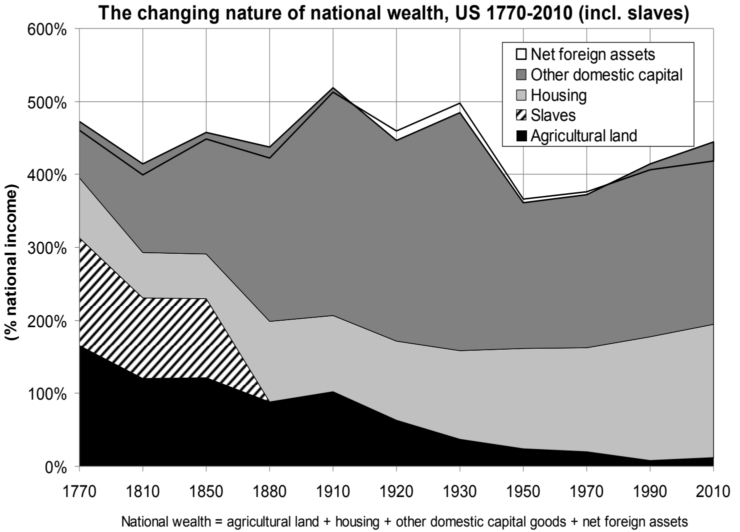
Source: Piketty and Zucman '13



Source: Piketty, Handbook chapter, 2014



Source: Piketty, Handbook chapter, 2014



Source: Piketty and Zucman '13

Piketty (2014) book: Capital in the 21st Century

Analyzes income, wealth, inheritance data over the long-run:

1) Growth rate $n+g$ = population growth + growth per capita. Population growth will converge to zero, growth per capita for frontier economies is modest (1%) $\Rightarrow$ long-run $g \simeq 1\%, n \simeq 0\%$

2) Long-run steady-state Wealth to income ratio (β) = savings rate (s) / annual growth ($n+g$): $\beta = s/(n+g)$

Low growth $\Rightarrow$ high wealth-to-income ratio.

Proof: $K_{t+1} = (1+n+g)\cdot K_t = K_t + s\cdot Y_t \Rightarrow K_t/Y_t = s/(n+g)$

With $s = 8\%$ and $n+g = 2\%$, $\beta = 400\%$ but with $s = 8\%$ and $n+g = 1\%$, $\beta = 800\% \Rightarrow$ Wealth will become important

Piketty (2014) book: Capital in the 21st Century

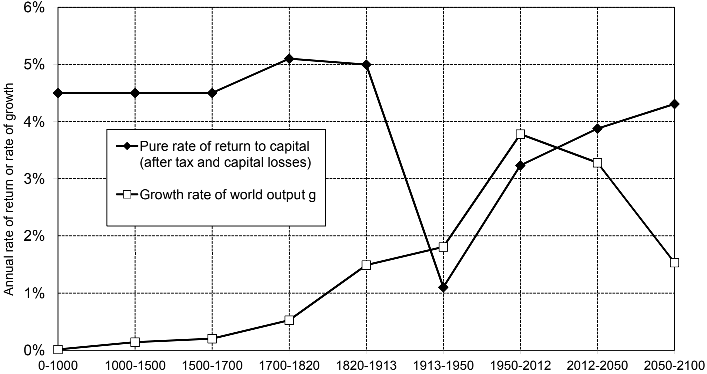
3) After-tax rate of return on wealth $\bar{r} = r(1 - \tau_K) = 4 - 5\%$ significantly larger than $n + g$ [except exceptional period of 1930–1970]

With $\bar{r} > n + g$, role of inheritance in wealth and wealth concentration become large [past swallows the future]

Explanation: Rentier who saves all his return on wealth accumulates wealth at rate $\bar{r}$ bigger than $n + g$ and hence his wealth grows relative to the size of the economy. The bigger $\bar{r} - (n + g)$, the easier it is for wealth to "snowball"

$\Rightarrow$ Capital taxation reduces r to $\bar{r} = r \cdot (1 - \tau_K)$ $\Rightarrow$ This can reduce wealth concentration

Figure 10.10. After tax rate of return vs. growth rate at the world level, from Antiquity until 2100



The rate of return to capital (after tax and capital losses) fell below the growth rate during the 20th century, and may again surpass it in the 21st century. Sources and series : see piketty.pse.ens.fr/capital21c

Source: Piketty (2014)

WEALTH AND CAPITAL INCOME IN AGGREGATE

Definition: Capital Income = Returns from Wealth Holdings

Aggregate US **Personal** Wealth $\simeq$ 4*GDP $\simeq$ $60 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

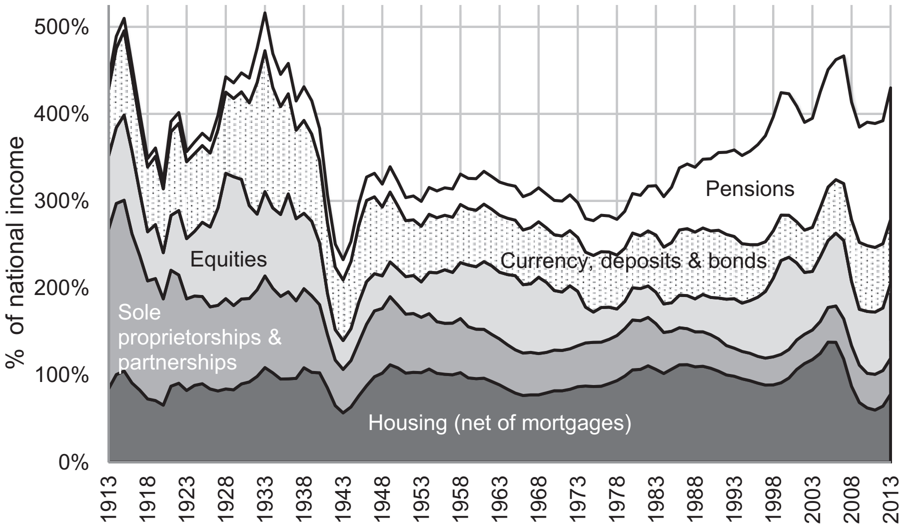
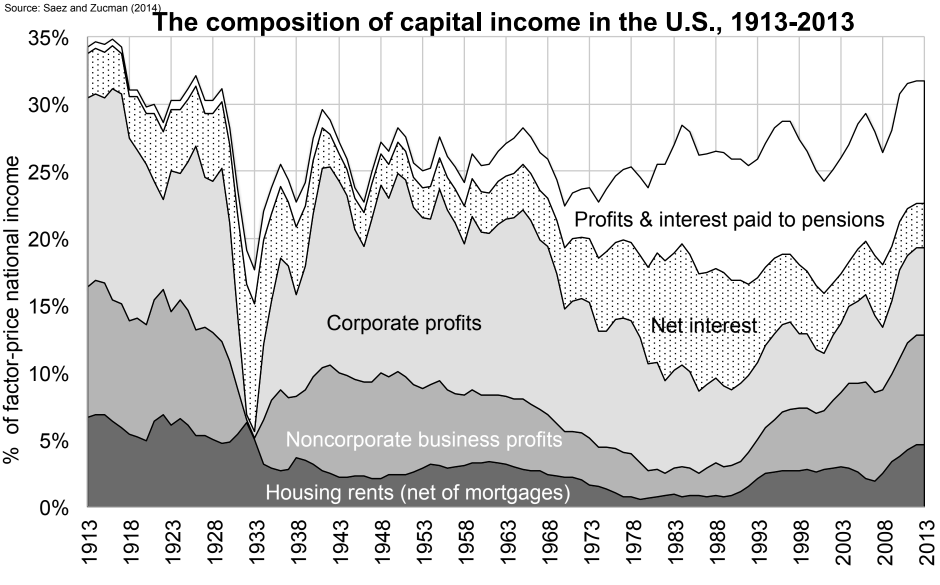


FIGURE II

Aggregate US Household Wealth, 1913–2013


Source: Saez and Zucman (2014)
The composition of capital income in the U.S., 1913-2013
35%
30%
25%
20%
15%
10%
5%
0%
% of factor-price national income
Profits & interest paid to pensions
Corporate profits
Net interest
Noncorporate business profits
Housing rents (net of mortgages)
1913
1918
1923
1928
1933
1938
1943
1948
1953
1958
1963
1968
1973
1978
1983
1988
1993
1998
2003
2008
2013

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

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.

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]

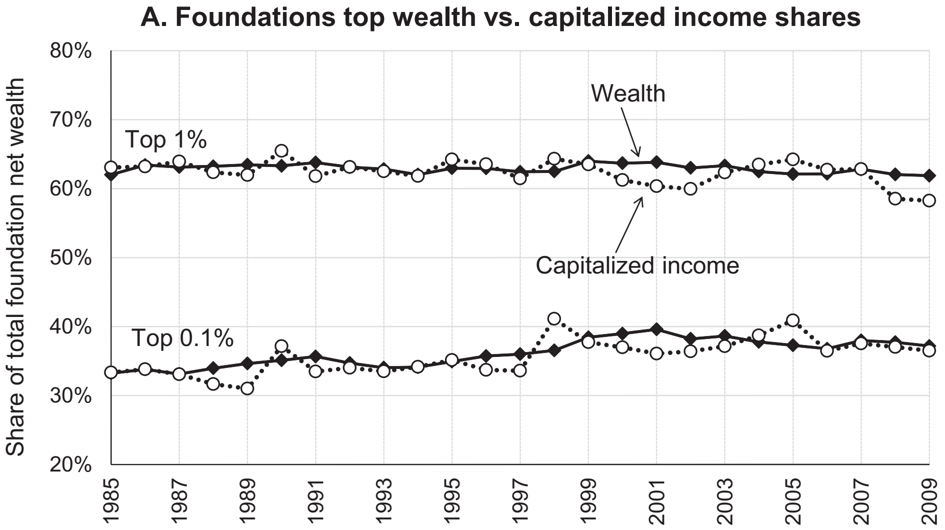
Problems: small sample size, measurement error, only every 3 years, starts in 1989

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


A. Foundations top wealth vs. capitalized income shares
Share of total foundation net wealth
80%
70%
60%
50%
40%
30%
20%
Top 1%
Top 0.1%
Wealth
Capitalized income
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009

