A Simpler Theory of Capital Taxation

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Motivation and objectives

- Literature on optimal taxation: many models, various assumptions, disparate set of tools, different results
- Public debate: around equity-efficiency tradeoff. Is the distribution of capital fair? How does capital react to taxation?
- Build a model with the following features:
    1. Tractable
    2. A role for capital taxation
    3. Robust optimal tax formulas in terms of estimable elasticities and distributional parameters
- Simple formulas allow us to understand the main forces and the policy implications

Setup

- Instantaneous utility function:

$$u_i(c,k,z) = c + a_i(k) - h_i(z)$$

  and discount rate δ_i

- Two important ingredients:
  1. Linear in consumption → No transitional dynamics
  2. Wealth in the utility → Limits consumption

- Budget constraint:

$$\frac{dk_i(t)}{dt} = rk_i(t) + z_i(t) - c_i(t) - \underbrace{T(z_i(t), rk_i(t))}_{\text{Tax schedule}} = 0$$

FOCs

$$h'(z_i) = 1 - T'_L(z_i, rk_i)$$

$$a'_i(k_i) = \delta_i - r[1 - T'_K(z_i, rk_i)]$$

- The marginal value of keeping wealth is equal to the value lost in delaying consumption $\delta_i - \bar{r}_i$
- Heterogeneity in wealth conditional on labor earnings $\Longrightarrow$ breaks Atkinson and Stiglitz (1976)

Static equivalence

- The model jumps to the steady-state immediately
- Dynamic problem equivalent to maximize the static utility:

$$U_i(c_i, k_i, z_i) = c_i + a_i(k_i) - h_i(z_i) + \delta_i(k^{init} - k_i)$$

- Issues of announced vs non-announced reforms, or policy commitment, are irrelevant

Optimal linear taxation (1)

- The Social Planner wants to maximize its social objective:

$$SWF = \int g_i \cdot U_i(c_i, k_i, z_i) di$$

- Notations:

$$\bar{r} = r(1 - \tau_K)$$

$$k^m(\bar{r}) = \int k_i di \quad ; \quad z^m(1 - \tau_L) = \int z_i di$$

$$\bar{g}_K = \frac{\int g_i k_i}{\int k_i} \quad ; \quad \bar{g}_L = \frac{\int g_i z_i}{\int z_i}$$

- Budget-balance: tax revenues are rebated lump-sum with transfer

$$G = \tau_K \cdot r k^m(\bar{r}) + \tau_L \cdot z^m(1 - \tau_L)$$

Optimal linear taxation (2)

- Key statistics is e_K: elasticity of aggregate capital, k^m, with respect to the net-of-tax return on capital, $\bar{r}$:

$$e_K = \frac{dk^m}{d\bar{r}} \cdot \frac{\bar{r}}{k^m}$$

- Similarly, e_L is the elasticity of z^m with respect to $1 - \tau_L$:

$$e_L = \frac{dz^m}{d(1 - \tau_L)} \cdot \frac{1 - \tau_L}{z^m}$$

- Envelope theorem:

$$\frac{dSWF}{d\tau_K} = rk^m \left[\int g_i \left(1 - \frac{k_i}{k^m} \right) di - \frac{\tau_K}{1 - \tau_K} e_K \right]$$

Optimal linear taxation (3)

- Optimal linear capital tax:

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

- Optimal linear labor tax:

$$\tau_L = \frac{1 - \bar{g}_L}{1 - \bar{g}_L + e_L}$$

- Equity-efficiency trade-off and nothing else: e_K is related to efficiency costs, $\bar{g}_K$ relates to equity according to social preferences

Optimal nonlinear separable taxation (1)

- Notations:

$$\bar{G}_K(rk) = \frac{\int_{\{rk_i \geq rk\}} g_i}{P(rk_i \geq rk)} \quad ; \quad \bar{G}_L(z) = \frac{\int_{\{z_i \geq z\}} g_i}{P(z_i \geq z)}$$

  which are the relative welfare weights on individuals above a certain level
- Local Pareto parameters:

$$\alpha_K(rk) = \frac{rk \cdot h_K(rk)}{1 - H_K(rk)} \quad ; \quad \alpha_L(z) = \frac{z \cdot h_Z(z)}{1 - H_Z(z)}$$

