Public Economics: Tax & Transfer Policies
(Master PPD & APE, Paris School of Economics)
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Lecture 7: Optimal taxation of capital
(November 5th 2013)
(check on line for updated versions)

- One reason for not taxing capital: if full information on k income flows + k accumulation = 100% life-cycle wealth (zero inheritance) + perfect capital markets, then there is no reason to tax capital (**Atkinson-Stiglitz**)

- Three reasons for taxing capital:

- « **Fuzzy frontier argument** »: if the frontier btw labor and capital income flows not so clear (e.g. for self-employed), then it is better to tax both income flows at rates that are not too different

- « **Fiscal capacity argument** »: if income flows are difficult to observe for top wealth holders, then wealth stock may be a better indicator of the capacity to contribute than income

- « **Meritocratic argument** »: individuals are not responsible for their inherited wealth, so maybe this should be taxed more than their labor income; imperfect k markets then imply that part of the ideal inheritance tax should be shifted to lifetime k tax

- See « Rethinking capital and wealth taxation », PSE 2013

- Basic theoretical result = zero optimal capital tax rate = mechanical implication of Atkinson-Stiglitz no-differential-commodity-tax result to intertemporal consumption

 = relies on several assumptions: full observability of k income flows + 100% lifecycle wealth (zero inheritance) + perfect capital markets

(or infinite horizon/infinite long-run elasticity of capital supply)

If these assumptions are verified, then the case of zero capital tax is indeed very strong

Basic result 1: without inheritance, and with perfect capital markets, optimal k tax = 0%

- Intuition: if 100% of capital accumulation comes from lifecycle savings, then taxing capital or capital income is equivalent to using differential commodity taxation (current consumption vs future consumption)

- Atkinson-Stiglitz: under fairly general conditions (separable preferences), differential commodity taxation is undesirable, and the optimal tax structure should rely entirely on direct taxation of labor income

- To put it differently: if inequality entirely comes from labor income inequality, then it is useless to tax capital; one should rely entirely on the redistributive taxation of labor income)

- Atkinson-Stiglitz 1976:
- Model with two periods $t=1$ & $t=2$
- Individual i gets labor income $y_{Li} = v_i l_i$ at $t=1$ ($v_i =$ wage rate, l_i = labor supply), and chooses how much to consume c_1 and c_2
- Max $U(c_1, c_2) - V(l)$

under budget constraint: $c_1 + c_2/(1+r) = y_L$

- Period 1 savings $s = y_L - c_1$ (≥ 0)
- Period 2 capital income $y_k = (1+r)s = c_2$
- r = rate of return (= marginal product of capital F_K with production function $F(K,L)$)

>>> taxing capital income y_k is like taxing the relative price of period 2 consumption c_2

>>> Atkinson-Stiglitz: under separable preferences $U(C_1,C_2)-V(l)$, there is no point taxing capital income; it is more efficient to redistribute income by using solely a labor income tax $t(y_L)$

With non-separable preferences $U(C_1,C_2,l)$, it might make sense to tax less the goods that are more complement with labor supply (say, tax less day care or baby sitters, and tax more vacations); but this requires a lot of information on cross-derivatives

- See A.B. Atkinson and J. Stiglitz, "The design of tax structure: direct vs indirect taxation", Journal of Public Economics 1976
- V. Christiansen, « Which Commodity Taxes Should Supplement the Income Tax ? », Journal of Public Economics 1984
- E. Saez, "The Desirability of Commodity Taxation under Non-Linear Income Taxation and Heterogeneous Tastes", Journal of Public Economics 2002
- E. Saez, « Direct vs Indirect Tax Instruments for Redistribution : Short-run vs Long-run », Journal of Public Economics 2004

Basic result 2: with infinite-horizon dynasties, optimal linear k tax = 0% (=because of infinite elasticity of long run capital supply), but optimal progressive k tax > 0%