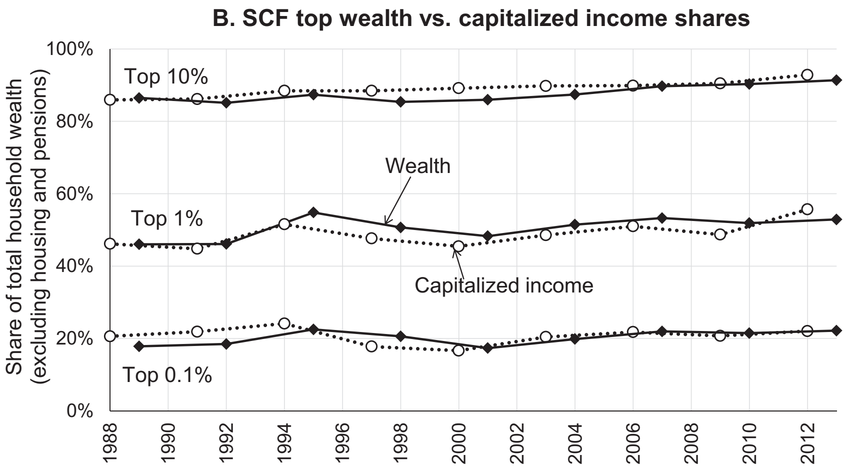
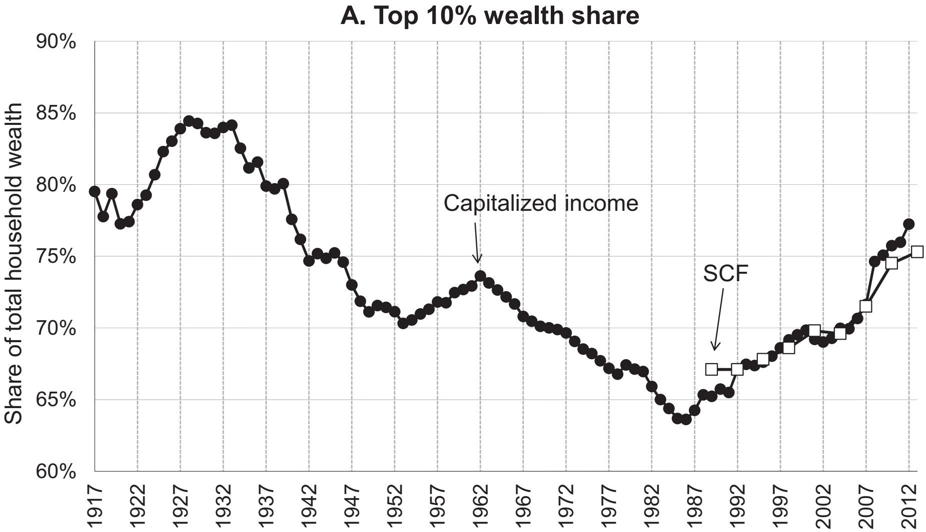
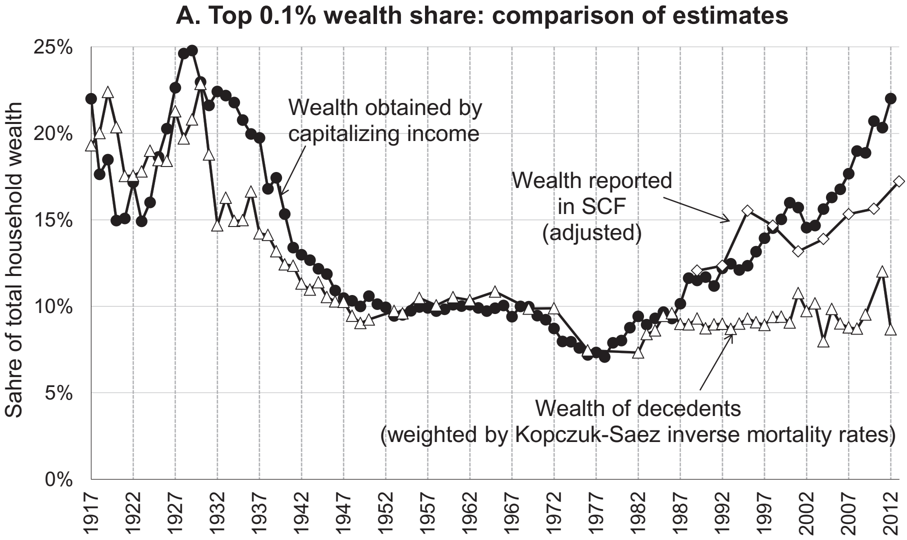
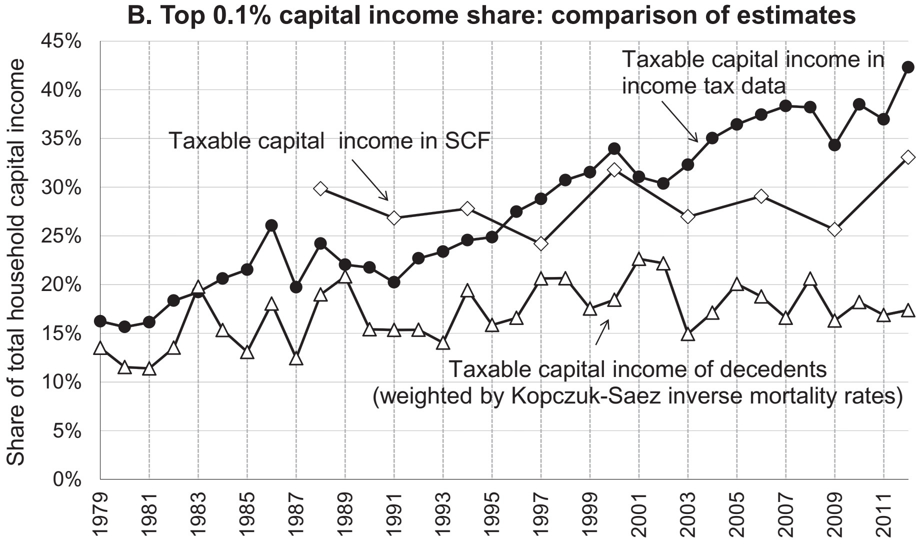


FIGURE IV

Testing the Capitalization Method Using SCF and Foundation Data


A. Top 10% wealth share
Share of total household wealth
90%
85%
80%
75%
70%
65%
60%
Capitalized income
SCF
1917
1922
1927
1932
1937
1942
1947
1952
1957
1962
1967
1972
1977
1982
1987
1992
1997
2002
2007
2012


A. Top 0.1% wealth share: comparison of estimates
Sahre of total household wealth
25%
20%
15%
10%
5%
0%
Wealth obtained by capitalizing income
Wealth reported in SCF (adjusted)
Wealth of decedents (weighted by Kopczuk-Saez inverse mortality rates)
1917
1922
1927
1932
1937
1942
1947
1952
1957
1962
1967
1972
1977
1982
1987
1992
1997
2002
2007
2012


B. Top 0.1% capital income share: comparison of estimates
Share of total household capital income
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
Taxable capital income in income tax data
Taxable capital income in SCF
Taxable capital income of decedents (weighted by Kopczuk-Saez inverse mortality rates)
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011

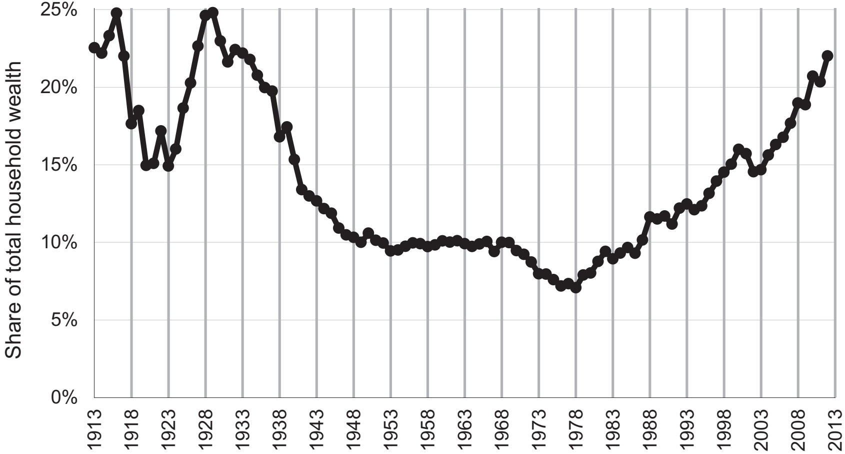


FIGURE I

Top 0.1% Wealth Share in the United States, 1913–2012

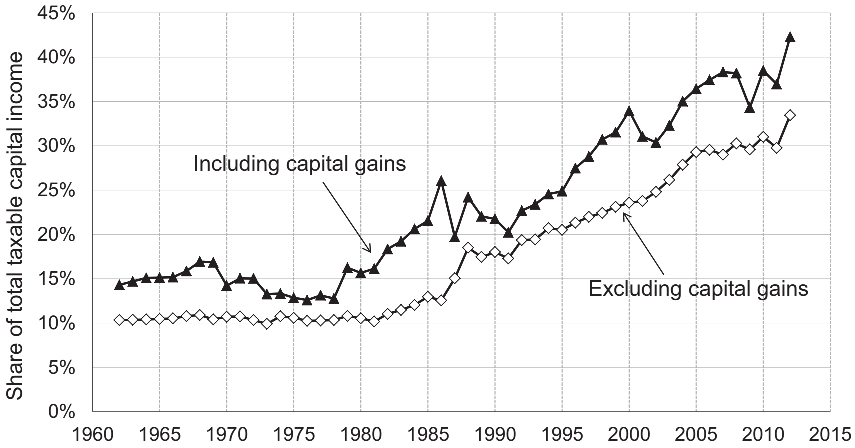


FIGURE III

The Top 0.1% Taxable Capital Income Share in the United States, 1962–2012

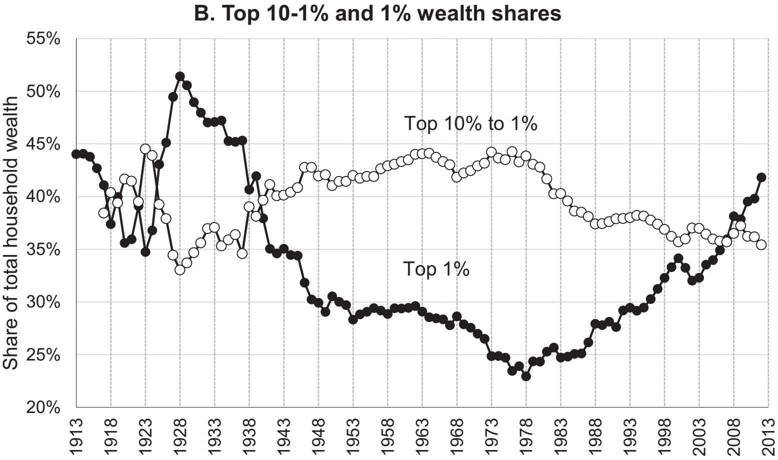
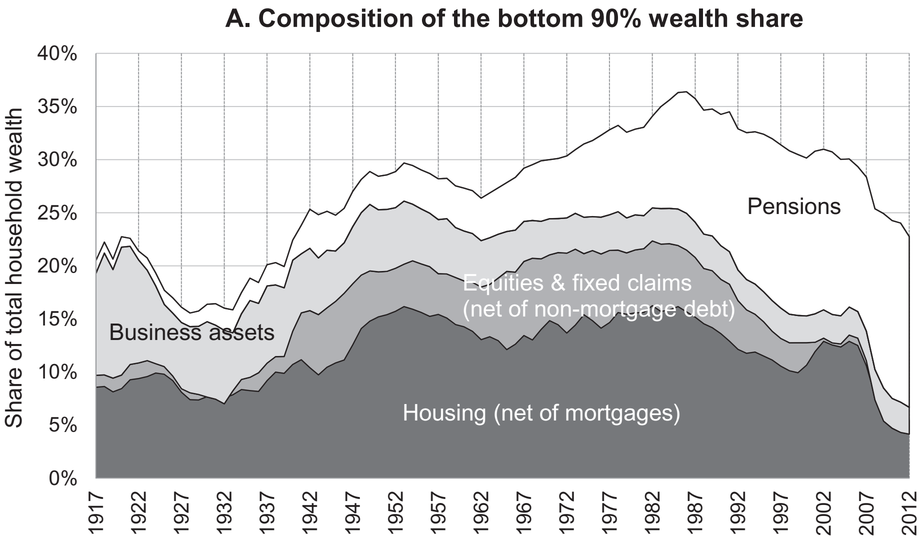


