Public Economics: Tax & Transfer Policies

(Master PPD & APE, Paris School of Economics)

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Lecture 5: Optimal Labor Income Taxation

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(check on line for updated versions)

- **Main theoretical results about optimal taxation of labor income** (for capital income, see lectures 6-7):

- (1) the social optimum usually involves a U-shaped pattern of marginal tax rates = in order to have high minimum income, one needs to withdraw it relatively fast (but not too fast) = relatively consistent with observed patterns (if we take into account transfers)

- (2) optimal top rates depends positively on income concentration (top income shares) and negatively on labor supply elasticities

  (and positively on bargaining power at the top: very important if we want to understand Roosevelt-type confiscatory tax rates)

- Here I will only present the main results and intuitions. For complete technical details and proofs, see the following papers:

- Mirrlees, J., "An exploration in the theory of optimum income taxation", RES 1971
- Diamond, P., “Optimal Income Taxation: An Example with a U-Shaped Pattern of Optimal Marginal Rates”, AER 1998 [article in pdf format]
- Saez, “Using Elasticities to Derive Optimal Income Tax Rates”, RES 2001 [article in pdf format]
- **Piketty-Saez, "Optimal Labor Income Taxation", 2013**, Handbook of Public Economics, vol. 5
- Piketty-Saez-Stantcheva, "Optimal Taxation of Top Labor Incomes: A Tale of Three Elasticities", AEJ 2013 (see also Slides)

The optimal labor income tax problem

- Mirrlees (1971) : basic labor supply model used to analyze optimal labor income taxes
- Each agent i is characterized by an exogeneous wage rate w_i (=productivity)
- Labor supply l_i
- Pre-tax labor income $y_i = w_i l_i$
- Income tax $t = t(y_i)$
- $t(y_i)$ can be >0 or <0 : if <0, then this is an income transfer, or negative income tax
- After-tax labor income $z_i = y_i – t(y_i)$
- Agents choose labor supply l_i by maximizing $U(z_i,l_i)$

- Social welfare function $W = \int W(U(z_i,l_i))\ f(y_i)dy_i$ subject to budgetary constraint: $\int t(y_i)\ f(y_i)dy_i = 0$ (or = G, with G = exogenous public spendings)

  ($f(y_i)$ = density function for y_i = partly endogenous, given exogenous distribution of productivities w_i and endogenous labor supply l_i)
- If individual productivities w_i were fully observable, then the first-best efficient tax system would be $t=t(w_i)$, i.e. would not depend at all on labor supply behaviour, so that there would be no distorsion = lump-sum transfers, fully efficient redistribution
- However if the tax system can only depend on income, i.e. $t = t(y_i)$, e.g. because of unobservable productivites w_i (adverse selection), then we have an equity/efficiency trade-off
- >>> Mirrlees 1971 provides analytical solutions for the second-best efficient tax system in presence of such an adverse selection pb

- But problems with the Mirrlees 1971 formula:
- (i) very complicated and unintuitive formulas, hard to apply empirically
- (ii) only robust conclusion: with finite number of productivity types w_i ,…, w_n, then zero marginal rate on the top group = completely off-the-mark
- >>> Diamond (1998), Saez (2001): continuous distribution of types (no upper bound, so that the artificial zero-top-rate result disappears), first-order derivation of the optimal tax formulas, very intuitive and easy-to-calibrate formulas

First-order derivation of linear optimal labor income tax formulas

- Linear tax schemes: $t(y) = ty - t_0$
- I.e. t = constant marginal tax rate
- $t_0 > 0$ = transfer to individuals with zero labor income (RMI/RSA in France)
- Define e = labor supply elasticity
- Definition: if the net-of-tax wage rate $(1-t)w_i$ increases by 1%, labor supply l_i (and therefore labor income $y_i = w_i l_i$, for given w_i) increases by e%
- E.g. if $U(z_i, l_i) = z_i - V(l_i)$ (separable utility, no income effect), with $V(l) = l^{1+\mu}/(1+\mu)$, then $e = 1/\mu$