- Simple model with capitalists vs workers
- Consider an infinite-horizon, discrete-time economy with a continuum [0;1] of dynasties.
- For simplicity, assume a two-point distribution of wealth. Dynasties can be of one of two types: either they own a large capital stock k_t^A, or they own a low capital stock k_t^B ($k_t^A > k_t^B$). The proportion of high-wealth dynasties is exogenous and equal to λ (and the proportion of low-wealth dynasties is equal to 1-λ), so that the average capital stock in the economy k_t is given by:
- $k_t = \lambda k_t^A + (1-\lambda)k_t^B$

- Consider first the case $k_t^B=0$. I.e. low-wealth dynasties have zero wealth (the "workers") and therefore zero capital income. Their only income is labor income, and we assume it is so low that they consume it all (zero savings). High-wealth dynasties are the only dynasties to own wealth and to save. Assume they maximize a standard dynastic utility function:

- $U_t = \sum_{t \geq 0} U(c_t)/(1+\theta)^t$
  $(U'(c)>0, U''(c)<0)$

- All dynasties supply exactly one unit of (homogeneous) labor each period. Output per labor unit is given by a standard production function $f(k_t)$ $(f'(k)>0, f''(k)<0)$, where k_t is the average capital stock per capita of the economy at period t.

- Markets for labor and capital are assumed to be fully competitive, so that the interest rate r_t and wage rate v_t are always equal to the marginal products of capital and labor:
- $r_t = f'(k_t)$
- $v_t = f(k_t) - r_t k_t$
- In such a dynastic capital accumulation model, it is well-known that the long-run steady-state interest rate r* and the long-run average capital stock k* are uniquely determined by the utility function and the technology (irrespective of initial conditions): in stead-state, r* is necessarily equal to θ, and k* must be such that:
- $f'(k*)=r*=\theta$
- I.e. $f'(\lambda k_A)=r*=\theta$

- This result comes directly from the first-order condition:
- $U'(c_t)/ U'(c_{t+1}) = (1+r_t)/(1+\theta)$
- I.e. if the interest rate r_t is above the rate of time preference θ, then agents choose to accumulate capital and to postpone their consumption indefinitely ($c_t<c_{t+1}<c_{t+2}<...$) and this cannot be a steady-state. Conversely, if the interest rate r_t is below the rate of time preference θ, agents choose to desaccumulate capital (i.e. to borrow) indefinitely and to consume more today ($c_t>c_{t+1}>c_{t+2}>...$). This cannot be a steady-state either.
- Now assume we introduce linear redistributive capital taxation into this model. That is, capital income $r_t k_t$ of the capitalists is taxed at tax rate τ (so that the post-tax capital income of the capitalists becomes $(1-\tau)r_t k_t$), and the tax revenues are used to finance a wage subsidy s_t (so that the post-transfer labor income of the workers becomes v_t+s_t).
- Note k_τ^* , $k_{A\tau}^*= k_\tau^*/\lambda$ and r_τ^* the resulting steady-state capital stock and pre-tax interest rate. The Golden rule of capital accumulation implies that:
- $(1-\tau) f'(k_\tau^*)= (1-\tau) r_\tau^* = \theta$

- I.e. the capitalists choose to desaccumulate capital until the point where the net interest rate is back to its initial level (i.e. the rate of time preference). **In effect, the long-run elasticity of capital supply is infinite in the infinite-horizon model**: any infinitesimal change in the net interest rate generates a savings response that is unsustainable in the long run, unless the net interest rate returns to its initial level.
- The long run income of the workers y_τ^* will be equal to:
- $y_\tau^* = v_\tau^* + s_\tau^*$
- with: $v_\tau^* = f(k_\tau^*) - r_\tau^* k_\tau^*$
- and: $s_\tau^* = \tau r_\tau^* k_\tau^*$
- That is:
- $y_\tau^* = f(k_\tau^*) - (1-\tau) r_\tau^* k_\tau^* = f(k_\tau^*) - \theta k_\tau^*$
- Question: what is the capital tax rate τ maximizing workers' income $y_\tau^* = f(k_\tau^*) - \theta k_\tau^*$?
- Answer: τ must be such that $f'(k_\tau^*) = \theta$, i.e. $\tau = 0\%$