FIGURE VI

Top Wealth Shares in the United States, 1913–2012


A. Composition of the bottom 90% wealth share
Share of total household wealth
40%
35%
30%
25%
20%
15%
10%
5%
0%
1917
1922
1927
1932
1937
1942
1947
1952
1957
1962
1967
1972
1977
1982
1987
1992
1997
2002
2007
2012
Pensions
Equities & fixed claims
(net of non-mortgage debt)
Business assets
Housing (net of mortgages)

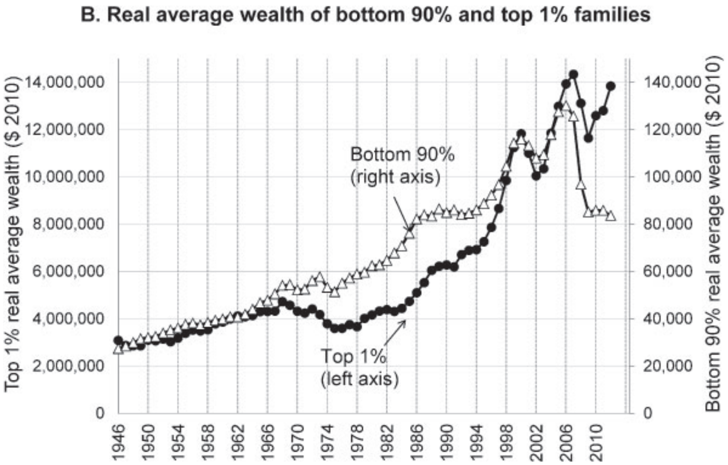
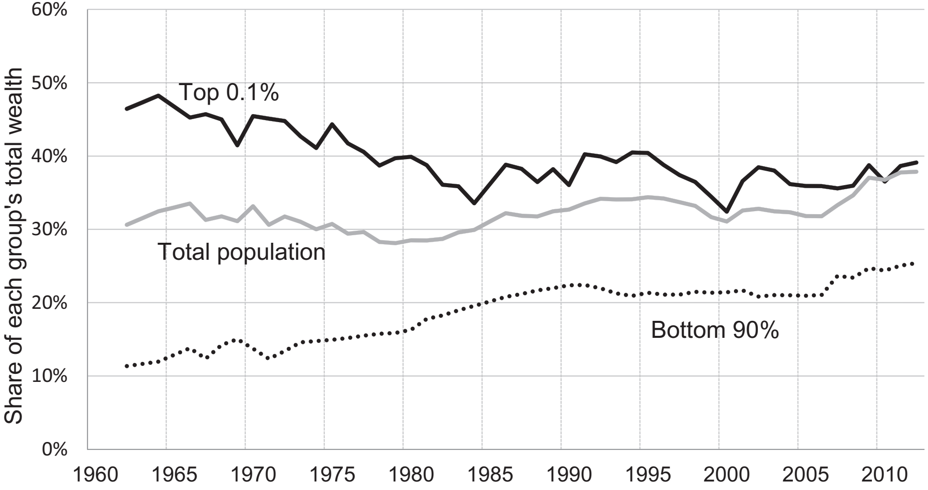


FIGURE VII

Wealth of the Bottom 90% of the Distribution

A. Share of wealth held by elderly households (aged 65+)



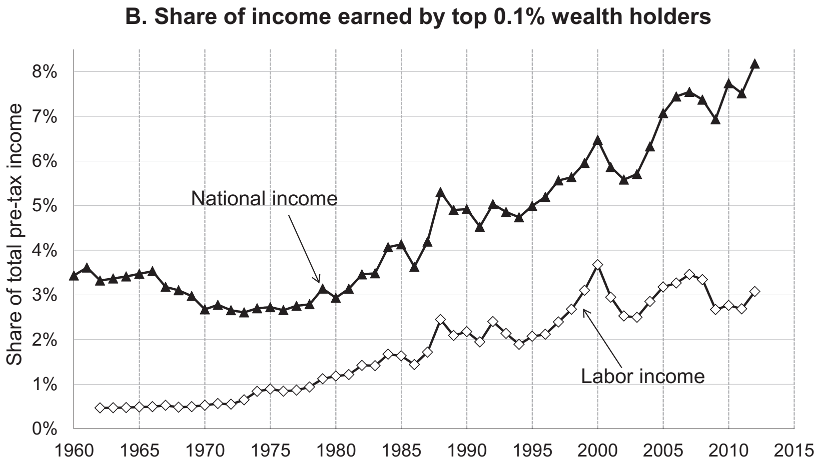
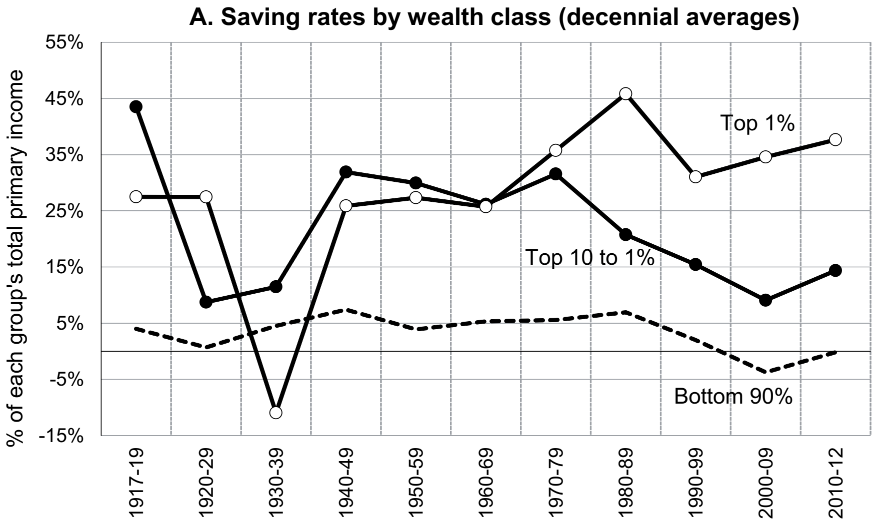


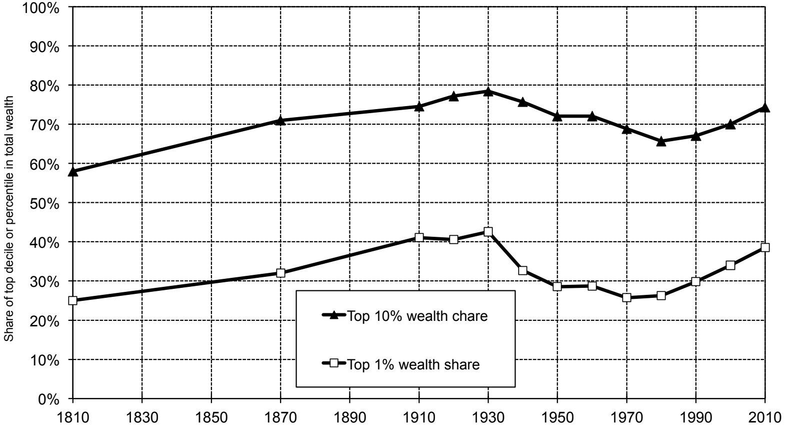
FIGURE VIII

Elderly Wealth and Income Shares of Top 0.1% Wealth Holders



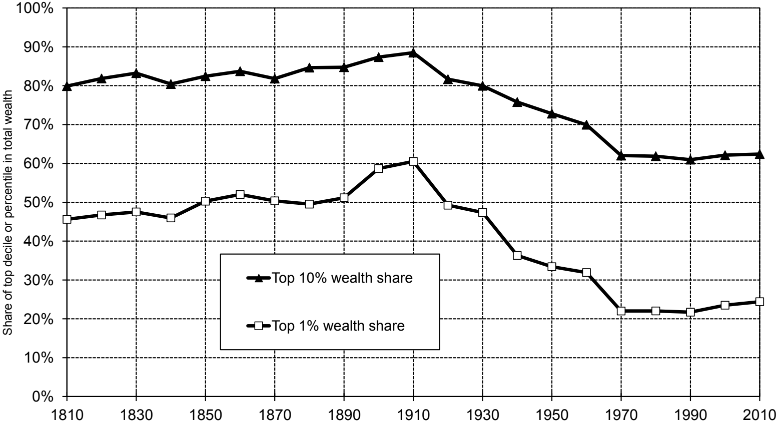
A. Saving rates by wealth class (decennial averages)
% of each group's total primary income
55%
45%
35%
25%
15%
5%
-5%
-15%
1917-19
1920-29
1930-39
1940-49
1950-59
1960-69
1970-79
1980-89
1990-99
2000-09
2010-12
Top 1%
Top 10 to 1%
Bottom 90%

Figure 3.5. Wealth inequality in the U.S., 1810-2010



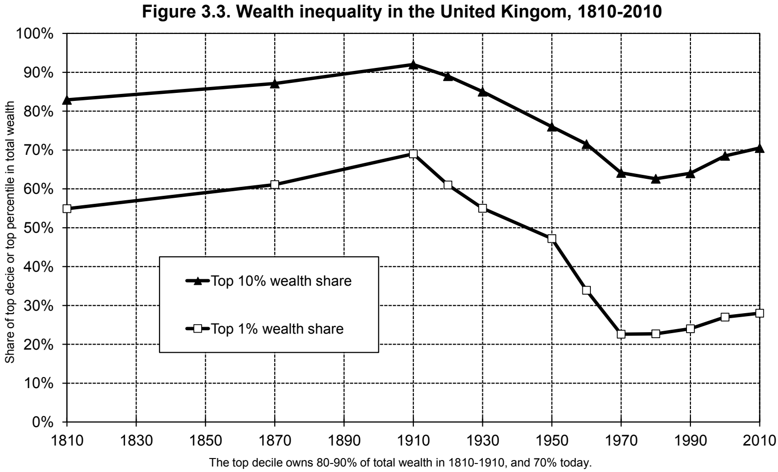
The top 10% wealth holders own about 80% of total wealth in 1929, and 75% today.

Figure 3.1. Wealth inequality in France, 1810-2010



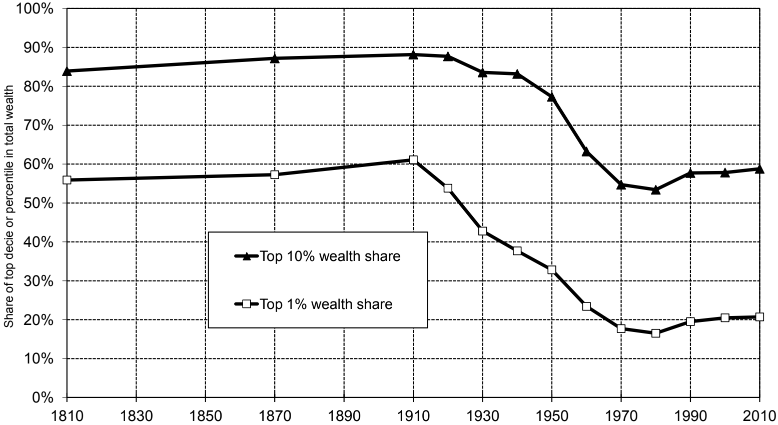
The top decile (the top 10% highest wealth holders) owns 80-90% of total wealth in 1810-1910, and 60-65% today.

