On the Optimal Design of Fiscal Policy

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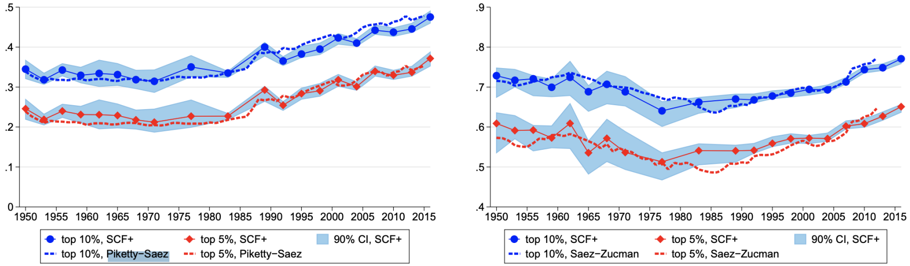
D1 PSE

November 2023

Income and wealth inequality have increased since 1950

Figure 5: Top 5% and top 10% income and wealth shares



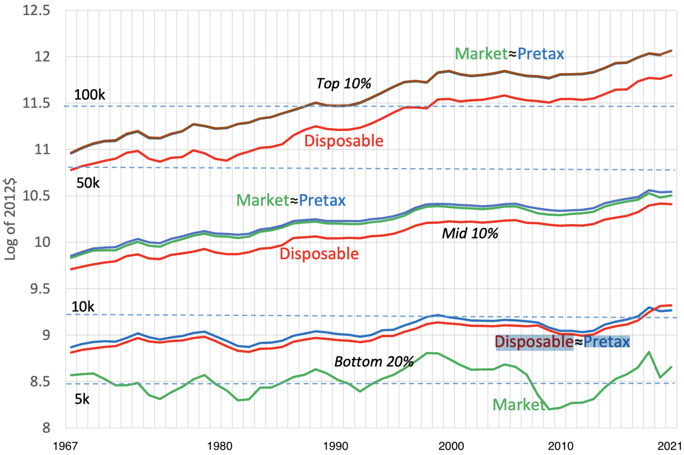
(a) Income

(b) Wealth

- Top-income and -wealth shares have increased (SCF+, United States)

  Kuhn, Schularick and Stein (2020)

Income and wealth inequality have increased since 1950



- Household income has been flat for 5 decades at the bottom (CPS, United States)
  Heathcote, Violante, Perri and Zhang (2022)

Rethinking fiscal policy

- High levels of inequality
  Piketty Saez (2003), Heathcote Perri Violante (2010), Kuhn, Schularick and Stein (2020), Saez and Zucman (2020, 2022), Heathcote, Violante, Perri and Zhang (2022), ...

- New questions in the policy debate, on the role of the welfare state
  - Should we implement a Universal Basic Income?
  - Should we tax wealth?

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  - Should we implement a Universal Basic Income?
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- This class: rethinking fiscal policy
  - Optimal taxes at the household level
  - Old classical theoretical literature, new quantitative macro literature

Lecture 1

Capital and Wealth Taxes

Lecture 2

Labor Taxes and Transfers

On capital taxes

Should we tax capital?

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- Methodology
  - Ramsey plans
  - Quantitative heterogeneous-agent models

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  - Ramsey plans
  - Quantitative heterogeneous-agent models

- Deterministic, long-run, steady-state

Should we tax capital?

1. Optimal fiscal policy in representative-agent models

    - Define **Ramsey plans** to compute optimal taxes

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   - Insurance, redistribution, and life-cycle dynamics

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    - Capital taxes should be 34%
3. Optimal fiscal policy with heterogeneous capital returns
    - New facts on capital returns

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   - Insurance, redistribution, and life-cycle dynamics
   - Capital taxes should be 34%
3. Optimal fiscal policy with heterogeneous capital returns
   - New facts on capital returns
   - Capital taxes should be negative, wealth taxes should be positive

Literature Main references (many more at the end)

- On optimal fiscal policy in RA models and the latest controversies
  - **Chamley (1986)**, Judd (1985), Straub and Werning (2020)
  - Chari, Christiano, and Kehoe (1994), Farhi (2010), ...

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  - Bach, Calvet, and Sodini (2020), Smith et al. (2019), Becker and Hvide (2022), ...
- On models with entrepreneurs and heterogeneous capital returns
  - **Guvenen et al. (2023)**
  - Kitao (2008), Bhandari and McGrattan (2020), Boar and Knowles (2020), Gaillard and Wangner (2022), ...

Next week?

- Labor taxes, transfers and welfare programs
  - Labor taxes should be constant
  - Labor taxes should provide redistribution

Admin

- Requirements:

    1. Attend all sessions

    2. Present one paper (20mn) on Nov 14 / Nov 21

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     - Structure:
       + Short intro (question, what they do, what they find)
       + Detailed description of the model and main results
       + Main intuition for main results
     - Notation: short sentences, clean notation, self-contained slides, etc.
     - One line per bullet!
     - Time management

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  ❏ Send me an email to pick a paper in the list (first come...)

Admin Presentations Nov 14: On Capital Taxes

a. Hubmer, Krusell, and Smith (2020). "Sources of U.S. Wealth Inequality: Past, Present, and Future", NBER Macroeconomics Annual: Vol 35.

b. Ozkan, Hubmer, Salgado, and Halvorsen (2023). "Why Are the Wealthiest So Wealthy? A Longitudinal Empirical Investigation".

c. Gaillard and Wangner (2022). "Wealth, Returns, and Taxation: A Tale of Two Dependencies".

d. Xavier (2021). "Wealth Inequality in the US: the Role of Heterogeneous Returns."

e. Gerritsen, Jacobs, Spiritus, Rusu (2022). "Optimal Taxation of Capital Income with Heterogeneous Rates of Return."

Admin Presentations Nov 21: On Labor Taxes and Transfers

On labor taxes and/or the welfare state

f. Heathcote Storesletten Violante (2020), "Optimal Progressivity with Age-Dependent Taxation", Journal of Public Economics.

g. Heathcote Storesletten Violante (2020), "How Should Tax Progressivity Respond to Rising Income Inequality?', JEEA.

h. Holter, Krueger, Stepanchuk (2019), "How Do Tax Progressivity and Household Heterogeneity Affect Laffer Curves?", QE.

i. Krueger & Ludwig (2022), "High Marginal Tax Rates on the Top 1%? Lessons from a Life Cycle Model with Idiosyncratic Income Risk", AEJ Macro.

j. Daruich & Fernandez (2022). "Universal Basic Income: A Dynamic Assessment", AER.

Admin Presentations Nov 21: On Labor Taxes and Transfers

k. Caroll, Luduvice & Young (2023), "Optimal Fiscal Reform with Many Taxes".

l. Guner, Lopez-Daneri and Ventura (2023), "The Looming Fiscal Reckoning: Tax Distortions, Top Earners, and Revenues", RED.

On taxes and the couple

m. Guner, Kaygusuz and Ventura (2020), "Child-Related Transfers, Household Labor Supply and Welfare", Review of Economic Studies

n. Bick and Fuchs-Schuendeln (2018), "Taxation and Labor Supply of Married Couples across Countries: A Macroeconomic Analysis"

o. Holter, Krueger, Stepanchuk (2023), "Until the IRS Do Us Part: Optimal Taxation of Families"

1. Optimal Taxes in a Deterministic Growth Model

General motivation

- Optimal taxes in a **competitive equilibrium**

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  - Households' behaviors and prices

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- Taxes: functional forms

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- Commitment in time-zero

General motivation

- Optimal taxes in a **competitive equilibrium**
  - Households' behaviors and prices
- Taxes: functional forms
- Commitment in time-zero
- Outline: environment; equilibrium; Ramsey plan

- Preferences of the representative household:

$$\sum_{t=0}^{\infty} \beta^t u(c_t, l_t), \tag{1}$$

where c_t: consumption, l_t: leisure.