- Proposition: The capital tax rate τ maximizing long run workers' welfare is τ = 0%

 >>> in effect, even agents with zero capital loose from capital taxation (no matter how small)

 (= the profit tax is shifted on labor in the very long run)

- But this result requires three strong assumptions: infinite elasticity of capital supply; perfect capital markets; and linear capital taxation: **with progressive tax, middle-class capital accumulation will compensate for the rich decline in k accumulation** (see E. Saez, "Optimal Progressive Capital Income Taxes in the Infinite Horizon Model", WP 2004)

- Most importantly: **the zero capital tax result breaks down whenever the long run elasticity of capital supply is finite**

- Three reasons for taxing capital:
- « **Fuzzy frontier argument** »: if one can only observe total income $y = y_L + y_K$, then one needs to use a comprehensive income tax $t(y)$; more generally, if high income-shifting elasticity, then $t(y_L)$ & $t(y_K)$ should not be too different
- « **Fiscal capacity argument** »: if income flow y is difficult to observe for top wealth holders (family holdings, corporate consumption, etc.: fiscal income reported by billionaires can be very small as compared to their wealth), then one needs to use a wealth tax $t(w)$ in addition to the income tax $t(y)$
- These two informational arguments are dicussed in « Rethinking capital and wealth taxation », PSE 2013
- « **Meritocratic argument** »: even with full observability of y_L, y_K, w, inheritance should be taxed as long as the relevant elasticity is finite; imperfect k markets then imply that part of the ideal inheritance tax should be shifted to lifetime k tax; see « A Theory of Optimal Inheritance Taxation », Econometrica 2013

(long version: see "A Theory of Optimal Capital Taxation", WP 2012 ; see also Slides)
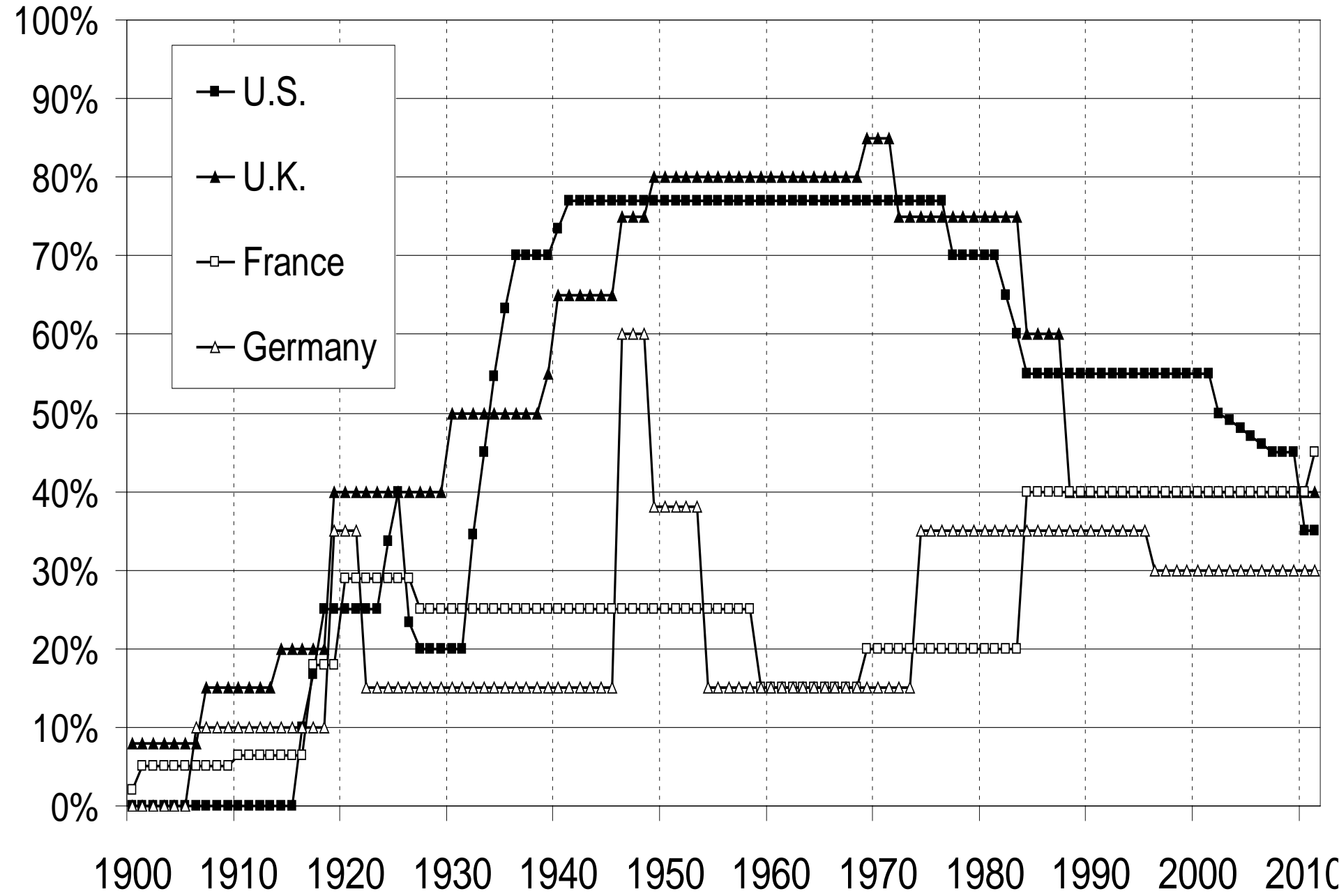
The optimal taxation of inheritance