Source: Piketty and Zucman '14, handbook chapter



Source: Piketty and Zucman '14, handbook chapter

Figure 3.4. Wealth inequality in Sweden, 1810-2010



The top 10% holds 80-90% of total wealth in 1810-1910, and 55-60% today.

Source: Piketty and Zucman '14, handbook chapter

CAPITAL TAXATION IN THE US

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

1) **Corporate Income Tax** (fed+state): 35% 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 \$5.5M exemption (only .1% of deceased liable), tax rate is 40% above exemption (2013+)

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 α 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 $\downarrow$ in 20th century but has $\uparrow$ 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 $\Rightarrow$ If $n+g$ (growth) large relative to r (rate of return on wealth) $\Rightarrow$ 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)

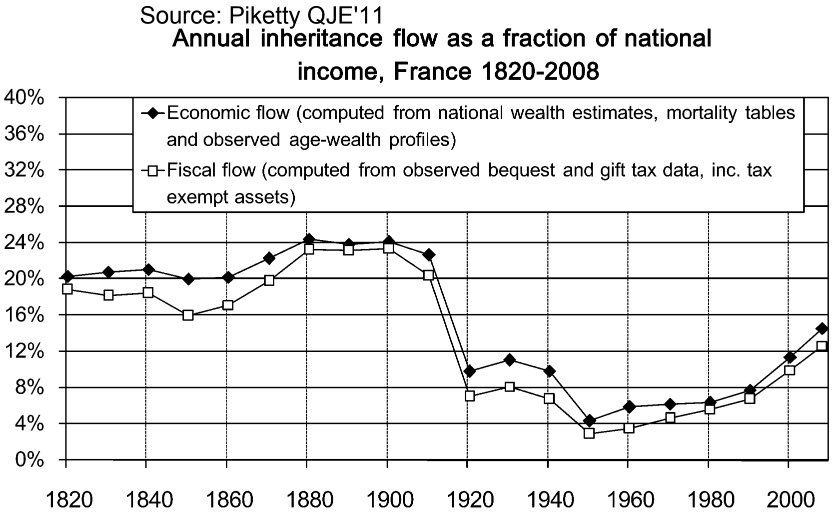
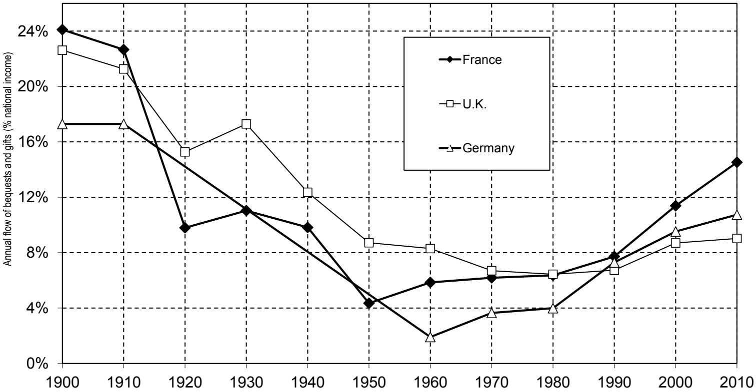


FIGURE I

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

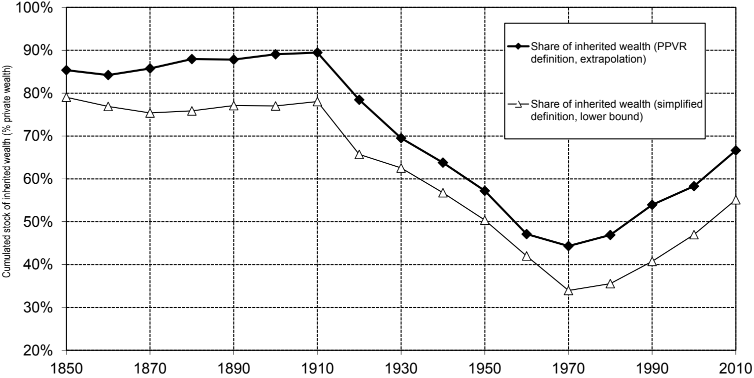
Figure 4.5. The inheritance flow in Europe 1900-2010



The inheritance flow follows a U-shaped in curve in France as well as in the U.K. and Germany. It is possible that gifts are under-estimated in the U.K. at the end of the period.

Source: Piketty and Zucman '14, handbook chapter

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

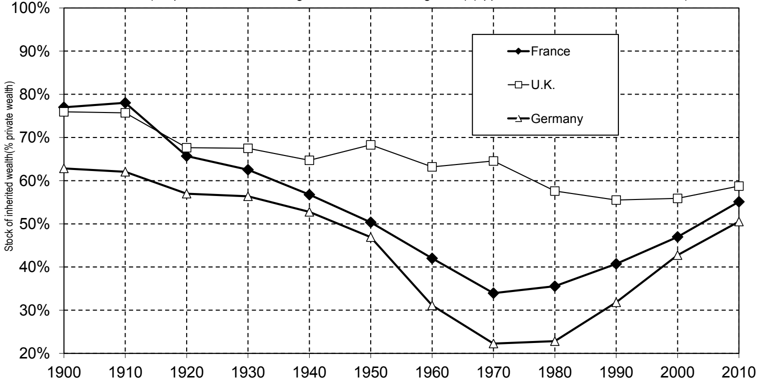


Inherited wealth represents 80-90% of total wealth in France in the 19th century; this share fell to 40%-50% during the 20th century, and is back to about 60-70% in the early 21st century.

Source: Piketty and Zucman '14, handbook chapter

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.

Source: Piketty and Zucman '14, handbook chapter

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

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:

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

Budget with labor income tax τ_L:

$$c_1 + c_2/(1 + r) \leq (1 - \tau_L)[w_1 l_1 + w_2 l_2/(1 + r)]$$

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 τ_K:

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

τ_K distorts only inter-temporal consumption choice

Budget with comprehensive income tax τ:

$$c_1 + c_2/(1 + r(1 - \tau)) \leq (1 - \tau)[w_1 l_1 + w_2 l_2/(1 + r(1 - \tau))]$$

τ distorts both labor-leisure and inter-temporal consumption choices

τ 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 $l_1 = 1$

$(1 + t_c)[c_1 + c_2/(1 + r)] = w_1$ 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 τ_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 τ_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:

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

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

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:

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

where g is exogenous tax revenue requirement

Can apply the results from the 3 good Ramsey model

Derive FOC for τ_K and τ_L

Can express them in terms of compensated elasticities

RAMSEY CAPITAL INCOME TAX

Combining the two FOC to get rid of λ, 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 $\sigma_{LL} << |\sigma_{22}|$ then τ_K should be small relative to τ_L

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

FELDSTEIN JPE'78

Feldstein JPE'78 makes famous theoretical argument why σ_{22} can be large even if $\varepsilon^u_{sq} = (q/s)\partial s/\partial q$ [uncompensated savings elasticity] is zero:
Budget $c_1 + qc_2 = w(1-\tau_L)l + y$

Slutsky equation [y is endowment =0 in equilibrium]:
$\partial c^c_2/\partial q = \partial c_2/\partial q + c_2 \partial c_2/\partial y \Rightarrow$

$\sigma_{22} = \varepsilon^u_{2q} + q\partial c_2/\partial y$

$c_2 = s/q$ so $\varepsilon^u_{2q} = (q/c_2)\partial c_2/\partial q = \varepsilon^u_{sq} - 1 \Rightarrow$

$\sigma_{22} = \varepsilon^u_{sq} - 1 + q\partial c_2/\partial y$

$c_1 + qc_2 = w(1-\tau_L)l + y \Rightarrow$
$\partial c_1/\partial y + q\partial c_2/\partial y = w(1-\tau_L)\partial l/\partial y + 1 \simeq 1$ (small income effects on labor supply)

$\sigma_{22} \simeq \varepsilon^u_{sq} - \partial c_1/\partial y \simeq -\partial c_1/\partial y \leq -0.75$ [as saving rate modest]

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 τ_K, τ_L given by same static Ramsey rule

Problems of dynamic efficiency (optimal K stock) and efficiency within a generation (τ_L, τ_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 τ_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.

Stop here: need to study a very important result:
Atkinson-Stiglitz theorem

ATKINSON-STIGLITZ THEOREM

Famous Atkinson-Stiglitz JpubE' 76 shows that

$$\max_{t,T(.)} SWF = \max_{t=0,T(.)} SWF$$

(i.e, commodity taxes not useful) under two assumptions on utility functions $u^h(c_1, .., c_K, z)$

1) Weak separability between $(c_1, .., c_K)$ and z in utility

2) Homogeneity across individuals in the sub-utility of consumption $v(c_1, .., c_K)$ [does not vary with h]

$$\text{(1) and (2):} \quad u^h(c_1, .., c_K, z) = U^h(v(c_1, .., c_K), z)$$

Original proof was based on optimum conditions, new straightforward proof by Laroque EL '05, and Kaplow JpubE '06.

ATKINSON-STIGLITZ THEOREM PROOF

Let $V(y, p+t) = \max_c v(c_1, .., c_K)$ st $(p+t) \cdot c \leq y$ be the indirect utility of consumption c [common to all individuals]

Start with $(T(.), t)$. Let $c(t)$ be consumer choice.

Replace $(T(.), t)$ with $(\bar{T}(.), t = 0)$ where $\bar{T}(z)$ such that $V(z - T(z), p + t) = V(z - \bar{T}(z), p) \Rightarrow$ Utility $U^h(V, z)$ and labor supply choices z unchanged for all individuals.

Attaining $V(z - \bar{T}(z), p)$ at price p costs at least $z - \bar{T}(z)$

Consumer also attains $V(z - \bar{T}(z), p) = V(z - T(z), p + t)$ when choosing $c(t) \Rightarrow z - \bar{T}(z) \leq p \cdot c(t) = z - T(z) - t \cdot c(t)$

$\Rightarrow \bar{T}(z) \geq T(z) + t \cdot c(t)$: the government collects more taxes with $(\bar{T}(.), t = 0)$

ATKINSON-STIGLITZ INTUITION

With separability and homogeneity, conditional on earnings z, consumption choices $c = (c_1, .., c_K)$ do not provide any information on ability

$\Rightarrow$ Differentiated commodity taxes $t_1, .., t_K$ create a tax distortion with no benefit $\Rightarrow$ Better to do all the redistribution with the individual income tax

Note: With weaker linear income taxation tool (Diamond-Mirrlees AER '71, Diamond JpubE '75), need $v(c_1, .., c_K)$ homothetic (linear Engel curves, Deaton EMA '81) to obtain no commodity tax result

[Unless Engel curves are linear, commodity taxation can be useful to "non-linearize" the tax system]

Generalization of Atkinson-Stiglitz to Heterogeneous Tastes – Saez (2002)

Can we generalize AS to case with heterogeneous consumption preferences?

Individuals indexed by h, utility $U(c, z)$ with $c = (c_1, ..., c_K)$.

Nonlinear income tax $T(z)$.

Pre-tax prices: p, post-tax price: $q = p + t$.