- Why these local Pareto parameters? Combine two pieces of information:
  1. Measure h of taxpayers affected by a change in marginal tax in a small band
  2. Measure $1 - H$ of taxpayers paying more tax

Optimal nonlinear separable taxation (2)

- Consider an increase of $\delta\tau_K$ in the marginal tax rate, for capital income between rk and $rk + d(rk)$
- Three different effects:
  1. Revenue effect: raise more revenues from agents above $rk \rightarrow$ Brings $1 - H_K(rk)$
  2. Behavioral effect: Taxpayers in the small band change their capital holdings $\rightarrow$ Brings $h_K(rk)$ and local elasticity $e_K(rk)$
  3. Welfare effect: loss on taxpayers above $rk \rightarrow$ Bring $\bar{G}_K(rk)$
- The optimum is reached when the sum of these three effects is zero
- The key is that without income effects, the behavioral effect only concerns agents in the small band (point 2)

Optimal nonlinear separable taxation (3)

- Optimal nonlinear capital tax:

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

- Optimal nonlinear labor tax:

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

Joint labor/wealth preferences

- Non-separable utility component for k and z:

$$u_i = c_i + v_i(k_i, z_i)$$

- FOCs are slightly changed:

$$-v_{iz}(k_i, z_i) = 1 - \tau_L$$

$$v_{ik}(k_i, z_i) = \delta_i - \bar{r}$$

- Capital tax must take into account the elasticity of labor with respect to the net-of-tax capital return, and vice-versa

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

General model: Concave utility of consumption

- Cannot abstract from transition dynamics
- Add three simplifying assumptions:
  1. The Social Planner budget is period-by-period neutral
  2. Tax rates are time-invariant
  3. At $t = 0$, the economy is in a steady-state with respect to the previous tax system

General model: Concave utility of consumption (2)

- Can still get similar formulas!

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

- But elasticities have to be evaluated **over the full path**:

$$e^u_K = \delta \int e^u_K(t) e^{-\delta t} dt$$

- u stands for *unanticipated*
- $e^u_K(t)$ is a policy elasticity: it also takes into account the income effect, coming from the fact that the transfer $G(t)$ changes along the transition path to keep the budget balanced
- Typically smaller than the steady-state elasticity
- If fast response, $e^u_K \approx e_K$ and we are back to the previous case

Normative issues

- Unanticipated tax reform allows the government to heavily tax by exploiting sluggish responses
- Anticipated tax reforms generates infinite elasticities if no uncertainty
- Third approach: *utility-based*
  - Forbid the government to exploit sluggishness
  - Formally equivalent to using steady-state elasticities in the optimal tax formulas
  - But not fully consistent with a standard dynamic model
- Consumption smoothing introduces dilemmas which are irrelevant in the linear case, and probably second-order

Foundations of wealth in the utility (I)

- Utility for wealth has long been recognized as important
  - *"Capitalist spirit"* (Weber, 1958)
  - *"Love of money as a possession"* (Keynes, 1931)
- Poor empirical fit of models with only utility for consumption
  - Precautionary savings not enough to rationalize high wealth holdings at the top (Carrol, 1997, 2000; Quadrini, 1999)
  - Hard to generate savings behavior making wealth much more concentrated than labor income (Benhabib and Bisin, 2016)
  - Important two-dimensional heterogeneity in labor and capital income

Foundations of wealth in the utility (II)

- **Warm-glow bequest motive**
  - Utility from leaving a bequest
  - If death time is stochastic ("perpetual youth" model of Yaari, 1965, Blanchard, 1985) infinite horizon expected utility equivalent to wealth in utility
  - Can explain large wealth holdings at the top (De Nardi, 2004)
- **Entrepreneurship**
  - Utility flow from running a business, capturing non-pecuniary benefits net of effort or disutility cost
  - Non-pecuniary benefits are important explanations for occupational choice (Hamilton, 2000, Hurst and Pugsley, 2010)

Foundations of wealth in the utility (III)

- **Service flows from wealth**
  - Capital is embodied in tangible of financial assets, yielding service flows (e.g. housing)
  - ”Money in utility” models
  - ”Many goods provide different types of utility” (Poterba and Rotemberg, 1987), including wealth services
  - Utility flows from assets needed to better fit financial data (Piazzesi et al. 2007, Stokey, 2009, Kiyotaki et al., 2011)

Should we redistribute ”from the ant to the grasshopper”?

