Efficient Labor and Capital Income Taxation over the Life Cycle

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Motivation: Tax Policy Practice and Theory

- **Tax policy practice in most countries**
  - Labor income: non-linear schedules with changing marginal tax rates
  - Based on current, annual earnings
  - Tax capital income in addition (capital income tax revenue/total tax revenue ≈ 15-30% USA and EU)
- **Approaches to optimal income taxation in public economics**
  1. Labor income taxation: Diamond (AER '98), Saez (ReStud '01)
  2. Life cycle model: Atkinson and Stiglitz (JpubE '76)
  3. NDPF: Farhi and Werning (ReStud '13), Kocherlakota (Ecma '05)

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- **Approaches to optimal income taxation in public economics**
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     - **Builds on Mirrlees (71)**
     - **Link to data (where possible) – sufficient statistics.**
     - **No explicit capital income taxation, however.**

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- **Approaches to optimal income taxation in public economics**
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  2. Life cycle model: Atkinson and Stiglitz (JpubE '76)
     - **Influential benchmark. Plausible case for zero capital tax.**
     - **One dimension of heterogeneity, labor tax sufficient**
     - **Data $\neq$ A-S model: changes in (within cohort) inequality over life cycle**

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     - **Risk and changes in inequality**
     - **Do not characterize taxes (only wedges)**
     - **Tax interpretation would require arbitrary amount of sophistication in tax systems**
     - n^{t-1} **tax schedules.** $\neq$ **current practice of taxing on annual current earnings**

Motivation: Goals

- Tractable life cycle model, government uses policy instruments as is current practice (surprisingly little work)
- Key ingredients:
  - Government has "realistic" policy instruments at disposal: **linear taxes on current capital income and non-linear taxes on current labor income**
  - **Wages change over the life cycle**
  - **Key question I: does government want to tax capital income?**
  - **Key question II: what shapes optimal labor income taxation in dynamic environments?**
  - Also explore age-dependency as potential middle ground

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Motivation: Key Results

- **Key question I: does government want to tax capital income?**
- **Yes.**
  - Derive new formula: very simple and intuitive equity-efficiency relationship.
  - Quantitative exercises: 15% tax rate on capital income
  - $\neq$ conventional Atkinson-Stiglitz-Chamely-Judd wisdom of $\tau^k = 0$
- **Key question II: optimal labor income taxation in dynamic environments versus static environments?**
- **Key difference:**
  - Redistribution and insurance can be separated in dynamic framework
  - Taxes serve two roles
    1. Redistributing income between individuals to keep inequality in check
    2. Insurance against idiosyncratic wage risk
  - Insurance puts (Pareto) lower bound on taxes

Relationship to previous work

- Atkinson-Stiglitz (JPubE '76) and generalization afterwards: optimal zero capital tax in life cycle model
- NDPF: Farhi and Werning (ReStud '13), Kocherlakota (Ecma '05), Kocherlakota-Golosov-Tsyvinski (ReStud '03)
- Inheritance Taxation: Piketty and Saez (Ecma '13)

Relationship to previous work

- Atkinson-Stiglitz (JPubE '76) and generalization afterwards: optimal zero capital tax in life cycle model
  - Only one source of heterogeneity in their model, so one instrument (labor tax) sufficient, here multiple sources as inequality changes over life cycle $\rightarrow \tau^k > 0$ as additional instrument
- NDPF: Farhi and Werning (ReStud '13), Kocherlakota (Ecma '05), Kocherlakota-Golosov-Tsyvinski (ReStud '03)
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  - Arbitrarily complex tax systems $\rightarrow$ concerns about implementability. Here taxes on current income as common practice
  - Tax savings when income effects reduce labor supply (evidence?), but not because of wealth inequality/concentration; in general wealth inequality not well defined
  - Here: no income effects, capital tax to insure and redistribute
- Inheritance Taxation: Piketty and Saez (Ecma '13)

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- Inheritance Taxation: Piketty and Saez (Ecma '13)
  - Also feature breakdown of conventional Atkinson-Stiglitz-Chamely-Judd wisdom of $\tau^k = 0$
  - Two dimensional heterogeneity in their model: parental preferences and income

Outline for Rest of Talk

1. **Model and Notation**
2. **Optimal Labor and Capital Income Taxation**
3. **Numerical Simulations**

Formal Framework

- Individuals live for T periods and are characterized by θ_t in each period
- Labor income: $y_t = \theta_t l_t$
- No income effects: $U(c_t - v(l_t))$

  $\rightarrow$ empirical literature has typically not rejected a zero income elasticity on labor supply or found very small effects (Gruber and Saez (2002), Kleven and Schultz (2013))
  $\rightarrow$ two simplifications