Environment Preferences and resources

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$$\sum_{t=0}^{\infty} \beta^t u(c_t, l_t), \tag{1}$$

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- The two resource constraints are given by

$$l_t + n_t = 1$$

  where n_t: labor, and

Environment Preferences and resources

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$$l_t + n_t = 1$$

where n_t: labor, and

$$g_t + c_t + k_{t+1} = A_t F(k_t, n_t) + (1 - \delta) k_t, \tag{2}$$

where g_t: government expenditure, A_t: TFP, k_t: capital with k_0 is given.

Environment First-Best

- Planner problem

Environment First-Best

- Planner problem

- Two efficiency conditions

$$u_{c,t} A_t F_{n,t} = u_{l,t} \tag{3}$$

$$u_{c,t} = \beta u_{c,t+1} \left[A_{t+1} F_{k,t+1} + 1 - \delta \right] \tag{4}$$

Competitive Equilibrium with Taxes Three agents

- Representative household
- Representative firm
- Government

Competitive Equilibrium with Taxes Government

- Government
  - Spending g_t
  - Public debt b_t, labor tax τ_t^n, capital tax τ_t^k, lump-sum taxes T_t
  - b_0 given

Competitive Equilibrium with Taxes Government

- Government
  - Spending g_t
  - Public debt b_t, labor tax τ_t^n, capital tax τ_t^k, lump-sum taxes T_t
  - b_0 given

- Budget constraint:

$$g_t + b_t = \tau_t^k r_t k_t + \tau_t^n w_t n_t + b_{t+1}/R_t + T_t \tag{5}$$

where r_t: renting price of capital, w_t: price of labor, R_t: gross rate of return on one-period bonds from t to $t+1$.

Competitive Equilibrium with Taxes **Households**

- Household
  - Save in b_t and k_t
  - b_0 and k_0 given

Competitive Equilibrium with Taxes Households

- Household
  - Save in b_t and k_t
  - b_0 and k_0 given
- Maximizes utility given budget constraint:

$$c_t + k_{t+1} + b_{t+1}/R_t = (1 - \tau_t^n) w_t n_t + (1 - \tau_t^k) r_t k_t - T_t + (1 - \delta) k_t + b_t \tag{6}$$

Competitive Equilibrium with Taxes Households

- Household's maximization problem

Competitive Equilibrium with Taxes Households

- Household's maximization problem

- Three first-order conditions

$$u_{l,t} = u_{c,t} w_t (1 - \tau_t^n) \tag{7}$$

$$u_{c,t} = \beta u_{c,t+1} [(1 - \tau_{t+1}^k) r_{t+1} + 1 - \delta] \tag{8}$$

$$R_t = (1 - \tau_{t+1}^k) r_{t+1} + 1 - \delta \tag{9}$$

Competitive Equilibrium with Taxes Firms

The representative firm is standard and maximizes its profit every period:

$$r_t = A_t F_{k,t} \tag{10}$$

$$w_t = A_t F_{n,t} \tag{11}$$

Competitive Equilibrium with Taxes Definition

Let $x \equiv \{x_t\}_{t=0}^{\infty}$.

Definition

A **feasible allocation** is a sequence (k, c, n, g) such that the resource constraint (2) holds $\forall t \geq 0$.

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Definition

A **price system** is a non-negative bounded sequence (w, r, R).

Definition

A **government policy system** is a sequence $(g, \tau_k, \tau_n, T, b)$.

Competitive Equilibrium with Taxes Definition

Definition

A **competitive equilibrium** is a feasible allocation, a price system, and a government policy, such that:

a. Given the price system and the government policy, the allocation solves the firm's problem and the household's problem

b. Given the allocation and the price system, the government policy satisfies the sequence of government budget constraints (5).

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- An infinity of CE! Why?

Competitive Equilibrium with Taxes Distortions

Claim

The first-best allocation requires capital and labor taxes to be zero.

Competitive Equilibrium with Taxes **Distortions**

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The first-best allocation requires capital and labor taxes to be zero.

- Labor and capital taxes are said to be distortionary.
- What about τ_0^k? What about lump-sum taxes?

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The first-best can be implemented by lump-sum taxes and balanced budget.

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Claim
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- What about τ_0^k? What about lump-sum taxes?

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The first-best can be implemented by lump-sum taxes and balanced budget.

Claim
Ricardian equivalence: the first-best allocation can be implemented by any path $\{b_t\}$ for debt, and $T_t = g_t + b_t - b_{t+1}/R_t$.

Ramsey Plan Definition

Government

- Choose sequences of tax rates at time-0
- Anticipate households' responses to tax plans
- Benevolent

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A Ramey problem is to choose a competitive equilibrium which maximizes (ex ante) consumer welfare.

Ramsey Plan Definition

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- Anticipate households' responses to tax plans
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Definition

A Ramey problem is to choose a competitive equilibrium which maximizes (ex ante) consumer welfare.

- Rule-out lump-sum taxes and assume τ_0^k is given. Why?

Ramsey Plan Definition

- A Ramsey plan is a complicated problem
  - Choose allocations, price system, and government policy
  - To maximize utility (1)
  - S.T. all equations holds: resource (2), gov BC (5), HH BC (6) & FOC (7), (8), (9), Firm FOC (10), (11)

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$\Rightarrow$ Goal: to simplify the Ramsey plan

Ramsey Plan Simplify the problem

- First, we can ignore the household budget constraint

Ramsey Plan **Simplify the problem**

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  - Euler theorem: $F(k,n) = F_k k + F_n n$

Ramsey Plan Simplify the problem

- First, we can ignore the household budget constraint
  - Euler theorem: $F(k,n) = F_k k + F_n n$
  - Resource constraint (2) + govt budget constraint

$$g_t + c_t + k_{t+1} = A_t F(k_t, n_t) + (1-\delta)k_t \tag{2}$$

$$g_t + b_t = \tau_t^k r_t k_t + \tau_t^n w_t n_t + b_{t+1}/R_t \tag{5}$$

Ramsey Plan Simplify the problem

- Dual approach: use **after-tax prices**
  - $\tilde{r}_t \equiv (1-\tau_{kt})F_{k,t}$ and $\tilde{w}_t \equiv (1-\tau_{nt})F_{n,t}$
  - Solve for $\tilde{r}_t$ and $\tilde{w}_t$ instead of r_t and w_t

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  - Get rid of two controls: τ_t^k and τ_t^n, and two FOC (firm)

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  - Solve for $\tilde{r}_t$ and $\tilde{w}_t$ instead of r_t and w_t
  - Get rid of two controls: τ_t^k and τ_t^n, and two FOC (firm)
- Rewrite government's budget constraint

Ramsey Plan Lagrangian

$$L = \sum_{t=0}^{\infty} \beta^t \left\{ u(c_t, 1-n_t) + \right.$$

Ramsey Plan Lagrangian

$$L = \sum_{t=0}^{\infty} \beta^t \left\{ \begin{array}{c} u(c_t, 1 - n_t) + \\ + \Phi_t \left[A_t F(k_t, n_t) - \tilde{r}_t k_t - \tilde{w}_t n_t - g_t + b_{t+1}/R_t - b_t\right] + \\ \\ \\ \\ \end{array} \right.$$