Wealth inequality considered fair

- Equality of opportunities: everybody has the same opportunities to save, conditional on labor income
- Capital accumulated by sacrificing earlier consumption

$\rightarrow$ g_i uncorrelated with k_i, $\bar{g}_k = 1$ and $\tau_k = 0$

Wealth inequality considered unfair

- Conditional on labor income, higher wealth comes from higher patience δ_i, preferences for wealth a_i, higher returns r_i
- Higher wealth comes from higher inheritance k_i^{init}

$\rightarrow$ g_i decreasing in k_i, $\bar{g}_k < 1$ and $\tau_k > 0$

Wealth as a tag

- Wealth can be a tag for a characteristic society cares about, but taxes cannot directly condition on
- E.g. society may want to compensate people from poorer backgrounds
  - Higher wealth is a tag for richer family background
  - Tax wealth, even if society does not care about wealth per se or tastes for wealth
- E.g. ability

→ $corr(g_i, k_i) < 0$ and $\tau_k > 0$, even if g_i may not depend on k directly

Comprehensive nonlinear income tax

- In many countries "ordinary" capital income (e.g. interests from savings account) taxed jointly with labor income
- Comprehensive taxation $T_Y(y)$ where $y = rk + z$
- Optimal tax formula as in Mirrlees (1971) and Saez (2001)

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

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

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

$e_Y(y)$ local elasticity of y to $1 - T'_y(y)$

Income shifting

- Individual i can shift an amount x from labor to capital income at utility cost $d_i(x)$
- z_L^R, reported labor income, z_K^R reported capital income
- Optimal τ_k and τ_l depend on shifting elasticity to tax differential $\Delta\tau = \tau_L - \tau_K$
  - Infinite shifting elasticity $\rightarrow \tau_k = \tau_l = \tau_y$ comprehensive tax on income
  - No shifting elasticity $\rightarrow \tau_k$ and τ_l set according to their usual formulas
  - Finite shifting elasticity $\rightarrow \tau_k, \tau_l$ closer than what they would be without shifting

Consumption taxation (I)

- Can a consumption tax achieve more redistribution than a wealth tax and be more progressive than a labor income tax?
- Argument that it is not wealth *per se* that matters but how people use it (consuming vs. investing)

- Linear consumption tax at rate t_C, tax inclusive rate τ_c such that $1 - \tau_c = 1/(1 + t_c)$
- Agents care about real wealth $k^r = k(1 - \tau_c)$
- Budget constraint in terms of real wealth

$$\frac{dk_i^r(t)}{dt} = rk^r + (z_i - T_L(z_i))(1 - \tau_C) + G(1 - \tau_C) - c$$

- Equivalent to a setting with higher $T_L(z)$ and $\tau_c = 0$, + tax on k^{init}

Consumption taxation (II)

→ Although τ_C successfully tax initial wealth, it has no long term effect on distribution of real wealth (as in Auerbach and Kotlikoff, 1987, Kaplow, 1994, Auerbach, 2009)

- Example: two individuals with same labor income and heterogeneous tastes for wealth
  - Same labor income tax
  - Wealth lovers pay more consumption taxes in steady state, but paid less while building up their wealth (cross-section vs. life-time distribution)

Different types of capital assets

- J assets, with different returns r^j
- Different elasticities e^j_K (e.g. housing vs. financial assets)
- Different associated value judgments g^j_K

- Optimal τ^j_K for each asset depends on e^j_K, $\bar{g}^j_K$ and cross-elasticities $e_{K^s,(1-\tau^j_K)}$

$$\tau^j_K = \frac{1 - \bar{g}^j_K - \sum_{s \neq j} \tau^s_K \frac{k^{m,s}}{k^{m,s}} e_{K^s,(1-\tau^j_K)}}{1 - \bar{g}^j_K + e^j_K}$$

with $\bar{g}_K = \frac{\int_i g_i k^j_i}{\int_i k^j_i}$, $\quad e^j_k = \frac{\bar{r}^j}{k^{m,j}} \cdot \frac{dk^{m,j}}{d\bar{r}^j} > 0, \quad e_{K^s,(1-\tau^j_K)} = \frac{\bar{r}^j}{k^{m,s}} \cdot \frac{dk^{m,s}}{d\bar{r}^j}$