  FO condition: Max $w_i l_i - V(l_i) \rightarrow l_i = w_i^{1/\mu}$
  $\rightarrow dl_i/l_i = e \, dw_i/w_i$ with $e = 1/\mu$

- More generally, whatever the labor income generating process y_i = y(wage rate w_i, labor hours l_i, effort e_i , luck u_i), one can always define **e = generalized labor supply elasticity** = elasticity of labor income with respect to the net-of-tax rate: if the net-of-tax rate (1-t) increases by 1%, observed labor income y increases by e%
- I.e. if t→t+dt, then 1-t→1-t-dt, so that 1-t declines by dt/(1-t)%; therefore we have: dy/y = - e dt/(1-t)
- The generalized elasticity reflects changes in labor hours but also endogenous changes in wage rates: with higher taxes, maybe one will put less effort in education investment, or less effort in trying to get a promotion, etc.

- Assume that we’re looking for the tax rate t* maximizing tax revenues R = ty
- Revenue-maximizing tax rate t* = top of the Laffer curve
- Revenue-maximizing tax rate t* = social optimum if social welfare function W = Rawlsian (infinitely concave), i.e. in the limit case where the marginal social welfare W’=0 for all $U>U_{min}$, i.e. social objective = maximizing minimum utility (maxmin) = maximizing transfer t_0
- = useful reference point: by definition, socially optimal tax rates for non-Rawlsian social welfare functions W will be below revenue-maximizing tax levels

- First-order condition: if the tax rate goes from t to t+dt, then tax revenues go from R to R+dR, with:

$$dR = y\, dt + t\, dy$$

$$\text{with } dy/y = - e\, dt/(1-t)$$

- I.e. $dR = y\, dt - t\, ey\, dt/(1-t)$
- $dR = 0$ if and only if $t/(1-t) = 1/e$
- **I.e. $t^* = 1/(1+e)$**
- I.e. pure elasticity effect : if the elasticity e is higher, then the optimal tax t^* is lower
- I.e. if e=1 then t^*=50%, if e=0,1 then t^*=91%, etc.
- **= the basic principle of optimal taxation theory: other things equal, don't tax what's elastic**
- Other example: Ramsey formulas on optimal indirect taxation: tax more the commodities with a less elastic demand, and conversely

First-order derivation of non-linear optimal labor income tax formulas

- General non-linear tax schedule t(y)
- I.e. marginal tax rates t'(y) can vary with y
- Note f(y) the density function for labor income, and $F(y) = \int_{z<y} f(z)dz$ = distribution function (= fraction of pop with income < y)
- Assume one wants to increase the marginal tax rate from t' to t'+dt' over some income bracket [y; y+dy]. Then tax revenues go from R to R+dR, with:
- $dR = (1-F(y))\ dt'\ dy - f(y)dy\ t'ey\ dt'/(1-t')$
- dR = 0 if and only if **$t'^*/(1-t'^*) = (1-F(y))/yf(y)\ \ 1/e$**

- **Key formula: t’*/(1-t’*) = (1-F(y))/yf(y) 1/e**
- I.e. two effects:
- Elasticity effect: higher elasticities e imply lower marginal tax rates t’*
- Distribution effect: higher (1-F)/yf ratios imply higher marginal rates t’*
- Intuition : (1-F)/yf = ratio between the mass of people above y (=mass of people paying more tax) and the mass of people right at y (=mass of people hit by adverse incentives effects)
- For low y, the ratio (1-F)/yf is necessarily declining: other things equal, marginal rates should fall
- But for high y, the ratio (1-F)/yf is usually increasing: other things equal, marginal rates should rise