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Ramsey Plan Lagrangian

$$
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$$

Ramsey Plan Lagrangian

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$$

- No more taxes!
- What do I chose?
  - Allocations $\{c_t, k_{t+1}, n_t\}$ and after-tax prices $\{\tilde{w}_t, \tilde{r}_t, R_t\}$

Ramsey Plan Lagrangian

$$L = \sum_{t=0}^{\infty} \beta^t \left\{ \begin{array}{c} u(c_t, 1-n_t)+ \\ +\, \Phi_t \left[A_t F(k_t, n_t) - \tilde{r}_t k_t - \tilde{w}_t n_t - g_t + b_{t+1}/R_t - b_t\right] + \\ +\, \lambda_t \left[A_t F(k_t, n_t) + (1-\delta)k_t - k_{t+1} - c_t - g_t\right] + \\ +\, \mu_{1t} \left[u_l(c_t, 1-n_t) - u_c(c_t, 1-n_t)\tilde{w}_t\right] + \\ +\mu_{2t} \left[u_c(c_t, 1-n_t) - \beta u_c(c_{t+1}, 1-n_{t+1})\left(\tilde{r}_{t+1} + 1 - \delta\right)\right] \\ +\mu_{3t} \left[R_t - \tilde{r}_{t+1} + 1 - \delta\right] \end{array} \right\}$$

- No more taxes!

- What do I chose?
  - Allocations $\{c_t, k_{t+1}, n_t\}$ and after-tax prices $\{\tilde{w}_t, \tilde{r}_t, R_t\}$

- Then I can compute taxes:

$$\tilde{r}_t = (1-\tau_t^k) r_t = (1-\tau_t^k) F_k(n_t, k_t)$$
$$\tilde{w}_t = (1-\tau_t^n) w_t = (1-\tau_t^n) F_n(n_t, k_t)$$

Ramsey Plan Lagrangian

$$L = \sum_{t=0}^{\infty} \beta^t \left\{ \begin{array}{c} u(c_t, 1-n_t)+ \\ +\Phi_t \left[A_t F(k_t, n_t) - \tilde{r}_t k_t - \tilde{w}_t n_t - g_t + b_{t+1}/R_t - b_t\right] + \\ +\lambda_t \left[A_t F(k_t, n_t) + (1-\delta)k_t - k_{t+1} - c_t - g_t\right] + \\ +\mu_{1t} \left[u_l(c_t, 1-n_t) - u_c(c_t, 1-n_t)\tilde{w}_t\right] + \\ +\mu_{2t} \left[u_c(c_t, 1-n_t) - \beta u_c(c_{t+1}, 1-n_{t+1}) \left(\tilde{r}_{t+1} + 1 - \delta\right)\right] \\ +\mu_{3t} \left[R_t - \tilde{r}_{t+1} + 1 - \delta\right] \end{array} \right\}$$

Ramsey Plan Capital taxes in the long-run

- FOC w.r.t. k_{t+1}

$$\lambda_t = \beta \left[\Phi_{t+1} \left(A_{t+1}F_k(k_{t+1}, n_{t+1}) - \tilde{r}_{t+1}\right) + \lambda_{t+1}(A_{t+1}F_k(k_{t+1}, n_{t+1}) + 1 - \delta)\right]$$

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- Long-run non-stochastic steady-state: $g_t = g$, $A_t = A$, assuming the steady-state converges

$$\lambda = \beta\left[\Phi\left(r - \tilde{r}\right) + \lambda(r + 1 - \delta)\right]$$

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- Long-run non-stochastic steady-state: $g_t = g$, $A_t = A$, assuming the steady-state converges

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- Under some conditions, $\lambda + \Phi > 0 => r = \tilde{r} => \tau_k = 0$

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  - How to finance g in the long-run? With labor taxes! (or assets?)
  - An **efficiency** argument
- But in the short run... $\tau_0^k = \bar{\tau}$!
  - Terrible time-consistency problem

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$\Rightarrow$ Not as general as we thought it was...

Optimal Fiscal Policy in RBC Model Taking stock

- Capital taxes should be zero. . .
- . . . in the long-run, and under some conditions

2. Optimal Fiscal Policy in Standard Aiyagari Models

Fiscal policy in standard Aiyagari models Capital taxes

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- Environment; equilibrium; optimal policy

Environment Demography

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- Value consumption and labor:

$$\mathbb{E} \sum_{j=1}^{J} \beta^{j-1} u(c_j, n_j)$$

Environment Demography

- Idiosyncratic productivity of agent with type i and age j: $\varepsilon_j \alpha_i \eta$
- Heterogeneity in several dimensions
  - Age j: ε_j captures the age-profile productivity, with $\varepsilon_j = 0 \; \forall \; j > J_r$
  - Type i: α_i distributed with probability p_i
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- Household state: (a, η, i, j)

- Technology

$$G_t + C_t + K_{t+1} - (1-\delta)K_t = K_t^{\alpha} N_t^{1-\alpha} \tag{12}$$

- Aggregate stationary steady-state
  - Aggregates are constant... but not idiosyncratic variables!

Environment Government

- Social Security
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- Exogenous spending G_t financed by
  - A linear tax τ_k on capital income $r_t(A_t + Tr_t)$
  - A linear tax τ_c on consumption c
  - A progressive tax $T(.)$ on taxable labor income $y_L - \tau_{ss} min\{y_L, \overline{y}\}$ where $y_L = w\varepsilon_j \alpha_i \eta$

Competitive Equilibrium Definition

A stationary recursive competitive equilibrium (RCE) is:

- a policy $\{G, \tau_c, \tau_k, T, \tau_{ss}, \overline{y}, SS\}$
- a policy for the firm $\{N, K\}$
- value and policy functions for the household $\{\nu(a,\eta,i,j), c(a,\eta,i,j), a'(a,\eta,i,j), n(a,\eta,i,j)\}$ and bequests (Tr)
- prices $\{w, r\}$ and a distribution $\Phi(a,\eta,i,j)$

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s.t.:

1. Given prices and policies, the household behaves optimally:

$$\nu(a,\eta,i,j) = \max_{c,a',n} u(c,n) + \beta\psi_j \int_{\eta'|\eta} \nu(a',\eta',i,j+1)\pi(\eta'|\eta) \text{ s.t.}$$

$$(1+\tau_c)c + a' = y_L - \tau_{ss} min\{y_L, \overline{y}\} - T(y_L^T) + [1 + r(1-\tau_k)](a + Tr) \text{ if } j < J_r, \text{ where } \; y_L = w\varepsilon_j\alpha_i\eta n$$

$$(1+\tau_c)c + a' = ss + [1 + r(1-\tau_k)](a + \text{Tr}) \text{ if } j \geq J_r$$

$$a' \geq \underline{a}$$

Competitive Equilibrium **Definition**

2. Firms behave optimally:

$$r = \alpha \left(\frac{N}{K} \right)^{1-\alpha} - \delta, \text{ and } w = (1-\alpha) \left(\frac{K}{N} \right)^{\alpha}$$

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3. Social Security system is balanced:

$$\tau_{ss} \int \min\{w\alpha_i\varepsilon_j \eta n(a,\eta,i,j), \overline{y}\}\Phi(a,\eta,i,j) = SS \int \Phi(a,\eta,i,j \geq J_r)$$

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5. The government's budget constraint holds:

$$G = \int \tau_k r(a+Tr)\Phi(a,\eta,i,j) + \int T(y_L^T(\eta,i,j))\Phi(a,\eta,i,j)\cdots$$
$$+\int \tau_c c(a,\eta,i,j)\Phi(a,\eta,i,j)$$