Taxation of top incomes

- **Asymptotic nonlinear formula**

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

- **Optimal linear tax in top bracket**

$$\tau_K^{top} = \frac{1 - \bar{g}_K^{top}}{1 - \bar{g}_K^{top} + \alpha_K^{top} \cdot e_K^{top}}$$

with $\alpha_K^{top} = \frac{E[k_i|k_i \geq k^{top}]}{E[k_i|k_i \geq k^{top}] - k^{top}}$, k^{top} threshold for top bracket

- Since capital income very concentrated, wide applicability for this formula

Numerical application to U.S. taxation

Capital income is more unequally distributed than labor income

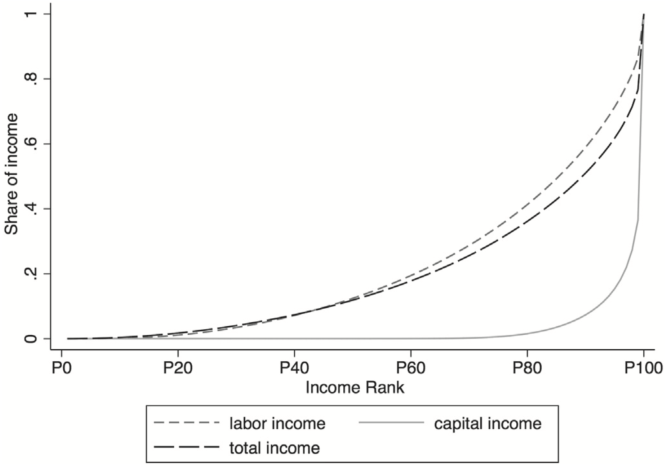

Figure: **Lorenz curves for capital, labor, and total income, 2007**

At the top, total income is mostly capital income

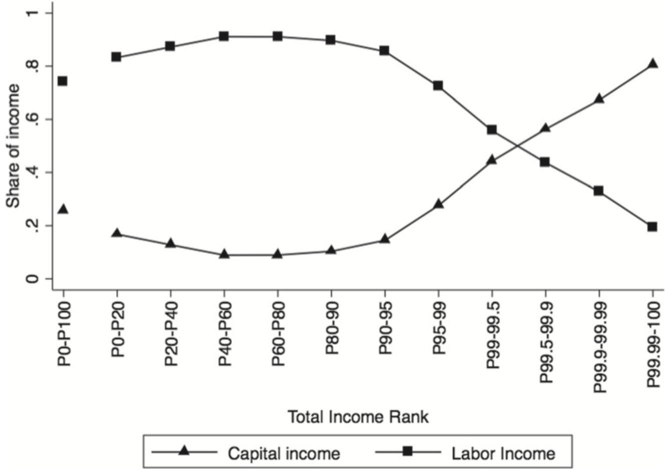

Figure: **Capital and labor incomes as a share of total income, 2007**

Two-dimensional heterogeneity in labor and capital income

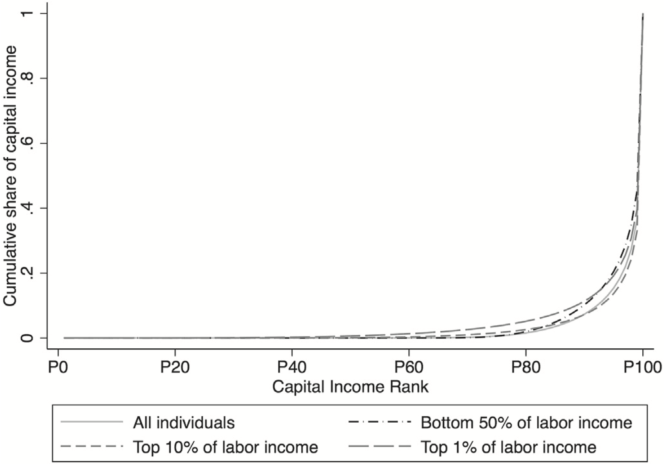

Figure: **Lorenz curves for capital income, conditional on labor income, 2007**

Methodology for computing optimal tax schedules

- IRS 2007 tax data on labor and capital income distributions
- Assume constant elasticities of labor, capital and total income ($e = 0.25, 0.5, 1$)
- Saez (2001) methodology to compute optimal tax schedule
  - Invert individual choices of labor, capital and total income to obtain latent types
  - Fit non-parametrically distribution of latent types and Pareto parameters
  - Compute optimal T' using sufficient statistic formulas
- Social preferences for redistribution: $g_i = \frac{1}{disposable\ income_i}$