Budget constraint $q \cdot c \leq z - T(z)$.

Demands: $c^h(q, R, z)$, labor supply $z^h(q, T)$, indirect utility $v^h(q, R, z)$.

Suppose that $T(z)$ is optimally chosen at zero commodity taxation $p = q$ to max

$$W = \sum_h \alpha^h v^h(p, z^h - T(z^h), z^h) \quad \text{s.t.} \quad \sum_h T(z^h) \geq E$$

Marginal social welfare weight $g^h = \alpha^h v_R^h / \lambda$.

Can commodity taxation improve welfare?

Imagine dt_1.

Mechanical revenue effect: $dM_1 = \sum_h c_1^h dt_1 = C_1 dt_1$.

Welfare effect (envelope theorem): $dU_1 = -\sum_h g^h c_1^h dt_1$.

Behavioral labor supply response: $dB_1 = -\sum_h T'(z^h) dz_{t_1}^h$ with $dz_{t_1}^h = dt_1 \frac{\partial z^h}{\partial q_1}$.

Why no behavioral response on revenue from changes in consumption?

If no commodity tax introduction can increase welfare, need $dW = dM_1 + dU_1 + dB_1 = 0$.

Can commodity taxation improve welfare? (II)

Find a small income tax reform that "mimics" commodity tax change: $dT(z) = C_1(z)dt_1$.

This reform has zero first order welfare impact, why?

Mechanical Revenue effect:
$dM_T = \sum_h dT(z^h) = \sum_h C_1(z^h)dt_1 = C_1 dt_1 = dM_1$ (why?)

Welfare effect: $dU_T = -\sum_h g^h C_1(z^h)dt_1$

Behavioral effect: $dB_t = -\sum_h T'(z^h)dz_T^h$.

Subtract one from other (using that $dW_T = 0$).

Can commodity taxation improve welfare? (III)

$$\frac{dW}{dt_1} = \underbrace{-\sum_h g^h[c_1^h - C_1(z^h)]}_{\text{Pure Welfare Effect}} + \underbrace{\sum_h T'(z^h)\left[\frac{dz_T^h}{dT(z^h)}\cdot\frac{dT(z^h)}{dt_1} - \frac{dz_1^h}{dt_1}\right]}_{\text{Behavioral Effect}}$$

- Pure welfare effect is zero if conditional on z, g^h and c^h are uncorrelated.
- What does this mean? Is this reasonable? (recall weights are "generalized" since α^h depends on h directly).
- Young/old? medical expenses?
- Always satisfied in "standard AS" assumptions.

Behavioral Effects under Commodity and Income Taxation

Since $T'(z^h) \geq 0$ (remember), increasing $dt_1 > 0$ more efficient than equivalent income tax increase if labor supply increase from commodity tax change larger than that of income tax change.

When is this the case? Can show that:

$$E[dz^h_{t_1}] = -dt_1 \left(\mathbb{E}\left[\frac{z^h_c}{1 + T''(z) z^h_c} \frac{dc^h_1}{dz} \right] + \mathbb{E}\left[\frac{z^h_R}{1 + T''(z) z^h_c} c^h_1 \right] \right)$$

$$E[dz^h_T] = -dt_1 \left(\mathbb{E}\left[\frac{z^h_c}{1 + T''(z) z^h_c} \right] \frac{dC_1(z)}{dz} + \mathbb{E}\left[\frac{z^h_R}{1 + T''(z) z^h_c} \right] C_1(z) \right)$$

Need $E[dz^h_{t_1}] = E[dz^h_T]$ for no commodity taxation.

Assumptions needed for behavioral effects to be the same under Commodity and Income Taxation

Assumption 2: Conditional on z, behavioral responses z_c^h and z_R^h independent of consumption patterns c_1^h and $\frac{dc_1^h}{dz}$.

Do you think this holds?

Assumption 3: For any income level, $E\left(\frac{dc_1^h}{dz}|z^h = z\right) = \frac{dC_1(z)}{dz}$.

This is the *key* assumption. What does it say? Why is this not mechanically true?

$\frac{dC_1(z)}{dz} = \lim_{dz \to 0} \frac{E(c_1^h|z^h = z + dz) - E(c_1^h|z^h = z)}{dz}$ is cross-sectional variation in consumption of good 1 when income changes.

What is $E\left(\frac{dc_1^h}{dz}|z^h = z\right)$?

Assumptions needed for behavioral effects to be the same under Commodity and Income Taxation

Imagine 2 groups:

Group A: $z^h = z$. consume $C_1(z)$ on average.

Group B: $z^h = z - dz$. Consumes on average $dc_1 = \frac{dC_1(z)}{dz}$ less of good 1.

Group A': Individuals from group A who are *forced* to reduce their income to $z - dz$. Reduce their consumption relative to group A by $dc_1' = E\left(\frac{dc_1^h}{dz}|z^h = z\right) dz$.

Assumption 3 says: Group B = Group A' for consumption of good 1.

Always true in AS since consumption only depends on after tax income with separability $C_1(z) = c_1^h(z)$.

Why would Group A' not have same consumption of good 1 as Group B?

WHEN ATKINSON-STIGLITZ ASSUMPTIONS FAIL

Thought experiment we just did was: force high earners to work less and earn only as much as low earners: if high earners consume more of good k than low earners, taxing good 1 is desirable.

1) High earners are "different" (since if left to chose, chose to work more. If they have a relatively higher/lower taste for good 1 (independently of income), tax more/less good 1. [indirect tagging] Cigarettes? Fancy wine? How would you see this empirically?

2) High earners now have more leisure. If Good 1 positively related to leisure (consumption of 1 increases when leisure increases keeping after-tax income constant), tax it! [tax on holiday trips, subsidy on work related expenses such as child care]

In general Atkison-Stiglitz assumption is a good starting place for most goods $\Rightarrow$ Zero-rating on some goods under VAT for redistribution is inefficient and administratively burdensome [Mirrlees review]

Life-Cycle model: Atkinson-Stiglitz JpubE '76

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

$V^h = \max U^h(v(c_1, c_2), l)$ 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

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).

Life-cycle model: linear labor income tax

Suppose the government can only use linear earnings tax: $wl \cdot (1 - \tau_L) + E$

If sub-utility $v(c_1, c_2)$ is also homothetic of degree one [i.e., $v(\lambda c_1, \lambda c_2) = \lambda v(c_1, c_2)$ for all λ] then $\tau_K = 0$ is again optimal [linear tax counter-part of Atkinson-Stiglitz, see Deaton, 1979]

In the general case $V^h(c_1, c_2, l)$, optimal τ_K is not always zero

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

$\Rightarrow$ 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 $\Rightarrow$ 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

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+)

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 Mturk 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.

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 lumpsum 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

Bequests in the Utility: Warm Glow Or Altruistic

$u(c) - h(l) + \delta v(b)$ where c is own consumption, l is labor supply, and b is net-of-tax bequests left to next generation and $v(b)$ is warm glow utility of bequests

Budget with no estate tax: $c + b/(1 + r) = wl - T_L(wl)$

Budget with bequest tax at rate τ_B: $c + b/[(1 + r)(1 - \tau_B)] = wl - T_L(wl)$

Suppose first that b is not bequeathed but used for "after-life" consumption [e.g., funerary monument of no value to next generation]

$\Rightarrow$ Atkinson-Stiglitz implies that b should not be taxed $[\tau_B = 0]$ and that nonlinear tax on wl is enough for redistribution

Bequests in the Utility: Warm Glow Or Altruistic

Suppose now that b is given to a heir who derives utility $v^{heir}(b) \Rightarrow b$ creates a positive externality (to donee) and hence should be subsidized $\Rightarrow$ $\tau_B < 0$ is optimal

Kaplow '01 makes this point informally

Farhi-Werning QJE'10 develop formal model of non-linear Pigouvian subsidization of bequests with 2 generations and social Welfare:

$$SWF = \int [u(c) - h(l) + \delta v(b) + v^{heir}(b)] f(w) dw$$

The marginal external effect of bequests is dv^{heir}/db and hence should be smaller for large b

$\Rightarrow$ Optimal subsidy rate is smaller for large estates $\Rightarrow$ progressive estate subsidy

A-S Fails with Inheritances In General Equilibrium (Piketty-Saez ECMA'13)

Atkinson-Stiglitz applies when sole source of lifetime income is labor:

$$c + b(\textit{left})/(1+r) = wl - T(wl) \quad (w = \text{productivity}, \, l = \text{labor supply})$$

In GE, bequests provide an additional source of life-income:

$$c + b(\textit{left})/(1+r) = wl - T(wl) + b(\textit{received})$$

$\Rightarrow$ conditional on wl, high $b(\textit{left})$ is a signal of high $b(\textit{received})$ $\Rightarrow$ $b(\textit{left})$ should be taxed even with optimal $T(wl)$

$\Rightarrow$ Two-dim. inequality requires two-dim. tax policy tool

Extreme example: no heterogeneity in productivity w but pure heterogeneity in bequests motives $\Rightarrow$ bequest taxation is desirable for redistribution

Piketty-Saez Simplified Optimal Inheritance Tax Model

Measure one of individuals, who are both bequests receivers and bequest leavers (in ergodic general equilibrium)

Linear tax τ_B on bequests funds lumsump grant E

Life-time budget constraint: $c_i + b_i = R(1 - \tau_B) b_i^r + y_{Li} + E$

with c_i consumption, b_i bequests left, y_{Li} inelastic labor income, b_i^r pre-tax bequests received, $R = 1 + r$ generational rate of return on bequests

Individual i has utility $V^i(c, \underline{b})$ with $\underline{b} = R(1 - \tau_B) b$ net-of-tax bequests left and solves

$$\max_{b_i} V^i(y_{Li} + E + R(1 - \tau_B) b_i^r - b_i, R b_i (1 - \tau_B)) \Rightarrow V_c^i = R(1 - \tau_B) V_{\underline{b}}^i$$

Piketty-Saez ECMA'13 Optimal Inheritance Tax

Government budget constraint is $E = \tau_B b$ with b aggregate (=average) bequests. Govt solves:

$$\max_{\tau_B} \int_i \omega_i V^i(y_{Li} + \tau_B b + R(1-\tau_B) b_i^r - b_i, R b_i (1-\tau_B))$$

with $\omega_i \geq 0$ Pareto weights

Meritocratic Rawlsian criterion: maximize welfare of those receiving no inheritances with uniform social marginal welfare weight $\omega_i V_c^i$ among zero-receivers

(e.g., people not responsible for b_i^r but responsible for y_{Li}) $\Rightarrow$

$$\textbf{Optimal inheritance tax rate: } \tau_B = \frac{1-\bar{b}}{1+e_B}$$

with $e_B = \frac{1-\tau_B}{b} \frac{db}{d(1-\tau_B)}$ elasticity of aggregate bequests and $\bar{b} = \frac{E[b_i | b_i^r = 0]}{b}$ relative bequest left by zero-receivers