Competitive Equilibrium Definition

6. Markets clear:

$$K = \int a\Phi(a, \eta, i, j)$$

$$N = \int \varepsilon_j \alpha_i \eta n(a, \eta, i, j)\Phi(a, \eta, i, j)$$

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7. The measure is stationary: $\forall \mathcal{J}$ s.t. 1 non in $\mathcal{J}$,

$$\Phi(A \times E \times \mathcal{I} \times \mathcal{J}) = \int Q((a, \eta, i, j); A \times E \times \mathcal{I} \times \mathcal{J})\Phi(a, \varepsilon, i, j)$$

where

$$Q(a, \eta, i, j; A \times E \times \mathcal{I} \times \mathcal{J}) = \cdots$$

$$\psi_j \int 1_{(a'(a,\eta,i,j)\in A)\times(i\in\mathcal{I})\times(j+1)\in\mathcal{J})} \sum_{\eta'} P(\eta' \in E|\eta)\Phi(a, \eta, i, j)$$

Calibration

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  - Agents born at age 20, retire at age 65, die w.p.1 at age 100
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- Technology: $\alpha = 0.36$, δ s.t. $\frac{I}{Y} = 25\%$
- Heterogeneity
  - Age-profile productivities $\{\epsilon_j\}$ follow Hansen (93)
  - Two types $\{\alpha_i\}$
  - Productivity $\{\eta\}$ follows Storesletten, Telmer, Yaron (04)

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- Government
  - G s.t. $G/Y = 0.17$
  - $\tau_c = 5\%$
  - Total income (including capital) taxed a la Gouveia and Strauss (94)

$$T(y) = \kappa_0 \left(y - \left(y^{-\kappa_1} + \kappa_2 \right)^{-\frac{1}{\kappa_1}} \right)$$

    where κ_0 captures the average tax rate (26%), κ_1 level of progressivity (0.76), κ_2 solves the budget constraint

Calibration A comment on tax functions

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  - Short-run capital gains are taxed differently in the U.S.
  - Real estate is taxed linearly
  - Corporate profits are taxed linearly
  - Measurement issues...

Results Optimal plan

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- Redistribution motives
  - Tax capital to lower labor taxes

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- Evaluate life-cycle components
  - Drop η-shocks and α-types, retain ϵ-profiles and social security
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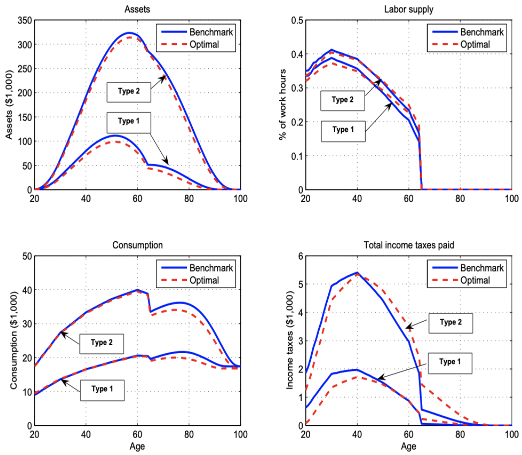

Figure 1: Life Cycle Profiles of Assets, Labor Supply, Consumption and Taxes

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  - Less elastic labor supply decreases τ_k
  - Robustness w.r.t.: IES, D/GDP, social welfare function, U, ...
  - No transitions (!!!)

3. Heterogeneous Capital Returns

Taxing capital? An ongoing debate

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- Policy: Taxing capital to redistribute?

Understanding capital? Mechanisms of accumulation

- **Basic Aiyagari model** fails to generate realistic wealth distributions
  - Standard log-AR(1) process (Floden and Lindé 2001) & preferences

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Data (04)	-0%	1%	4%	12%	83%	65%	34%
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  - De Nardi and Fella (2017)
    - Earnings,

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  - An example: Ferriere, Grübener, Navarro, and Vardishvili (2023)

- Why do some households save so much?
  - Exact mechanisms matter for taxation purposes
  - De Nardi and Fella (2017)
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    - + Entrepreneurship, and more generally, **heterogeneous capital returns**

Heterogeneous returns Theory

- Heterogeneous capital returns: most promising theoretical avenue
  - Can generate fat tails in wealth distribution
    - Benhabib, Bisin, and Zhu (2011), Benhabib, Bisin, and Luo (2019)
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- Plausible in the data?

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Fagereng, Guiso, Malacrino, and Pistaferri (2020)

- Norwegian administrative data
  - Individual tax records 2004-2015
  - + Labor and capital income
  - + **Asset holdings and liabilities**

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    + **Asset holdings and liabilities**
  - Private business balance sheet
  - Housing transactions registry
  - Data on deposits and loans
- Compute individual returns to wealth

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- Very heterogeneous returns on wealth
  - Large heterogeneity: standard deviation 22.1%
  - Large scale dependence: from net worth-10th to 90th, returns $+18$pp
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$\Rightarrow$ Implications for taxation?

Implications for taxation

- Under **homogenous returns**, taxing capital $=$ taxing wealth

$$(1 + r(1 - \tau_k))a_i = (1 - \tau_a)(1 + r)a_i$$

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- What if returns are heterogeneous?

$$(1 + r_i(1 - \tau_k))a_i \text{ vs. } (1 - \tau_a)(1 + r_i)a_i$$

· Guvenen et al. (2023)

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- Assume two agents, a and b
  - Same wealth $k = \$1000$; but different returns: $r^a = 0 < r^b = 0.2$

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"Use it or lose it!" Three channels

In a dynamic general-equilibrium model

1. "Use-it-or-lose-it" channel
    - Capital reallocates toward more productive entrepreneurs

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1. “Use-it-or-lose-it” channel
   - Capital reallocates toward more productive entrepreneurs
2. “Behavior response” channel
   - More productive entrepreneurs will save more
3. “Price” channel
   - Wages and interest rates will adjust

Environment Demographics

- Overlapping generations (OLG) model
  - Age h, live up to H years
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  - Portfolio choice
    - Choose how much to invest in own technology ("entrepreneurship")

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  - Stochastic transition downwards

Environment Production

- Final good: $Y = Q^{\alpha} L^{1-\alpha}$
  - Aggregate labor L, with $\alpha = 0.4$
  - Intermediates: $Q = \left(\int x_{ih}^{\mu}\right)^{\frac{1}{\mu}}$, with $\mu = 0.9$
  - Competitive sector
- Intermediate goods: $x_{ih} = z_{ih} k_{ih}$
  - Price $p_{ih} = \alpha x_{ih}^{\mu-1} Q^{\alpha-\mu} L^{1-\alpha}$

Environment Household problem and equilibrium

1. Choose capital to max profits

$$\pi(a,z) = \max_{k \leq \nu(z)a} p(zk)zk - (r+\delta)k$$

   - Financial friction which generates misallocation
   - Invests more if z is higher and if a is higher

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$$V_h(a,\bar{z},\mathcal{I},e,\kappa) = \max_{c,n,a'} u(c,n) + \beta s_{h+1}\mathbb{E}\left[V_{h+1}(a',\bar{z},\mathcal{I}',e',\kappa)\right]$$

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- Equilibrium: $\int a = \int k$

Calibration

- Dynamics of entrepreneurship to match fast wealth growth of super wealthy (Forbes 400)
- Standard earnings risk
- Taxes: $\tau_k = 25\%$, $\tau_\ell = 22.4\%$, $\tau_c = 7.5\%$

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$\Rightarrow$ Generates high wealth inequality!

	top-50	top-10	top-1	top-0.5	top-0.1
Data	0.99	0.75	0.36	0.27	0.14
Model	0.97	0.66	0.36	0.31	0.23

- Data: SCF+Forbes 2010

Main experiment A wealth tax

Tax reform

- Set $\tau_k = 0$, balance budget with a wealth tax
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  - Larger K: $+20\% \rightarrow$ agents save more
  - Larger Q: $+25\% \rightarrow$ less misallocation
  - Larger Y and C: $+10\%$
  - Higher wages, smaller net interest rates on the risk-free rate
  - Large welfare gains: $+7.4\%$!