Optimal capital income tax schedule $T'_K(rk)$

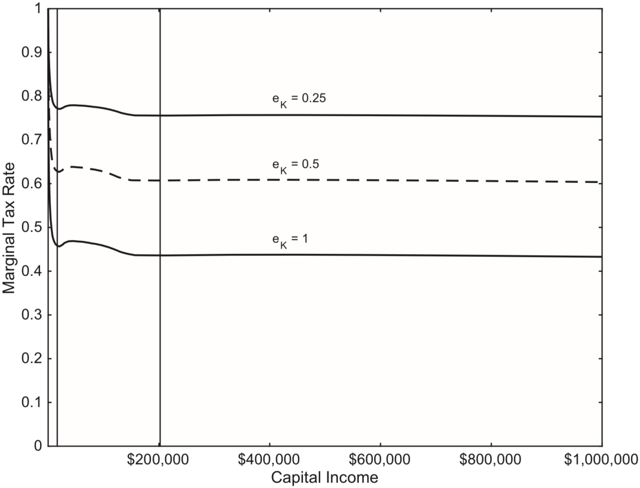

Figure: **Optimal marginal capital income tax rates**

Optimal labor income tax schedule $T_L'(z)$

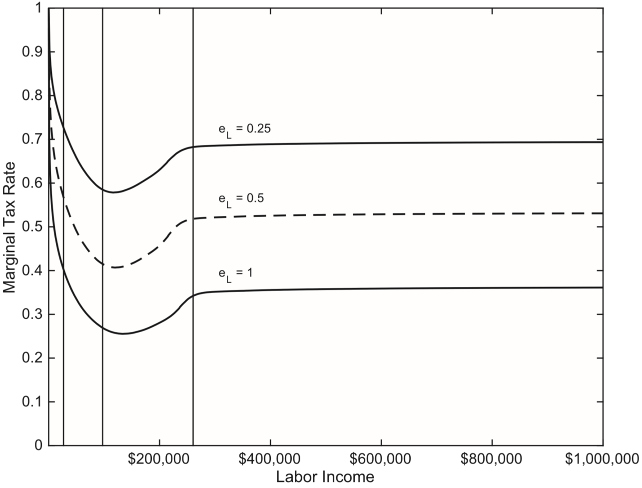

Figure: Optimal marginal labor income tax rates

Optimal comprehensive tax schedule $T'_Y(rk+z)$

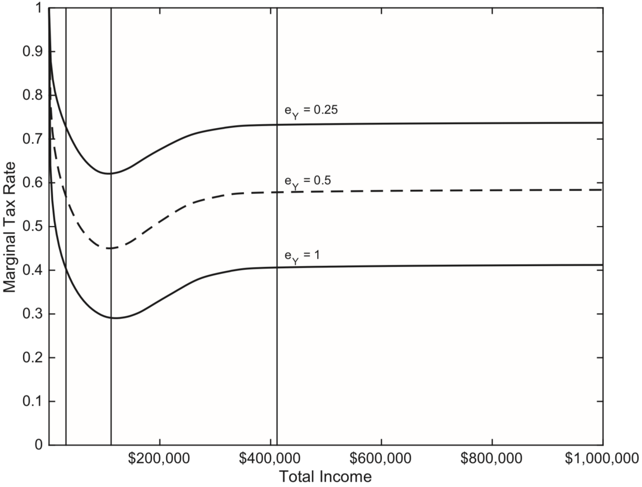

Figure: Optimal marginal comprehensive income tax rates

Connection with earlier models

- General framework: derived formulas can be applied using other specific elasticities, determined by primitives or type of reform considered

- **Chamley-Judd**
  - $e^{anticipated} = \infty$ if reform implemented in the very distant future
  - $e^{ss} = \infty$, no wealth in the utility function

- **Aiyagari model with uncertainty**
  - $e^{anticipated} < \infty$
  - $e^{ss} < \infty$

- Sluggish adjustment to reform in all models, except with linear utility

Conclusion

- Tractable new model for capital taxation
- Link to policy debate and empirics
- Incorporating equity-efficiency tradeoff
- Framework can accommodate different social objectives