  1. $y_t(\theta_t)$ instead of $y_t(\theta_t, a_t)$

- Value function of individual

$$V_t(\theta_t, a_t(\theta^{t-1})) = \max_{a_{t+1}, y_t} U\left(c_t - v\left(\frac{y_t}{\theta_t}\right)\right) + \int_{\theta_{t+1}} V_{t+1}(\theta_{t+1}, a_t) dF_{t+1}(\theta_{t+1}|\theta_t)$$

- subject to budget contraint:
  $c_t + a_{t+1} = y_t - \mathcal{T}(y_t) + (1+r)(1-\tau)a_t(\theta^{t-1})$

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$$c_t + a_{t+1} = y_t - \mathcal{T}_t(y_t) + (1+r)(1-\tau_t)a_t(\theta^{t-1})$$

$\Rightarrow$ Taxes possibly age-dependent

- The government solves

$$\max_{\tau,\mathcal{T}} \int_{\theta_1} V_1(\theta_1, 0) d\tilde{F}(\theta_1)$$

- subject to present value budget constraint
- where
  - $\tilde{F}(\theta_1)$ are Pareto weights
  - and $\tau = \{\tau_2, \tau_3, ..., \tau_T\}$
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- Static model (Mirrlees-Diamond-Saez): anything goes (Werning 2007), can justify zero taxes for some weights
- Dynamic model: no longer true...

- Two solution methods

1. Optimal control (first-order approach, mechanism design)
2. Tax pertubation

- This talk:
  - Two period model now
  - Just age-independent taxes

- Optimal $T'(y) = F(\mathcal{M}, LS, \mathcal{S})$

1. $\mathcal{M}$: mechanical effect depends on
   - Taste for redistribution
   - Income distribution
   - Insurance motives: risk-aversion, income risk
2. LS: labor supply distortion
   - Elasticity
3. S: savings effect
   - Non-zero savings taxes create fiscal externalities

$$\mathcal{S}_1(\theta_1) = \tau \int_{\theta_1}^{\overline{\theta}_1} \frac{\partial a_2(\tilde{\theta}_1)}{\partial \mathcal{T}'(y_1(\tilde{\theta}_1))} dF_1(\tilde{\theta}_1)$$

Proposition

Optimal labor taxes:

$$\frac{\mathcal{T}'(y(\theta))}{1-\mathcal{T}'(y(\theta))} = \left(1+\frac{1}{\varepsilon(\theta)}\right)\frac{1}{\lambda\theta \times f^*} \times \left[\sum_{i=1}^{2}\mathcal{M}_i(\theta)+\mathcal{S}_i(\theta)\right].$$

$$f^* = f_1(\theta) + \frac{1}{1+r}\int_\Theta f_2(\theta|\theta_1)dF_1(\theta_1)$$

- Can decompose

$$\mathcal{M}_i = \mathcal{M}_i^I + \mathcal{M}_i^R$$

- $\mathcal{M}_i^R$: redistribution between θ_1 types
  - Governed by welfare weights $\tilde{f}$
- $\mathcal{M}_i^I$: insurance for θ_2 types.
  - Governed by income risk and risk aversion

Optimal Capital Tax Rate

- Consider small $d\tau^k > 0$.
- Behavioral Responses (lowers wealth accumulation – efficiency cost), Mechanical and Welfare effect (redistribution, insurance)

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- $\tau^k > 0$ **likely, for commonly used social welfare criteria**
- τ^k **increasing in wealth inequality**

Optimal Capital Tax Rate

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- **Breakdown of A-S (1976)?**
- A-S looks at case where individuals retire in second period. Savings taxes superfluous and harmful.
- Suppose, labor income constant across two periods: $\tau^k = 0$.
- With non-constant labor income: multiple source of heterogeneity, multiple instruments beneficial

Optimal Capital Tax Rate

Proposition

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- **Comparison to NDPF**: capital wedge > 0 because of income effects, here no income effects.
- With realistic tax instruments wealth inequality drives capital taxation (wealth distribution not well defined in NDPF model).

Numerical Exploration

Numerical Simulation: Risk over the Life Cycle

- Karahan and Ozkan (2013)

$$y_a^i = f(X_a^i) + \tilde{y}_a^i$$

$$\tilde{y}_a^i = \alpha^i + z_a^i + \phi\epsilon_a^i$$

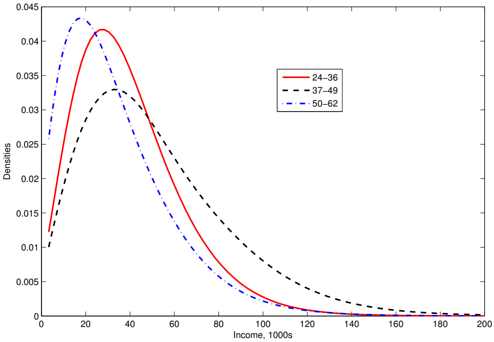
$$z_a^i = \rho_a z_{a-1}^i + \pi\eta_a^i$$

- α^i : permanent fixed-effect
- ϵ_a^i transitory: measurement error, bonuses, overtime
- η_a^i permanent: layoff, promotion
- ρ_a persistence of permanent events