- Summary of main results from « A Theory of Optimal Inheritance Taxation », Econometrica 2013
- **Result 1:Optimal Inheritance Tax Formula** (macro version, NBER WP'12)
- Simple formula for optimal bequest tax rate expressed in terms of estimable macro parameters:

$$\tau_B = (1 - (1\text{-}\alpha\text{-}\tau)s_{b0}/b_y)/(1+e_B+s_{b0})$$

with: b_y = macro bequest flow, e_B = elasticity, s_{b0} =bequest taste
 $\rightarrow \tau_B$ increases with b_y and decreases with e_B and s_{b0}

- For realistic parameters: τ_B=50-60% (or more..or less...)
- $\rightarrow$ **this formula can account for the variety of observed top bequest tax rates (30%-80%)**

Top Inheritance Tax Rates 1900-2011

- Intuition for $\tau_B = (1 - (1-\alpha-\tau)s_{b0}/b_y)/(1+e_B+s_{b0})$

- Meritocratic rawlsian optimum, i.e. social optimum from the viewpoint of zero bequest receivers

- τ_B increases with b_y and decreases with e_B and s_{b0}

- If bequest taste $s_{b0}=0$, then $\tau_B = 1/(1+e_B)$
$\rightarrow$ standard revenue-maximizing formula
- If $e_B \rightarrow +\infty$, then $\tau_B \rightarrow 0$: back to zero tax result
- If $e_B=0$, then $\tau_B<1$ as long as $s_{b0}>0$
- I.e. zero receivers do not want to tax bequests at 100%, because they themselves want to leave bequests
- $\rightarrow$ **trade-off between taxing rich successors from my cohort vs taxing my own children**

Example 1: $\tau=30\%$, $\alpha=30\%$, $s_{bo}=10\%$, $e_B=0$

- If $b_y=20\%$, then $\tau_B=73\%$ & $\tau_L=22\%$
- If $b_y=15\%$, then $\tau_B=67\%$ & $\tau_L=29\%$
- If $b_y=10\%$, then $\tau_B=55\%$ & $\tau_L=35\%$
- If $b_y=5\%$, then $\tau_B=18\%$ & $\tau_L=42\%$

$\rightarrow$ with high bequest flow b_y, zero receivers want to tax inherited wealth at a higher rate than labor income (73% vs 22%); with low bequest flow they want the oposite (18% vs 42%)

Intuition: with low b_y (high g), not much to gain from taxing bequests, and this is bad for my own children