Main experiment **A wealth tax**

- Why does capital increase? Three channels

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- Why does capital increase? Three channels
  - "Use-it-or-loose-it" [fixing prices & decision rules to benchmark] $K \uparrow$

Main experiment A wealth tax

- Why does capital increase? Three channels
  - "Use-it-or-loose-it" [fixing prices & decision rules to benchmark] $K \uparrow$
  - GE effects [with prices of new equilibrium] $K \downarrow$
  - Behavioral responses [with new decision rules] $K \uparrow$
- Three effects of comparable magnitude

Main experiment **A wealth tax**

- Who wins from the reform?

Main experiment A wealth tax

- Who wins from the reform? Welfare gains by age and entrepreneurial ability

Table IX – Welfare Gain/Loss by Age Group and Entrepreneurial Ability

	Entrepreneurial Ability Groups ($\bar{z}_i$ Percentiles)					
Age	0–40	40–80	80–90	90–99	99–99.9	99.9+
groups:	*RN Reform*					
20	7.0	7.3	7.9	8.9	10.6	11.7
21–34	6.5	6.3	6.3	6.6	7.0	6.8
35–49	5.1	4.4	3.9	3.3	1.7	0.1
50–64	2.3	1.8	1.4	0.8	–0.6	–1.8
65+	–0.2	–0.3	–0.4	–0.6	–1.2	–1.8

- The high-wealth/low-z (= the old) **lose**
- The young **benefit**...
  + From $\tau_k = 0$ (high z)
  + From higher w (low a)

Optimal taxation

Optimize steady-state fiscal system

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- Transitions

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  - Gaillard and Wangner (2023) , Ferey, Lockwood, Taubinsky (2023), , Guvenen et al. (2023b), etc.!

Taxing capital? Gaillard and Wangner (2023)

- On taxation and heterogeneous returns
  - Productivity or rents?
  - Scale or type dependency?

$\Rightarrow$ Capital income or wealth taxation?

Lecture 2

Labor Taxes and Transfers

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   - Linear (distortionary) labor taxes to finance transfers T!

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   - Going further: **Progressive** taxes?

Optimal progressivity **Why should we care?**

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  - Welfare gains
    - $+$ Insurance, redistribution, etc.

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  - Welfare costs
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  - General equilibrium effects
- Hard to analyze?
  - A highly multi-dimensional object
  - Computational?

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- Non-monetary transfers: spending on education, etc.

Optimal progressivity Two approaches

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- Public finance: Mirrlees
  - Fully flexible tax-and-transfer function
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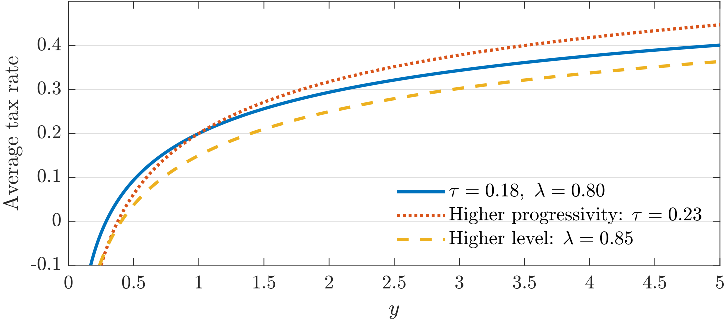
  - Quantitatively realistic model
  - But simple tax functions?
- "New" approach: a rich Ramsey approach
  - Heathcote, Storesletten, and Violante (2014), Heathcote, Storesletten, and Violante (2017)
  - Ferriere, Grübener, Navarro, and Vardishvili (2023)

1. Optimal Progressivity With Loglinear Income Taxes

Loglinear tax function

- A loglinear tax scheme: $\mathcal{T}(y) = y - \lambda y^{1-\tau}$
- Tax progressivity is captured by τ
  - If $\tau = 0$: flat average (and marginal) tax rate $\mathcal{T}(y) = (1 - \lambda)y$
  - If $\tau > 0$: progressive tax
  - If $\tau = 1$: full redistribution $y - \mathcal{T}(y) = \lambda \quad \forall y$



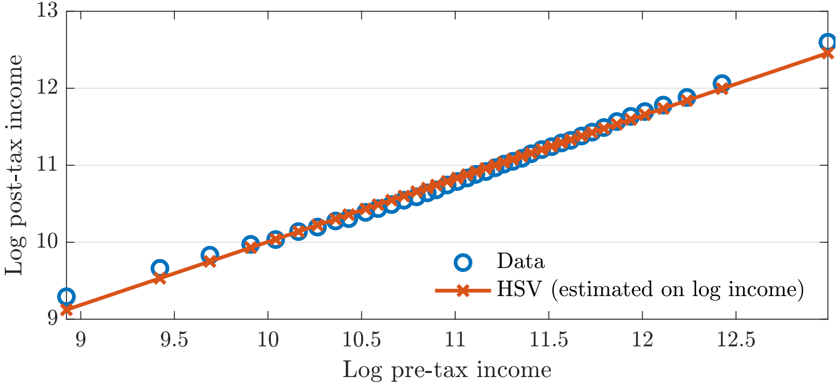
Data Taxes and transfers FGNV (2023)

- CPS 2013, working-age population
  - Total pre-tax income
  - Minus personal federal and state income taxes; payroll taxes
  - Minus payroll taxes (including employer share)
  - Plus tax credits
  - Plus SNAP and Housing Assistance (CBO imputation); Welfare

    IPUMS CPS

    Imputation of transfers following CBO Habib (2018)

Log-linear tax function



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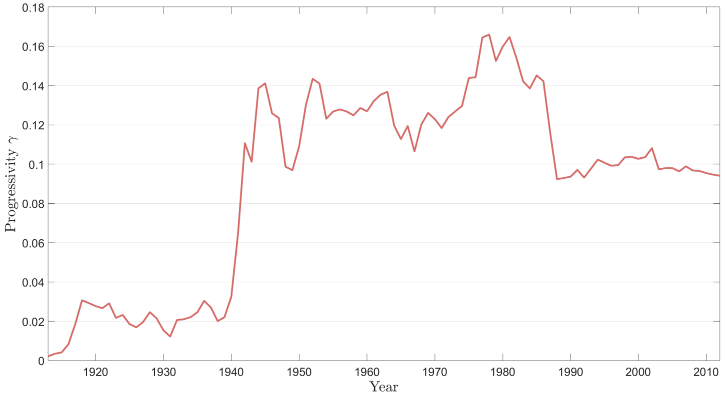

Figure 12: U.S. Federal Income Tax Progressivity

- A crude estimate over time Ferriere and Navarro (2023)

A tractable environment HSV (2017), FGNV (2023)

- No capital, representative **firm** with linear production function

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  - Budget: $G = \int y_{it} di - \lambda \int y_{it}^{1-\tau} di$
- A continuum of **workers**
  - Heterogenous wages: log-normal distribution with variance v_ω
  - Separable utility function: $\log c_{it} - B\frac{n_{it}^{1+\varphi}}{1+\varphi}$
  - Hand-to-mouth workers: $c_{it} = \lambda(z_{it}n_{it})^{1-\tau}$