>>> for constant elasticity profiles, U-shaped pattern of marginal tax rates

Asymptotic optimal marginal rates for top incomes

- With a Pareto distribution $1\text{-}F(y) = (k/y)^a$ and $f(y)=ak^a/y^{(1+a)}$, then $(1\text{-}F)/yf$ converges towards $1/a$, i.e. t'^* converges towards:
- **$t'^* = 1/(1+ae)$**
- with e= elasticity, a = Pareto coefficient
- Intuition: higher a (i.e. lower coefficient $b=a/(a-1)$, i.e. less fat upper tail = less income concentration) imply lower tax rates, and conversely
- Exemple: if e=0,5 and a=2, t'^* = 50%

  But if e=0,1 and a=2, t'^* = 83%

- Reminder on key property of Pareto distributions: **ratio average/threshold = constant**
- Note $y^*(y)$ the average income of the population above threshold y. Then $y^*(y)$ can be expressed as follows :
- $y^*(y) = [\int_{z>y} z\, f(z)dz\ ] / [\int_{z>y} f(z)dz\ ]$

  $= [\int_{z>y} dz/z^a\ ] / [\int_{z>y} dz/z^{(1+a)}\ ] = ay/(a-1)$
- I.e. $y^*(y)/y = b = a/(a-1)$ (and $a = b/(b-1)$)

- In practice : b is usually around 2, but can vary quite a lot

For top incomes

- France 2010s, US 1970s: b = 1.7-1.8 (a=2.2-2.3)
- France or US 1910s, US 2010s: b = 2.2-2.5 (a=1.7-1.8)

For top wealth:

- France today: b = 2.3-2.5; France 1910s: b=3-3.5
- **Higher b coefficients = fatter upper-tail of the distribution = higher concentration of income (or wealth)**

Evidence on U-shaped pattern of marginal rates

- $$t'^*/(1-t'^*) = (1-F(y))/yf(y) \ \ 1/e$$
- The distribution effect (1-F(y))/yf(y) is typically U-shaped; so if elasticity effect e=e(y)≈stable over y, then the social optimum involves a U-shaped pattern of marginal tax rates
- Same conclusion with general SWF as long as marginal social welfare weights not too far from Rawlsian social welfare function
- Basic intuition = in order to have high minimum income, one needs to withdraw it relatively fast (but not too fast) = relatively consistent with observed patterns (if we take into account transfers)

- The increasing part of the U-shaped pattern (for upper half incomes) is due to income tax progressivity → rising marginal rates at the top

- The decreasing part (for bottom half incomes) is due to the withdrawal of income transfers, which also creates high marginal rates

→ Observed pattern of marginal rates in France: U-shaped curve (see RFE 97 graphs, paper)

- Simplified example for France 2013 (see here for detailed simulations and computer codes for French transfers & taxes)
- If labor income y=0, then $t(y)=-t_0$: t_0= transfer to individuals with zero labor income ≈ 500€/month for RMI/RSA in France
- If labor income $y=y_{min}$=full-time minimum wage, you receive no transfer any more (unless you have children);
  net minimum wage ≈ 1100€/m, gross min. wage ≈ 1400€/m, total labor cost ≈ 1700€/m

(CSG+employee payroll tax ≈ 20%; employer payroll tax ≈ 20%)

- Note: total labor cost would be ≈ 2000€/m at the level of the minimum wage in the absence of low-wage payroll tax cut: employer payroll tax ≈20% at y_{min} → back to ≈40% at 1,6 x y_{min}

- As pre-tax income y goes from y=0 to y=1700€, after-tax income y-t(y) goes from 500 to 1100€, and t(y) goes from -500 to +600€, i.e. rises by 1100€

→ marginal tax rate associated to the transition between pre-tax incomes 0 and y_{min} = Δt/Δy = 1100/1700 = 65%

(if we include VAT & other indirect taxes, the marginal tax rate on minimum wage workers would be closer to 75-80%)

- The pb is that if one wants to reduce this marginal rate (say, by further cuts in low-wage payroll tax), then one has to raise the marginal rate higher up in the distribution (say, btw y_{min} and 1,6 x y_{min})