Piketty-Saez ECMA'13 Optimal Inheritance Tax: Proof

$$SWF = \int_i \omega_i V^i(y_{Li} + \tau_B b - b_i, Rb_i(1-\tau_B))$$

[NB: removed term $R(1-\tau_B)b_i^r$ because $\omega_i = 0$ when $b_i^r = 0$]

$$0 = \frac{dSWF}{d\tau_B} = \int_i \omega_i \cdot \left(V_c^i \left[b - \tau_B \frac{db}{d(1-\tau_B)} \right] - Rb_i V_{\underline{b}}^i \right) \Rightarrow$$

$$0 = \int_i \omega_i \cdot \left(V_c^i \cdot b \left[1 - \frac{\tau_B}{1-\tau_B} e_B \right] - \frac{b_i}{1-\tau_B} V_c^i \right) \Rightarrow$$

$$0 = b \left[1 - \frac{\tau_B}{1-\tau_B} e_B \right] - \frac{1}{1-\tau_B} \cdot \frac{\int_i \omega_i V_c^i \cdot b_i}{\int_i \omega_i V_c^i} \Rightarrow$$

as $\omega_i V_c^i \equiv 0$ for $b_i^r > 0$ and $\omega_i V_c^i \equiv 1$ for $b_i^r = 0 \Rightarrow$

$$0 = 1 - \tau_B - \tau_B \cdot e_B - \frac{E[b_i | b_i^r = 0]}{b} \Rightarrow \tau_B = \frac{1 - \bar{b}}{1 + e_B}$$

Piketty-Saez ECMA'13 Optimal Inheritance Tax

Optimal inheritance tax rate: $\tau_B = \dfrac{1-\bar{b}}{1+e_B}$

1) Optimal $\tau_B < 1/(1+e_B)$ revenue maximizing rate because zero-receivers care about bequests they leave

2) $\tau_B = 0$ if $\bar{b} = 1$ (i.e, zero-receivers leave as much bequest as average)

3) If bequests are quantitatively important, highly concentrated, and low wealth mobility then $\bar{b} << 1$

4) Empirically e_B small (Kopcuzk-Slemrod '01) but poorly known, $\bar{b} = 2/3$ in US (SCF data) but poorly measured

5) Formula can be extended to other social criteria, elastic labor supply, wealth loving preferences, altruistic preferences [see Piketty-Saez ECMA'13]

Optimal Capital Stock and Modified Golden Rule

Modified Golden Rule: $r = \delta + \gamma \cdot g$
with $r = F_K(K, L) = f'(k)$ rate of return, δ discount rate, γ curvature of $u'(c) = c^{-\gamma}$, g growth rate (per capita).

Proof: \$1 extra in period t gives social welfare $u'(c_t)$

\$$1 + r$ extra in period $t + 1$ gives social welfare
$\frac{(1+r)u'(c_{t+1})}{1+\delta} = \frac{(1+r)u'(c_t)}{1+\delta}\frac{u'(c_{t+1})}{u'(c_t)} = \frac{1+r}{(1+\delta)(1+g)^{\gamma}}u'(c_t) \Rightarrow$
$1 + r = (1 + \delta)(1 + g)^{\gamma}$

This is equivalent to $r = \delta + \gamma \cdot g$ when the period is small. QED.

Normatively $\delta = 0$ seems justified. Small capital stock and $r > g$ desirable if γ is high [controversy Stern vs. Nordhaus]

Optimal Capital Stock and Modified Golden Rule

Modified Golden Rule: $r = \delta + \gamma \cdot g$

Bequest and capital taxes affect capital stock

However, if govt can use debt, it can control capital stock

If debt used to set optimal capital stock at the Modified Golden Rule) then effects of taxes on K stock can be ignored $\Rightarrow$ Optimal K stock and optimal redistribution are **orthogonal**

If K stock is not at Modified Golden Rule, then optimal K tax formulas include a corrective term

[see King 1980 and Atkinson-Sandmo 1980 in OLG life-cycle model, Piketty-Saez ECMA'13 for models with bequests]

In practice: no reason for MGR to hold, govts do not actively target K stock

MANIPULATIVE BEQUESTS

Parents use potential bequest to extract favors from children

Empirical Evidence: Bernheim-Shleifer-Summers JPE '85 show that number of visits of children to parents is correlated with bequeathable wealth but not annuitized wealth of parents

$\Rightarrow$ Bequest becomes one additional form of labor income for donee and one consumption good for donor

$\Rightarrow$ Inheritances should be counted and taxed as labor income for donees

SOCIAL-FAMILY PRESSURE BEQUESTS

Parents may not want to leave bequests but feel compelled to by pressure of heirs or society: bargaining between parents and children

With estate tax, parents do not feel like they need to give as much $\Rightarrow$ parents are made better-off by the estate tax $\Rightarrow$ Case for estate taxation stronger [Atkinson-Stiglitz does not apply and no double counting of bequests]

Empirical evidence:

Aura JpubE'05: reform of private pension annuities in the US in 1984 requiring both spouses signatures when retiring worker decides to get a single annuity or couple annuity: reform $\uparrow$ sharply couple annuities choice

Equal division of estates [Wilhelm AER'96, Light-McGarry '04]: estates are very often divided equally but gifts are not

DYNASTIC MODEL OR INFINITE HORIZON

Special case of warm glow: $V_t = u(c_t, l_t) + V_{t+1}/(1+\delta)$ implies

$$V_0 = \sum_{t \geq 0} u(c_t, l_t)/(1+\delta)^t$$

$$\text{subject to } \sum_{t \geq 0} c_t/(1+r)^t \leq \sum_{t \geq 0} w_t l_t/(1+r)^t$$

Dynasty with **Ricardian equivalence:** consumption depends only on PDV of earnings of dynasty

Poor empirical fit:

1) Altonji-Hayashi-Kotlikoff AER'92, JPE'97 show that income shocks to parents have bigger effect on parents consumption than on kids consumption (and conversely)

2) Temporary tax cut debt financed [fiscal stimulus] should have no impact on consumption but actually do

INFINITE HORIZON MODEL: CHAMLEY-JUDD

Govt can collect taxes using linear labor income tax or capital income taxes that vary period by period τ_L^t, τ_K^t

Goal of the government is to maximize utility of the dynasty

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

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

With constant tax rate τ_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 τ_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 lumpsum 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]

5) Introducing stochastic shocks in labor/preferences in dynastic model leads to finite elasticities (and reasonable optimal tax rates) [Piketty-Saez ECMA'13]

The Need for a Simpler Model for Optimal Capital Taxation

1) Public debate centers around a **simple equity-efficiency tradeoff**:

Is the distribution of capital fair? How does capital react to taxation?

2) Econ literature: disparate models and results (individual preferences, shocks, govt objective, policy tools)

Connect 1) and 2) by deriving robust optimal capital tax formulas in terms of estimable elasticities and distributional parameters

$\Rightarrow$ optimal K tax theory looks like optimal L tax theory.

Centered around equity-efficiency trade-off.

Highlights main forces + policy implications for K tax (often obscured).

Goals and Contributions

1) Start with dynamic model with linear utility for consumption and concave utility for wealth.

$\Rightarrow$ Transitional dynamics instantaneous $\Rightarrow$ Simple, tractable theory.

Put simplicity to use: new formulas for policy-relevant cases (nonlinear tax, cross-effects, shifting, consumption tax, ..) and normative considerations.

2) Generalize to model with concave utility $\Rightarrow$ Same optimal K tax formulas apply, with *appropriately defined elasticity of the tax base.*

Qualitatively: Lessons and intuitions from simpler model still valid.

Quantitatively: Sluggish adjustments reflected in elasticity.

The faster K adjustments, the closer to simpler model.

3) Numerically explore optimal taxation using U.S. IRS data.

A Simpler Model of Capital Taxation

For exposition: Exogenous and uniform labor income z

Heterogeneous discount rate δ_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:

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

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

Solving the Individual's Maximization Problem

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

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

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

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

$$\text{FOC in } k_i(t): \quad a_i'(k_i(t)) + \lambda_i(t) \cdot r \cdot (1 - T_K') = -\frac{d\lambda_i(t)}{dt} + \delta_i \cdot \lambda_i(t)$$

$$\Rightarrow a_i'(k_i(t)) = \delta_i - \bar{r} \quad \text{where} \quad \bar{r} = r \cdot (1 - T_K')$$

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 the 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: Elasticitiy $e_K = (\bar{r}/k) \cdot (dk/d\bar{r})$ 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 τ_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.

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

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

Standard optimal tax derivation (using envelope thm 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 τ_K such that $dSWF / d\tau_K = 0$.

Optimal Linear Capital Tax τ_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.

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) $\bar{G}_K(rk) \equiv \frac{\int_{\{i:rk_i \geq rk\}} g_i d_i}{P(rk_i \geq rk) \int_i g_i di}$ 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)
$\Rightarrow$ 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

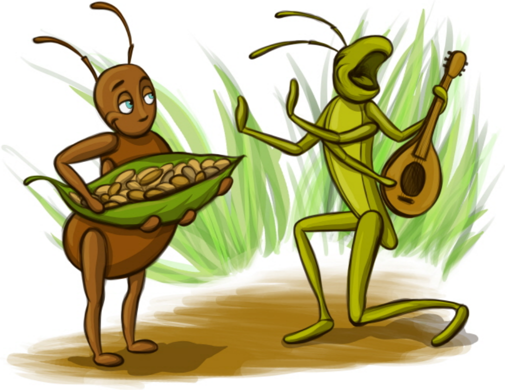
Equity Considerations: The Ant and the Grasshopper

Credit: Adelya Tumasyeva

Equity Considerations: The Ant and the Grasshopper

Credit: Adelya Tumasyeva

Equity Considerations: The Ant and the Grasshopper

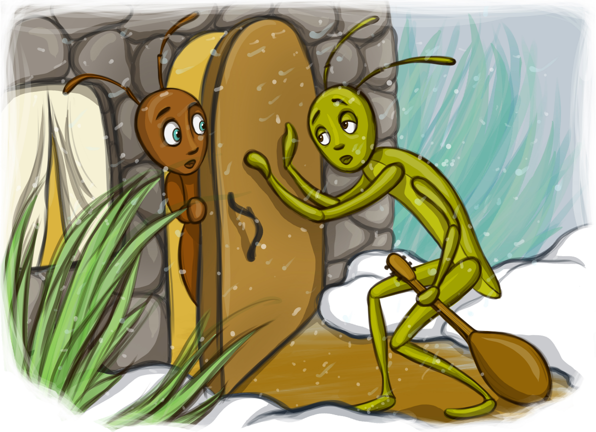


Credit: Adelya Tumasyeva

Equity Considerations: The Ant and the Grasshopper

Credit: Adelya Tumasyeva

Equity Considerations: The Ant and the Grasshopper



Credit: Adelya Tumasyeva

Equity Considerations: The Ant and the Grasshopper

Credit: Adelya Tumasyeva

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 δ_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.

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

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.

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

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) $\bar{G}_L(z) \equiv \frac{\int_{\{i:z_i \geq z\}} g_i d_i}{P(z_i \geq z) \int_i g_i di}$ 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 τ_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

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

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

$\alpha_Y(y)$ 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 $d_i(\underset{+}{x})$

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 τ_L, τ_K closer than they would be absent any shifting

If shifting elasticity is large then e_K can appear large, but wrong to set τ_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 judgement 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 τ_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, τ_C equivalent labor tax + tax on initial wealth (Kaplow, 1994, Auerbach, 2009).