With high b_y (low g), it's the opposite: it's worth taxing bequests, so as to reduce labor taxation and allow zero receivers to leave a bequest

Example 2: τ=30%, α=30%, s_{bo}=10%, b_y=15%

- If e_B=0,   then τ_B=67% & τ_L=29%
- If e_B=0.2, then τ_B=56% & τ_L=31%
- If e_B=0.5, then τ_B=46% & τ_L=33%
- If e_B=1,   then τ_B=35% & τ_L=35%

$\rightarrow$ behavioral responses matter but not hugely as long as the elasticity e_B is reasonnable

Kopczuk-Slemrod 2001: e_B=0.2 (US)

(French experiments with zero-children savers: e_B=0.1-0.2)

- **Optimal Inheritance Tax Formula (micro version, EMA'13)**
- The formula can be rewritten so as to be based solely upon estimable distributional parameters and upon r vs g :
- $\tau_B = (1 - Gb^*/Ry_L^*)/(1+e_B)$

With: **b* =** average bequest left by zero-bequest receivers as a fraction of average bequest left

y_L^* **=** average labor income earned by zero-bequest receivers as a fraction of average labor income

G = generational growth rate, **R =** generational rate of return

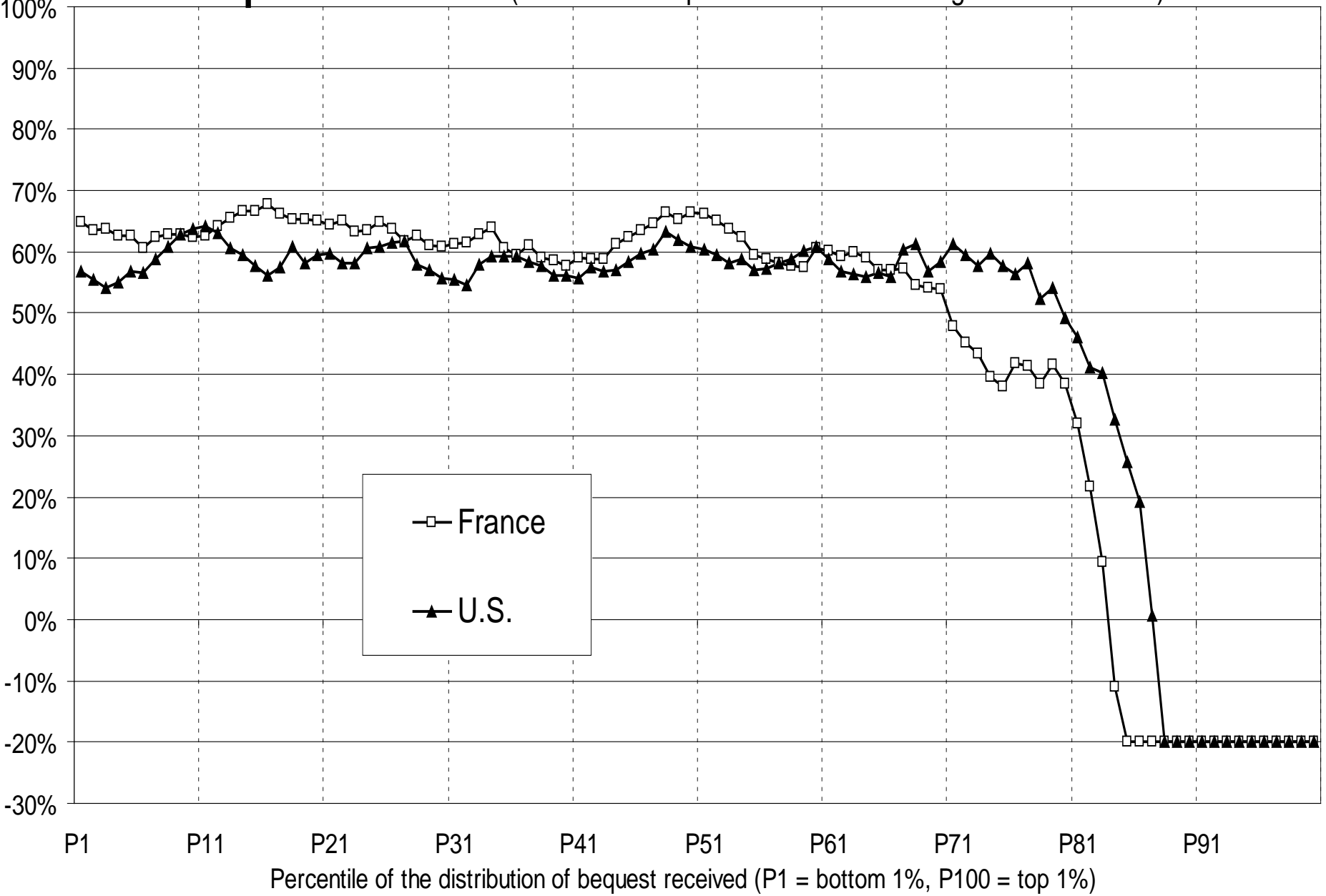- If e_B=0 & G=R, then $\tau_B = 1 - b^*/y_L^*$ (**pure distribution effect**)
- → if b*=0.5 and y_L^*=1, $\tau_B = 0.5$: if zero receivers have same labor income as rest of the pop and expect to leave 50% of average bequest, then it is optimal from their viewpoint to tax bequests at 50% rate
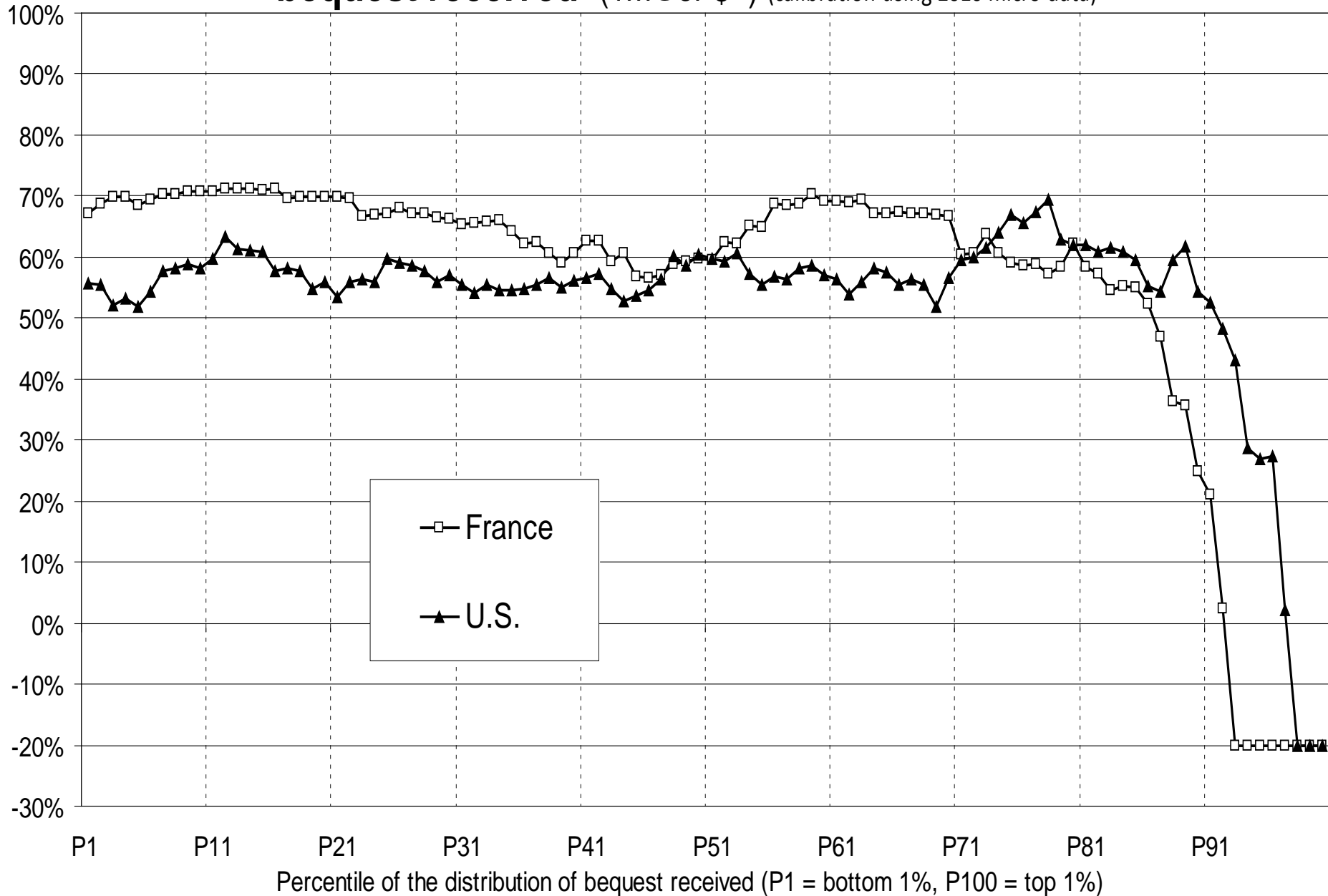- If e_B=0 & b*=y_L^*=1, then $\tau_B = 1 - G/R$ (**fiscal Golden rule**)
- → if R →+∞, τ_B →1: zero receivers want to tax bequest at 100%, even if they plan to leave as much bequest as rest of the pop