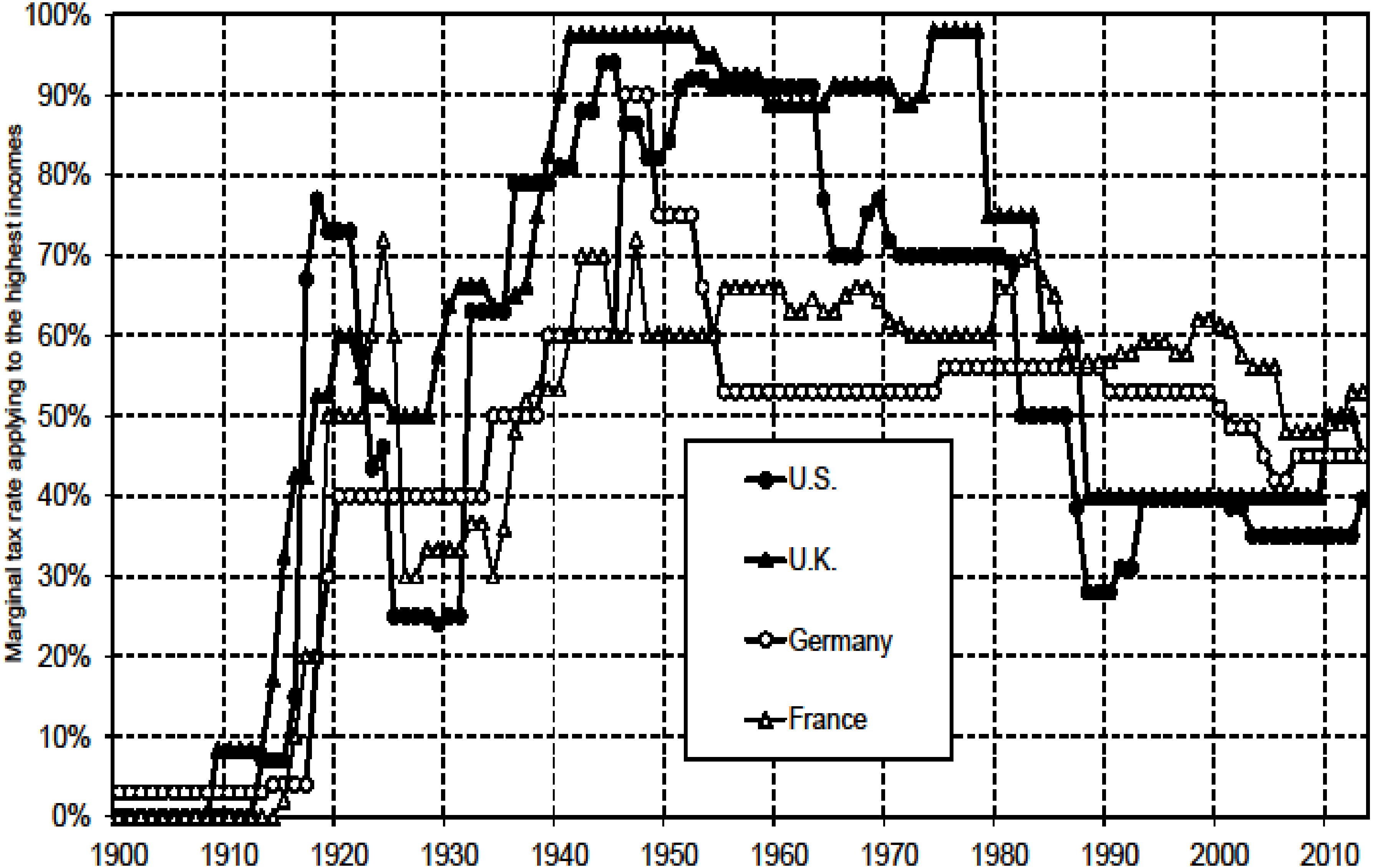
→ complex trade-off, current U-shaped pattern might be not too far from optimal

Evidence on top marginal rates

- Observed top marginal rates go from 20-30% to 80-90%
- One possible interpretation = different beliefs about elasticities of labor supply (see this paper for a learning model: it is difficult to estimate e with certainty)

- **t'* = 1/(1+ae)** (with e= elasticity, a = Pareto coefficient)
- If e=1 and a=2, t'* = 33%
- If e=0,5 and a=2, t'* = 50%
- If e=0,1 and a=2, t'* = 83%

Figure 14.1. Top income tax rates, 1900-2013



The top marginal tax rate of the income tax (applying to the highest incomes) in the U.S. dropped from 70% in 1980 to 28% in 1988. Sources and series: see piketty.pse.ens.fr/capital21c.