Welfare Heterogeneous agents

- Policy function for labor is $n_{it} = [(1-\tau)/B]^{\frac{1}{1+\varphi}} \equiv n_0(\tau)$

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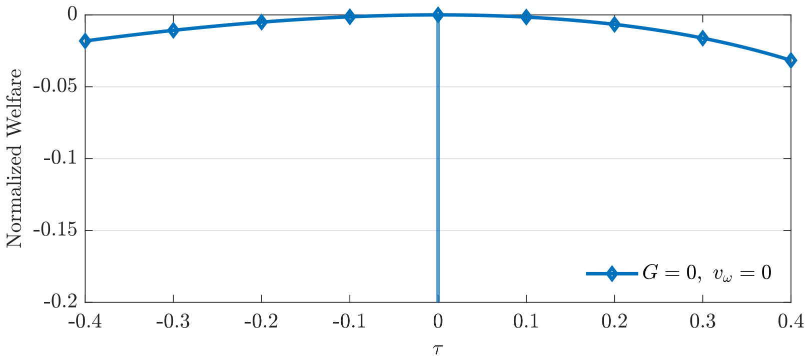
- **Redistribution** term $\uparrow$ with τ

- Calibration: $\tau = 0.18$, $\varphi = 2.5$, $G/Y = 0.223$, v_ω to match $\mathbb{V}[\log c] = 0.18$

Welfare **Optimal τ**



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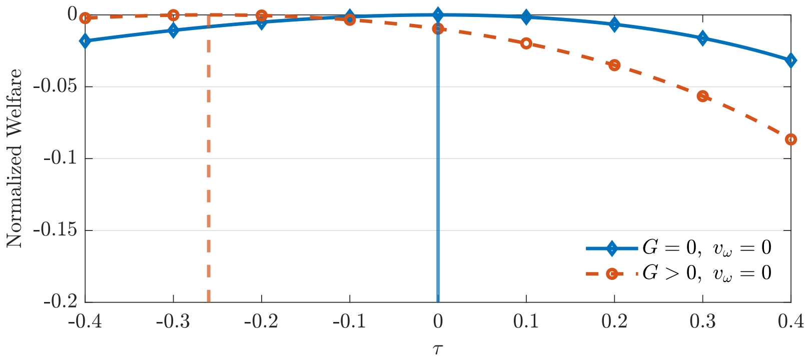

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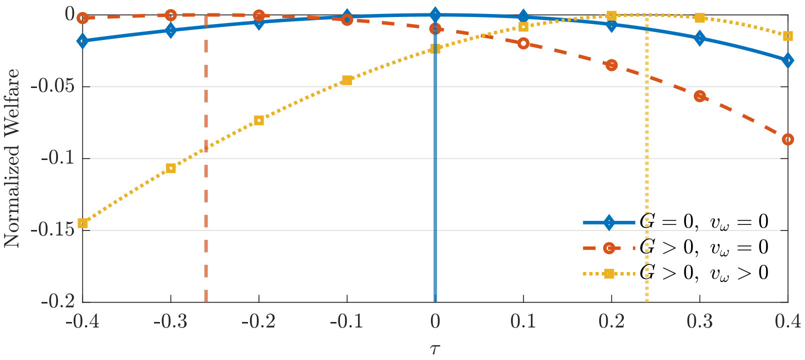

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  - Spending, no heterogeneity: $\tau < 0$
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Adding savings HSV (2014)

- A richer model with hand-to-mouth households *in equilibrium*
  - Richer structure of stochastic process

$$\log w_t = \alpha_t + \varepsilon_t$$

where

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with w_t and θ_t normally i.i.d. (+ stochastic death)

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$\Rightarrow$ "Partial-insurance" framework

- $v_\omega + v_\theta$ to capture variance of log income
- v_ω to capture variance of log consumption

Optimal income-tax progressivity HSV (2017)

- A richer model with many more features

1. Endogenous spending

2. Distribution over preference parameters

$$u_i(c_{it}, h_{it}, G) = \log c_{it} - B_i \frac{n_{it}^{1+\varphi}}{1+\varphi} + \chi \log G$$

where $\log B_i \sim \mathcal{N}(\frac{v_B}{2}, v_B)$

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$$U_i = -v_i(s_i) + \mathbb{E}_0 \sum_{t=0}^{\infty} (\beta\delta)^t u_i(c_{it}, n_{it}, G)$$

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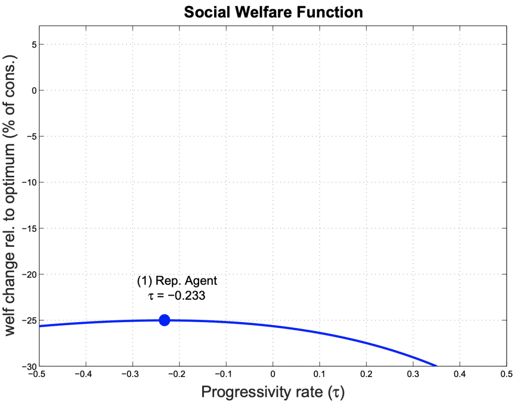
4. [Insurable shocks] ε

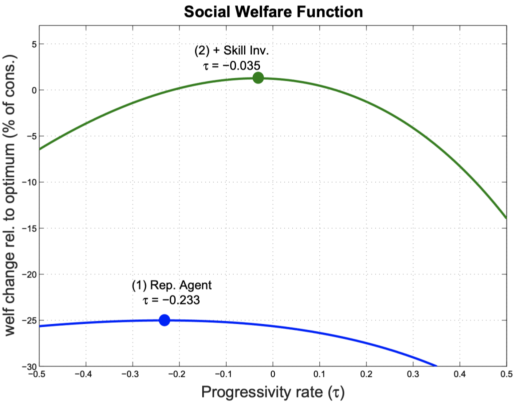
Welfare HSV (2017)

- Representative-agent, $\chi > 0$



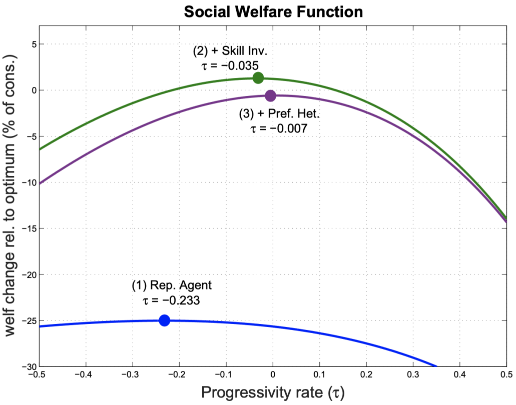
Welfare HSV (2017)

- With heterogeneity in skills



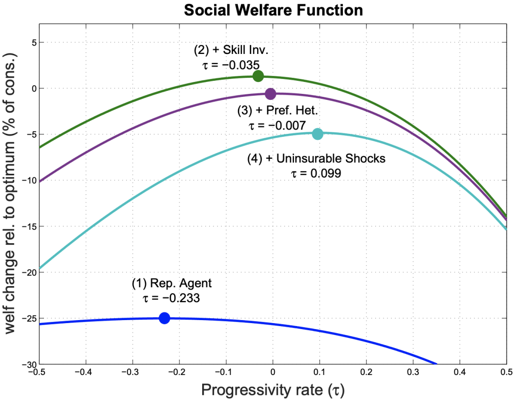
Welfare HSV (2017)