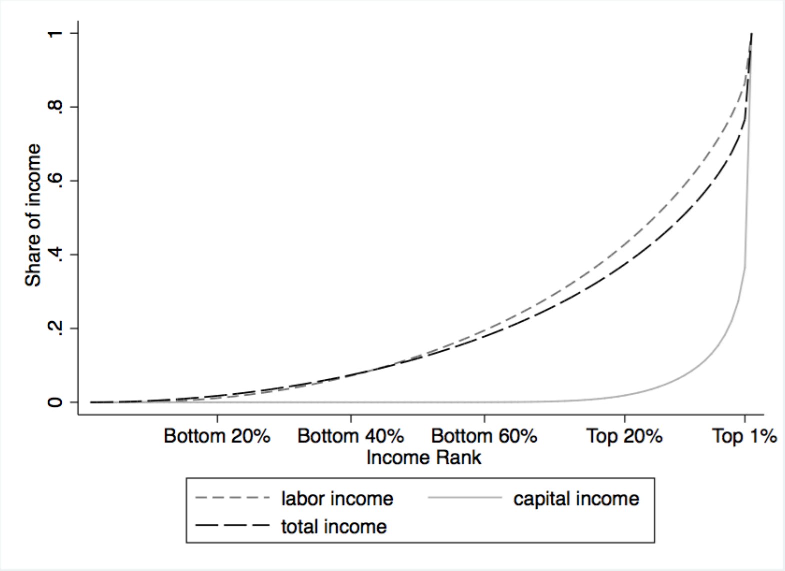
Thought experiment: equal labor income.

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

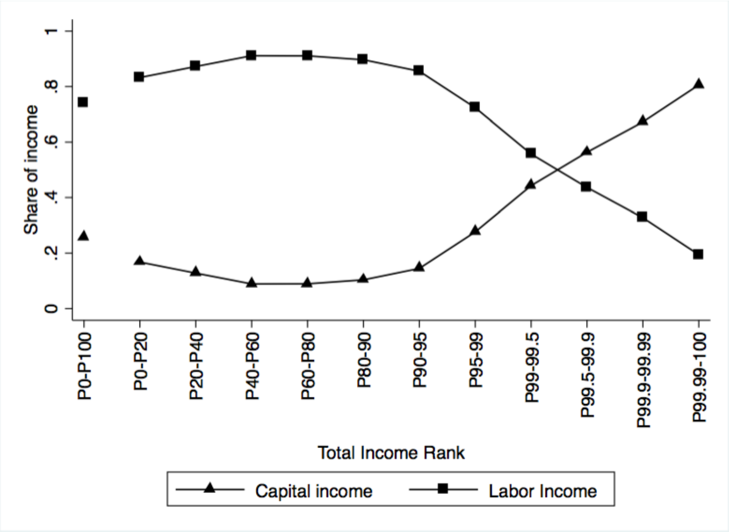
With 2-dim heterogeneity: labor tax not sufficient (Atkinson-Stiglitz).

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

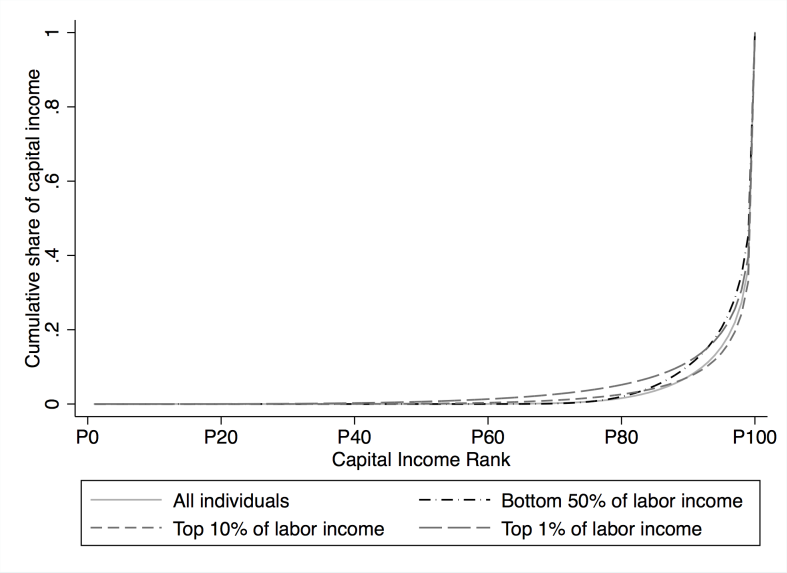
Fact 1: K income more unequally distributed than L income



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



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: (θ_i, η_i).

Based on the IRS micro data, use pairs (z_i, rk_i) to invert individual choices to obtain (θ_i, η_i).

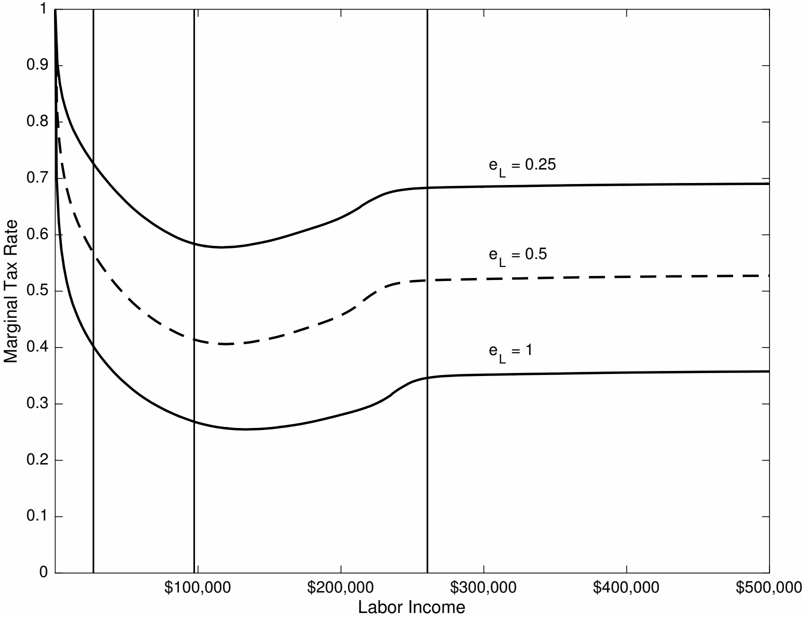
Non-parametrically fit type distributions and empirical Pareto parameters.

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

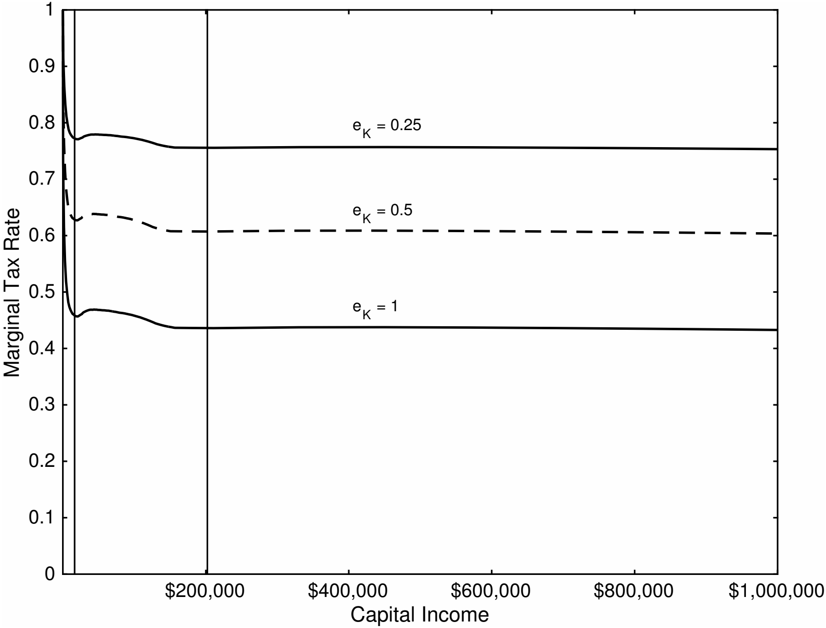
For capital – our simpler theory provides a much easier way to compute optimal tax rates based on the data.

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

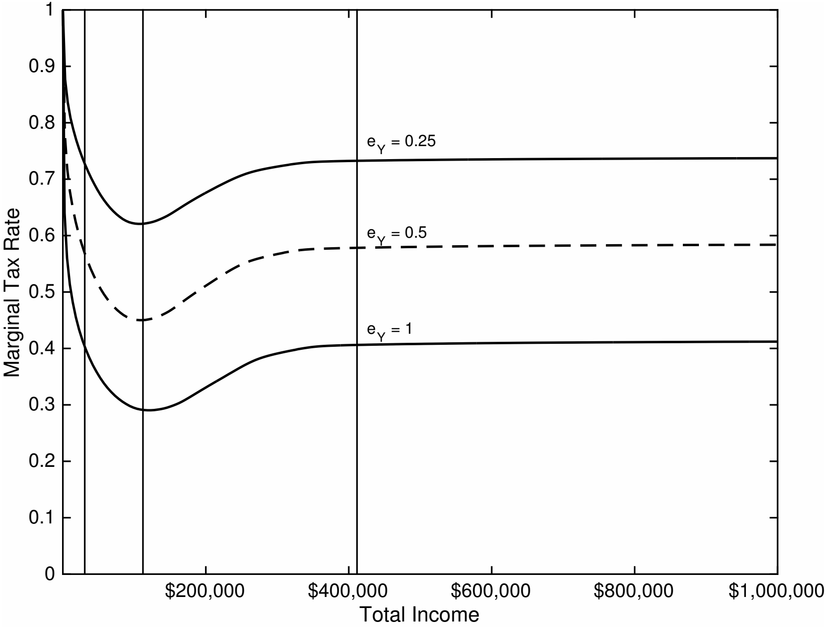
Optimal Labor Income Tax Rate $T'_L(z)$



Optimal Capital Income Tax Rate $T_K'(rk)$



Optimal Tax Rate on Comprehensive Income $T'_Y(y)$



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

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 τ_K and τ_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?

Optimal Linear Capital Tax in the Steady State

Given τ_K and τ_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?

Optimal Linear Capital Tax in the Steady State

Given τ_K and τ_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?

Optimal Linear Capital Tax in the Steady State

Given τ_K and τ_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:

$$\tau_K = \frac{1 - \bar{g}_K - \tau_L \frac{z^m}{k^m} e_{L,1-\tau_K}}{1 - \bar{g}_K + \bar{e}_K} \quad \text{with} \quad \bar{e}_K = \int_i g_i \delta_i \int_0^\infty e_K(t) \cdot e^{-\delta_i t} dt$$

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?

General analysis of reforms

Comparison to standard dynamic objective:
$SWF_d = \int_i \omega_i \cdot V_i(\{c_i(t), k_i(t), z_i(t)\}_{t\geq 0})$

Any reform can be summarized by:

$$e_K^{total} = e_K^{ante} + e_K^{post}$$

Simpler model: $e_K^{total} = e_K$.

Generalized model: $\bar{e}_K = e_K^{total} = e_K^{ante} + e_K^{post}$ (if anticipated),
$\bar{e}_K = e_K^{post}$ if not anticipated.

In every model: difference between primitives vs. reform considered.

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).