- Empirical evidence: real labor supply elasticities ≈0,2-0,3 at most (higher elasticities usually come from pure income shifting, i.e. if one can transfer income to a less taxed tax base: in principle, this can be solved by a broader tax base)

  → $t'^* \approx$ 60-70% ?

- See P. Diamond & E. Saez, "The Case for a Progressive Tax: From Basic Research to Policy Recommendations", JEP 2011

- For a survey on empirical estimates of labor supply elasticities, see E. Saez, J. Slemrod and S. Gierz, “The Elasticity of Taxable Income with Respect to Marginal Tax Rates: A Critical Review”, NBER 2009 [article in pdf format]

- However the perfect-competition model (labor income = marginal product) may not be sufficient to analyze Roosevelt-type tax rates & the recent surge in US top incomes
- A model with imperfect competition and CEO bargaining power (CEOs can sometime extract some than their marginal product) is more promising

- See Piketty-Saez-Stantcheva, "Optimal Taxation of Top Labor Incomes: A Tale of Three Elasticities", AEJ 2014 (see also Slides)

- With imperfect competition and bargaining power, the optimal tax formula becomes more complicated and can justify confiscatory tax rates
- **Augmented formula: $\tau = (1+tae_2+ae_3)/(1+ae)$**
- With $e = e_1 + e_2 + e_3$

= labor supply elasticity e_1 + income shifting elasticity e_2 + bargaining elasticity e_3 (= more intensive bargaining with lower tax rate)

- **Key point: τ ↑ as elasticity e_3 ↑**

→ for a given total elasticity e, the decomposition between the three elasticities e_1, e_2, e_3 is critical

Table 5: Synthesis of Various Scenarios

Total elasticity $e = e_1 + e_2 + e_3 =$ 0.5

Scenario 1: Standard supply side tax effects		Scenario 2: Tax avoidance effects		Scenario 3: Compensation bargaining effects	
		(a) current narrow tax base	(b) after base broadening		
$e_1 =$	0.5	$e_1 = 0.2$	$e_1 = 0.2$	$e_1 =$	0.2
$e_2 =$	0.0	$e_2 = 0.3$	$e_2 = 0.1$	$e_2 =$	0.0
$e_3 =$	0.0	$e_3 = 0.0$	$e_3 = 0.0$	$e_3 =$	0.3

Optimal top tax rate $\tau^* = (1+ tae_2 + ae_3)/(1+ae)$

Pareto coeffient a =	1.5
Alternative tax rate t =	20%

Scenario 1		Scenario 2		Scenario 3	
		(a) e_2=0.3	(b) e_2=0.1		
τ^* =	57%	τ^* = 62 %	τ^* = 71 %	τ^* =	83%

This table presents optimal top tax rates in the case where the overall elasticity of reported taxable income is e=0.5 in three scenarios depending on how this total elasticity breaks down into the standard labor supply elasticity (e_1), the tax avoidance elasticity (e_2), the compensation bargaining elasticity (e_3). In scenario 1, the only elasticity is e_1. In scenario 2, both e_1 and e_2 are present, income shifted away from the regular tax is assumed to be taxed at rate t=20%. Scenario 2a considers the case of the current narrow base with avoidance opportunities and scenario 2b considers the case where the base is first broadened so that e_2 falls to 0.1 (end hence e falls to 0.3). In scenario 3, both e_1 and e_3 are present. In all cases, top tax rates are set to maximize tax revenue raised from top bracket earners.