- With heterogeneity in labor disutility



Welfare HSV (2017)

- With uninsurable shocks



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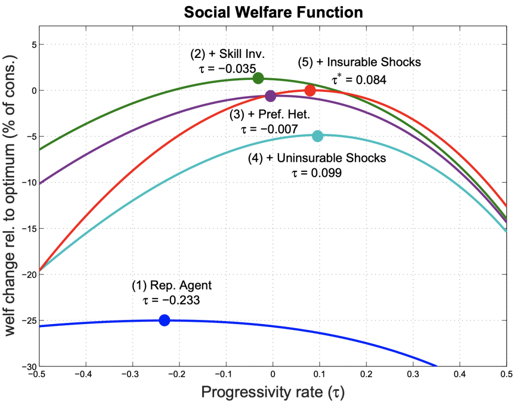

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- Going further [1]: age-dependent taxes, progressivity over time (see references)
- Going further [2]: adding an intercept?
  - Mirrlees typical findings: a quick overview
  - Revisiting the data

Adding Transfers

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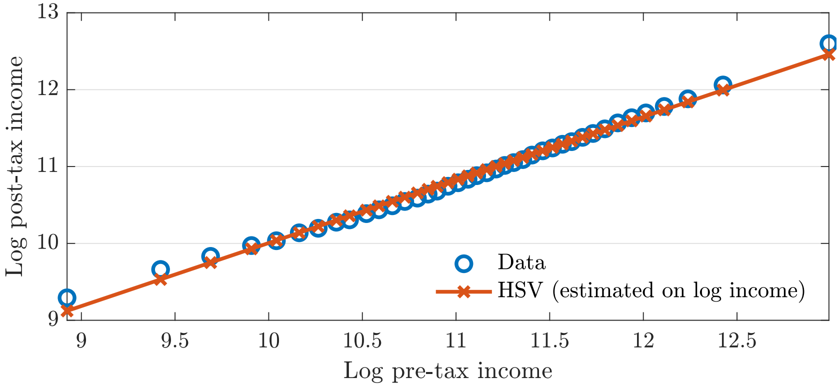
Loglinear tax function No transfer (HSV)



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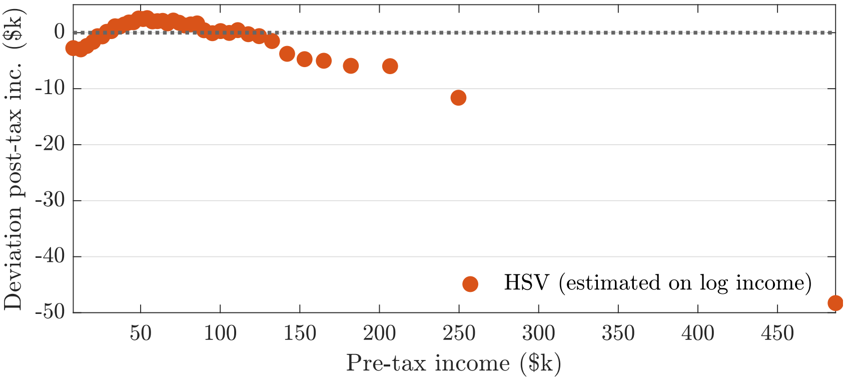

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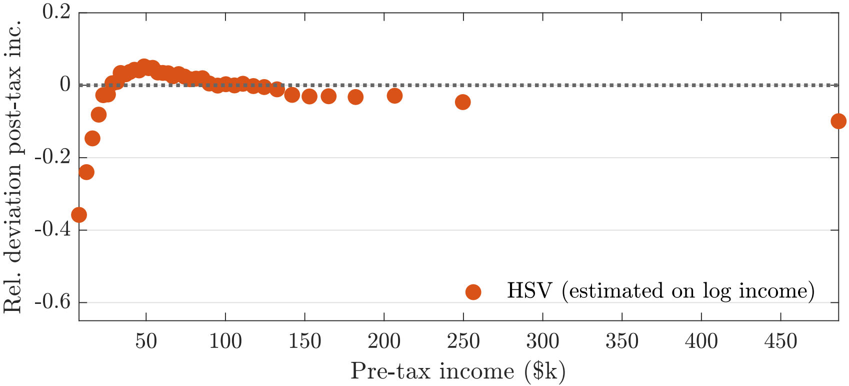

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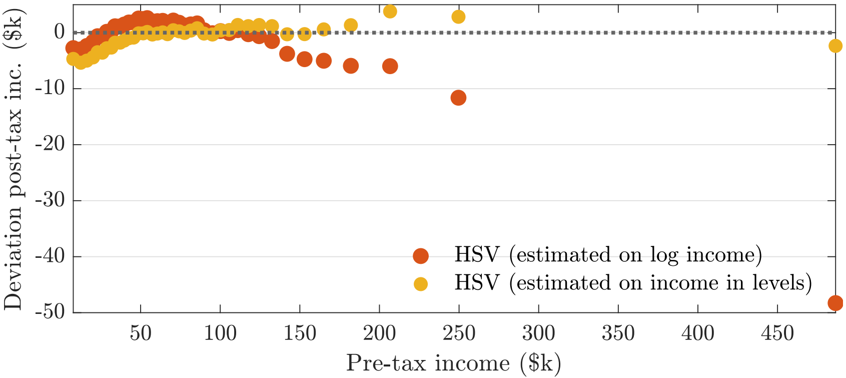

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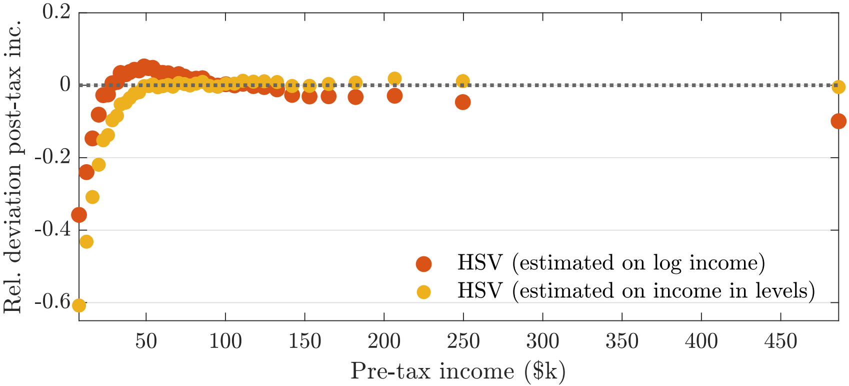