Figure 1: Optimal linear inheritance tax rates, by percentile of bequest received (calibration of optimal tax formulas using 2010 micro data)

Percentile of the distribution of bequest received (P1 = bottom 1%, P100 = top 1%)

Figure 2: Optimal top inheritance tax rates, by percentile of bequest received (1m€ or $+) (calibration using 2010 micro data)

Percentile of the distribution of bequest received (P1 = bottom 1%, P100 = top 1%)

- **Result 2: Optimal Capital Tax Mix** (NBER WP'12)

- **K market imperfections** (e.g. uninsurable idiosyncratic shocks to rates of return) can justify shifting one-off inheritance taxation toward lifetime capital taxation (property tax, K income tax,..)

- **Intuition**: what matters is capitalized bequest, not raw bequest; but at the time of setting the bequest tax rate, there is a lot of uncertainty about what the rate of return is going to be during the next 30 years → so it is more efficient to split the tax burden

→ **this can explain the actual structure & mix of inheritance vs lifetime capital taxation**

(& why high top inheritance and top capital income tax rates often come together, e.g. US-UK 1930s-1980s)

Equivalence between τ_B and τ_K

- In basic model with perfect markets, tax τ_B on inheritance is equivalent to tax τ_K on annual return r to capital as:

  after tax capitalized inheritance $\underline{b}_{ti} = (1 - \tau_B)b_{ti}e^{rH} = b_{ti}e^{(1-\tau_K)rH}$

  i.e. $\tau_K = -\log(1-\tau_B)/rH$

- E.g. with r=5% and H=30, τ_B=25% $\leftrightarrow$ τ_K=19%, τ_B=50% $\leftrightarrow$ τ_K=46%, τ_B=75% $\leftrightarrow$ τ_K=92%

- This equivalence no longer holds with

(a) tax enforcement constraints, or **(b)** life-cycle savings,

or **(c)** uninsurable risk in $r=r_{ti}$

$\rightarrow$ Optimal mix τ_B,τ_K then becomes an interesting question

$\rightarrow$ More research is needed on the optimal capital tax mix

On the difficulties of taxing capital with international capital mobility

- Without fiscal coordination (automated exchange of bank information, unified corporate tax base, etc.), all forms of k taxation might well disappear in the long run

- On these issues see the following papers:

- G. Zucman, "The missing wealth of nations", QJE 2013

- N. Johanssen and G. Zucman,, "The End of Bank Secrecy? An Evaluation of the G20 Tax Haven Crackdown", WP 2012

- K. Clausing, "In Search of Corporate Tax Incidence", WP 2011 Tax Law Review 2012