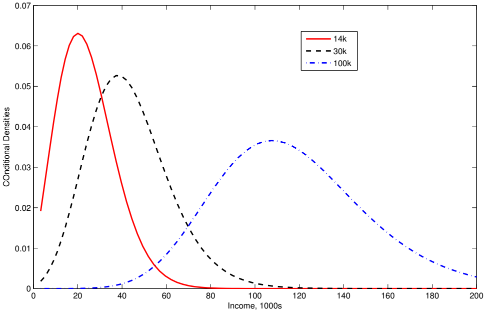
Calibration

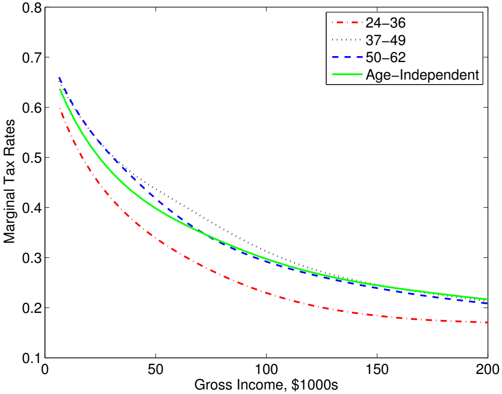
- We use parameters from Karahan and Ozkan (2013) who find two structural breaks in parameters
- Simulate millions of earnings histories given parameter estimates
- We consider three period model with age classes 24-36, 37-49 and 50-62
- CRRA utility (=1.5) and constant labor supply elasticity (=1/3)

Calibration Cross Section Distribution

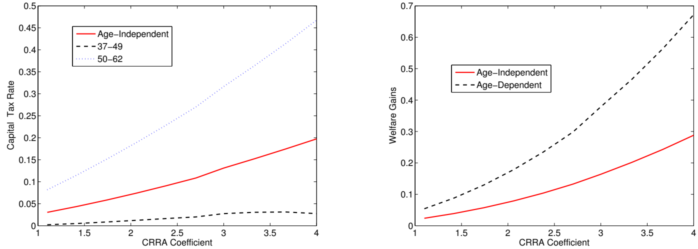


Calibration Conditional Distribution





- If age-dependent: taxes on the young the lowest
- Reason: higher insurance value of taxation on the old

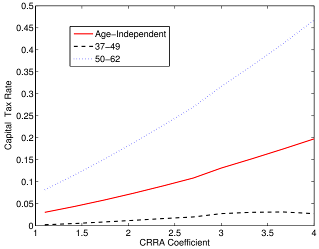


(a) Risk-Aversion and Capital Taxes (b) Welfare Gains of Capital Taxation

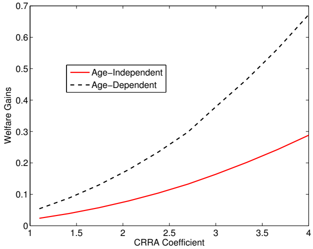
FIGURE : Capital Income Taxes

- Baseline capital income tax around 15%
- Highly increasing in risk aversion

Simulation Optimal Capital Income Taxes



(a) Risk-Aversion and Capital Taxes

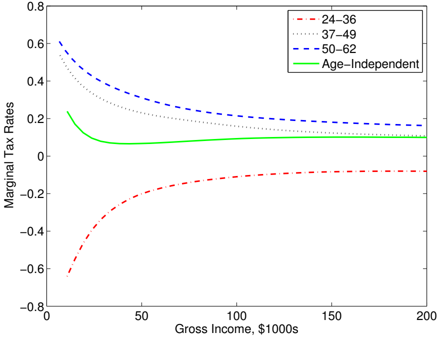


(b) Welfare Gains of Capital Taxation

Figure : Capital Income Taxes

- Driven by desire to tax wealth of the old (like to leave young untaxed)
- Higher wealth inequality at old age

- In a framework with heterogeneous agents, there is no correct or incorrect normative objective.
- To what extent can redistributive taxation be grounded on the idea of social insurance?
- We therefore make the following thought experiment: We consider a static economy where productivities are distributed as in the first period of our dynamic economy. We then consider a static Mirrlees problem and back out the Pareto weights that would yield the laissez-faire equilibrium as the optimum.



- Social insurance tax rate around 10% $>>$ 0
- If age-dependent insurance value increasing
- Negative marginal tax rates on the young to counteract later distortions

- Capital income taxes are not superfluous in simple life cycle model ($\neq$ Atkinson-Stiglitz)
  - Robust theoretical results
  - Numerical exercises: 15% on savings income
- Redistribution versus insurance distinction becomes meaningful in dynamic model
  - Puts lower bound on tax rates (around 10% in our exercises)
  - In static model, in contrast, anything goes
- Age-dependent: if feasible, suggest lowest taxes on the young
  - Main driver: insurance value increases over the life cycle