REFERENCES

Altonji, J., F. Hayashi, and L. Kotlikoff "Is the Extended Family Altruistically Linked? Direct Tests Using Micro Data", American Economic Review, Vol. 82, 1992, 1177-98. (web)

Altonji, J., F. Hayashi and L. Kotlikoff "Parental Altruism and Inter Vivos Transfers: Theory and Evidence", Journal of Political Economy, Vol. 105, 1997, 1121-66. (web)

Atkinson, A.B. and A. Sandmo "Welfare Implications of the Taxation of Savings", Economic Journal, Vol. 90, 1980, 529-49. (web)

Atkinson, A.B. and J. Stiglitz "The design of tax structure: Direct versus indirect taxation", Journal of Public Economics, Vol. 6, 1976, 55-75. (web)

Atkinson, A.B. and J. Stiglitz Lectures on Public Economics, Chap 14-4 New York: McGraw Hill, 1980. (web)

Auerbach, A. and L. Kotlikoff "Evaluating Fiscal Policy with a Dynamic Simulation Model", American Economic Review, May 1987, 49?55. (web)

Aura, S. "Does the Balance of Power Within a Family Matter? The Case of the Retirement Equity Act", Journal of Public Economics, Vol. 89, 2005, 1699-1717. (web)

Banks J. and P. Diamond "The Base for Direct Taxation", IFS Working Paper, The Mirrlees Review: Reforming the Tax System for the 21st Century, Oxford University Press, 2009. (web)

Bernheim, B. D., A. Shleifer, and L. Summers "The Strategic Bequest Motive", Journal of Political Economy, Vol. 93, 1985, 1045-76. (web)

Carroll, C. "Why Do the Rich Save So Much?", NBER Working Paper No. 6549, 1998. (web)

Chamley, C. "Optimal Taxation of Capital Income in General Equilibrium with Infinite Lives", Econometrica, Vol. 54, 1986, 607-622. (web)

Christiansen, Vidar and Matti Tuomala "On taxing capital income with income shifting", International Tax and Public Finance, Vol. 15, 2008, 527-545. (web)

Cremer, H. and F. Gahvari "Uncertainty and Optimal Taxation: In defense of Commodity Taxes", Journal of Public Economics, Vol. 56, 1995, 291-310. (web)

Davies, J. and A. Shorrocks, Chapter 11 The distribution of wealth, In: Anthony B. Atkinson and Francois Bourguignon, Editor(s), Handbook of Income Distribution, Elsevier, 2000, Vol. 1, 605-675. (web)

DeLong, J.B. “Bequests: An Historical Perspective,” in A. Munnell, ed., *The Role and Impact of Gifts and Estates*, Brookings Institution, 2003 (web)

Diamond, P. and J. Mirrlees “A Model of Social Insurance with Variable Retirement”, Journal of Public Economics, Vol. 10, 1978, 295-336. (web)

Diamond, Peter and Emmanuel Saez “The Case for a Progressive Tax: From Basic Research to Policy Recommendations”, Journal of Economic Perspectives, 25(4), Fall 2011, 165-190. (web)

Diamond, P. and J. Spinnewijn “Capital Income Taxes with Heterogeneous Discount Rates”, NBER Working Paper, No. 15115, 2009. (web)

Feldstein, M. “The Welfare Cost of Capital Income Taxation”, Journal of Political Economy, Vol. 86, 1978, 29-52. (web)

Finkelstein A. and J. Poterba, “Adverse Selection in Insurance Markets: Policyholder Evidence from the U.K. Annuity Market”, Journal of Political Economy, Vol. 112, 2004, 183-208. (web)

Finkelstein A. and J. Poterba, “Selection Effects in the United Kingdom Individual Annuities Market”, The Economic Journal, Vol. 112, 2002, 28-50. (web)

Gale, William G. and John Karl Scholz, "Intergenerational Transfers and the Accumulation of Wealth", Journal of Economic Perspectives, Vol. 8(4), 1994 145-160. (web)

Gordon, R.H. and J. Slemrod "Are "Real" Responses to Taxes Simply Income Shifting Between Corporate and Personal Tax Bases?," NBER Working Paper, No. 6576, 1998. (web)

Holtz-Eakin, D., D. Joulfaian and H.S. Rosen "The Carnegie Conjecture: Some Empirical Evidence", Quarterly Journal of Economics Vol. 108, May 1993, pp.288-307. (web)

Judd, K. "Redistributive Taxation in a Simple Perfect Foresight Model", Journal of Public Economics, Vol. 28, 1985, 59-83. (web)

Kaplow, L. "A Framework for Assessing Estate and Gift Taxation", in Gale, William G., James R. Hines Jr., and Joel Slemrod (eds.) *Rethinking estate and gift taxation* Washington, D.C.: Brookings Institution Press, 2001. (web)

Kaplow, L. "On the undesirability of commodity taxation even when income taxation is not optimal", Journal of Public Economics, Vol.90, 2006, 1235-1260. (web)

Kennickell, A. "Ponds and streams: wealth and income in the U.S., 1989 to 2007", Board of Governors of the Federal Reserve System (U.S.), Finance and Economics Discussion Series: 2009-13, 2009. (web)

King, M. "Savings and Taxation", in G. Hughes and G. Heal, eds., Public Policy and the Tax System (London: George Allen Unwin, 1980), 1-36. (web)

Kopczuk, W. "The Trick Is to Live: Is the Estate Tax Social Security for the Rich?", The Journal of Political Economy, Vol. 111, 2003, 1318-1341. (web)

Kopczuk, Wojciech "Taxation of Intergenerational Transfers and Wealth", in A. Auerbach, R. Chetty, M. Feldstein, and E. Saez (eds.), Handbook of Public Economics, Vol. 5 (Amsterdam: North-Holland, 2013). (web)

Kopczuk, Wojciech and Joseph Lupton 2007. "To Leave or Not to Leave: The Distribution of Bequest Motives," Review of Economic Studies, 74(1), 207-235. (web)

Kopczuk, Wojciech and Emmanuel Saez "Top Wealth Shares in the United States, 1916-2000: Evidence from Estate Tax Returns", National Tax Journal, 57(2), Part 2, June 2004, 445-487. (web)

Kopczuk, Wojciech and Joel Slemrod, "The Impact of the Estate Tax on the Wealth Accumulation and Avoidance Behavior of Donors", in William G. Gale, James R. Hines Jr., and Joel B. Slemrod (eds.), *Rethinking Estate and Gift Taxation,* Washington, DC: Brookings Institution Press, 2001, 299-343. (web)

Kotlikoff, L. "Intergenerational Transfers and Savings", Journal of Economic Perspectives, Vol. 2, 1988, 41-58. (web)

Kotlikoff, L. and L. Summers "The Role of Intergenerational Transfers in Aggregate Capital Accumulation", Journal of Political Economy, Vol. 89, 1981, 706-732. (web)

Kuziemko, Ilyana, Michael I. Norton, Emmanuel Saez, and Stefanie Stantcheva "How Elastic are Preferences for Redistribution? Evidence from Randomized Survey Experiments," NBER Working Paper No. 18865, 2013. (web)

Laroque, G. "Indirect Taxation is Superfluous under Separability and Taste Homogeneity: A Simple Proof", Economic Letters, Vol. 87, 2005, 141-144. (web)

Light, Audrey and Kathleen McGarry. "Why Parents Play Favorites: Explanations For Unequal Bequests," American Economic Review, 2004, v94(5,Dec), 1669-1681. (web)

Modigliani, F. "The Role of Intergenerational Transfers and Lifecyle Savings in the Accumulation of Wealth", Journal of Economic Perspectives, Vol. 2, 1988, 15-40. (web)

Norton, M. and D. Ariely "Building a Better America–One Wealth Quintile at a Time", Perspectives on Psychological Science 2011 6(9). (web)

Park, N. "Steady-state solutions of optimal tax mixes in an overlapping-generations model", Journal of Public Economics, Vol. 46, 1991, 227-246. (web)

Piketty, Thomas 2000. "Theories of Persistent Inequality and Intergenerational Mobility", In Atkinson A.B., Bourguignon F., eds. *Handbook of Income Distribution*, (North-Holland). (web)

Piketty, T. "Income Inequality in France, 1901-1998", CEPR Discussion Paper No. 2876, 2001 (appendix with optimal capital tax point). (web)

Piketty, T. "Income Inequality in France, 1901-1998", Journal of Political Economy, Vol. 111, 2003, 1004-1042. (web)

Piketty, T. "On the Long-Run Evolution of Inheritance: France 1820-2050", Quarterly Journal of Economics, 126(3), 2011, 1071-1131. (web)

Piketty, Thomas, *Capital in the 21st Century*, Cambridge: Harvard University Press, 2014, (web)

Piketty, Thomas, Gilles Postel-Vinay and Jean-Laurent Rosenthal, "Inherited vs. Self-Made Wealth: Theory and Evidence from a Rentier Society (1872-1927)," Explorations in Economic History, 2014. (web)

Piketty, T. and E. Saez "Income Inequality in the United States, 1913-1998", Quarterly Journal of Economics, Vol. 118, 2003, 1-39. (web)

Piketty, T. and E. Saez "A Theory of Optimal Capital Taxation", NBER Working Paper No. 17989, 2012. (web)

Piketty, T. and E. Saez "A Theory of Optimal Inheritance Taxation", Econometrica, 81(5), 2013, 1851-1886. (web)

Piketty, T. and G. Zucman "Capital is Back: Wealth-Income Ratios in Rich Countries, 1700-2010", Quarterly Journal of Economics, 2014 (web)

Piketty, T. and G. Zucman "Wealth and Inheritance in the Long-Run", Handbook of Income Distribution, Volume 2, Elsevier-North Holland, 2014 (web)

Pirttila, Jukka and Hakan Selin, "Income shifting within a dual income tax system: evidence from the Finnish tax reform," Scandinavian Journal of Economics, 113(1), 120-144, 2011. (web)

Saez, E. "Optimal Capital Income Taxes in the Infinite Horizon Model", Journal of Public Economics, 97(1), 2013, 61-74. (web)

Saez, E. "The Desirability of Commodity Taxation under Nonlinear Income Taxation and Heterogeneous Tastes", Journal of Public Economics, Vol. 83, 2002, 217-230. (web)

Saez, E. and S. Stantcheva "A Simpler Theory of Optimal Capital Taxation", NBER Working Paper 22664, 2016. (web)

Saez, E. and G. Zucman "Wealth Inequality in the United States since 1913: Evidence from Capitalized Income Tax Data', Quarterly Journal of Economics, 2016. (web)

Sandmo, A. "The Effects of Taxation on Savings and Risk-Taking", in A. Auerbach and M. Feldstein, Handbook of Public Economics vol. 1, chapter 5, 1985, 265-311. (web)

Scholz, J. “Wealth Inequality and the Wealth of Cohorts”, University of Wisconsin, mimeo,2003. (web)

Slemrod, J. and J. Bakija, Taxing Ourselves: A Citizen's Guide to the Debate over Taxes. The MIT Press, 2004.

Wilhelm, Mark O. “Bequest Behavior and the Effect of Heirs' Earnings: Testing the Altruistic Model of Bequests,” American Economic Review, 86(4), 1996, 874-892. (web)

Zucman, G. “The Missing Wealth of Nations: Are Europe and the US Net Debtors or Net Creditors”, Quarterly Journal of Economics, 2013, 1321-1364. (web)

Zucman, Gabriel, “Taxing Offshore Wealth and Profits,” Journal of Economic Perspectives 28(3), 2014.