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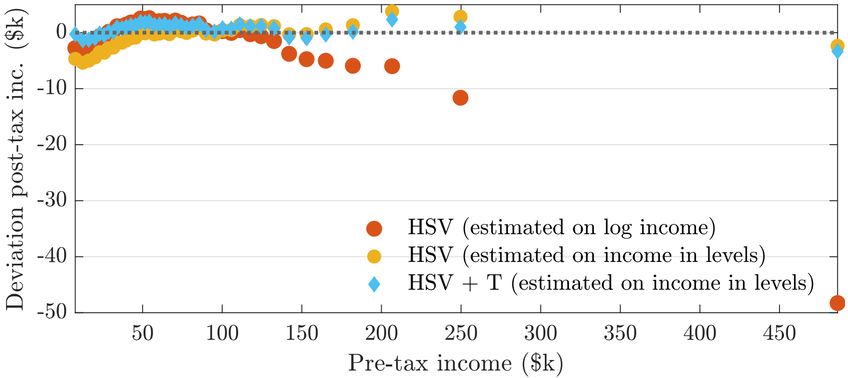
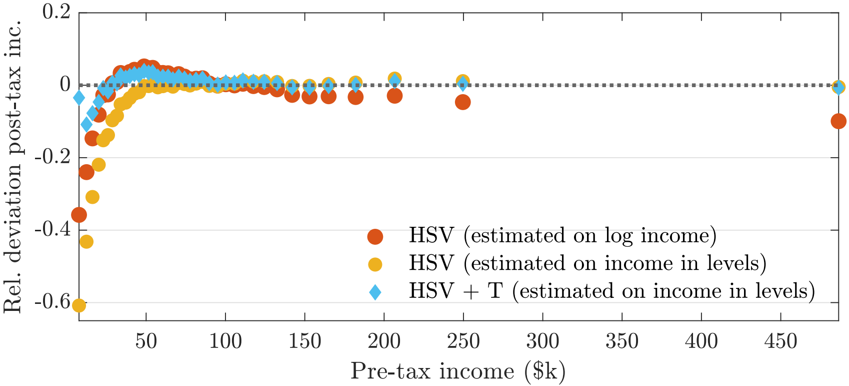
Empirical fit Loglinear tax function with a transfer



- Non-linear estimate on income in levels: $y^{at} = \lambda y^{1-\tau} + T$
- Estimated progressivity $\tau = 0.06$, transfer $T \approx \$5,400$

Empirical fit Loglinear tax function with a transfer



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- Estimated progressivity $\tau = 0.06$, transfer $T \approx \$5,400$

Transfers Heterogeneous agents

- Implicit function theorem: approximation of the FOC around $T = 0$:

$$\hat{n}_{it} \approx n_0(\tau) - \frac{T}{1+\varphi} \frac{n_0(\tau)}{n_0(\tau) - G} \exp\left(-\tau(1-\tau)v_\omega\right) z_{it}^{-(1-\tau)}$$

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- Approximated formula with heterogeneity $v_\omega > 0$

$$W(\tau, T) = W(\tau, 0) + T\left[\Omega_e(\tau, v_\omega) + \Omega_r(\tau, v_\omega)\right],$$

where the two terms capture

- Efficiency concerns
- Redistribution concerns ($\Omega_r(\tau, v_\omega) = 0$ when $v_\omega = 0$)

Transfers Welfare: Efficiency

- **Efficiency** with a representative agent ($v_\omega = 0$):

$$\Omega_e(\tau,0) \equiv \underbrace{U_c(C_0(\tau)) \left.\frac{\partial Y^{ra}(\tau,T)}{\partial T}\right|_{T=0}}_{\text{Size } <\mathbf{0}} \underbrace{+U_n(n_0(\tau)) \left.\frac{\partial n^{ra}(\tau,T)}{\partial T}\right|_{T=0}}_{\text{Labor disutility } >\mathbf{0}}$$

  - Claim: Ω_e **decreases with** τ
    - + Offset the effects of progressivity on labor supply incentives

- With heterogeneity, efficiency Ω_e numerically decreases with τ

$\Rightarrow$ **Efficiency** gains of T are **decreasing** in τ

Transfers Welfare: Redistribution

- Redistribution $\Omega_r(\tau, v_\omega)$

$$\Omega_r(\tau, v_\omega) \equiv \mathbb{E}\left[U_c(c_0(\tau))\right] - U_c(C_0(\tau)) = (1-\tau)^2 \frac{1}{n_0(\tau) - G} v_\omega$$

  - Positive as long as $v_\omega > 0$ and **decreases** with τ

$\Rightarrow$ **Redistribution** gains of T are **decreasing** in τ

$\Rightarrow$ Overall **negative** optimal relationship between T and τ

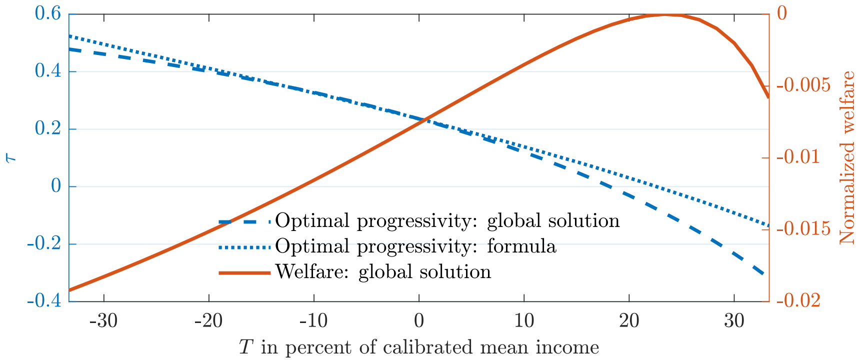
- Use formula to evaluate local welfare gains of transfers:

$$W(\tau, T) = W(\tau, 0) + T\left[\Omega^e(\tau, v_\omega) + \Omega^r(\tau, v_\omega)\right]$$

  - At calibrated v_ω and τ: -0.54 + 0.78 > 0

Transfers Heterogeneous agents

- A **negative** relationship between τ and T

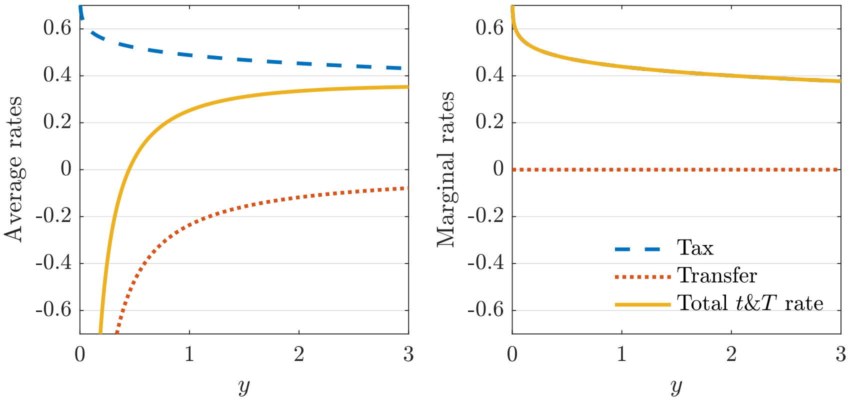


- Formula: a good approximation

- Optimal transfers are large, with regressive income taxes

Optimal plan with transfers Global static solution

- Generous transfers: $T/Y = 23\%$, regressive income taxes: $\tau = -0.09$



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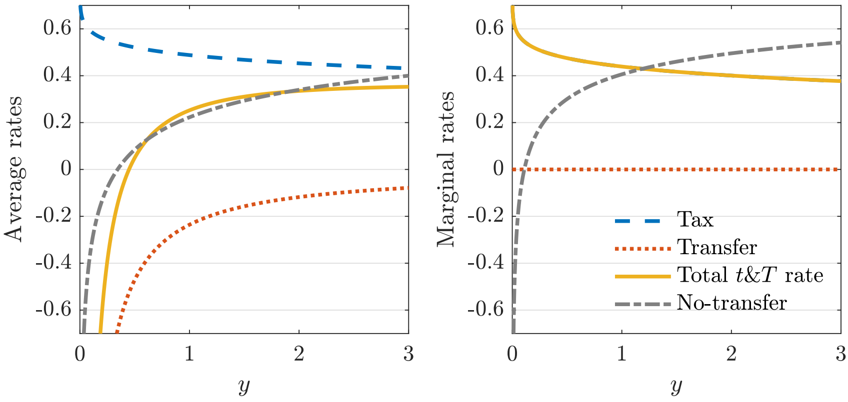

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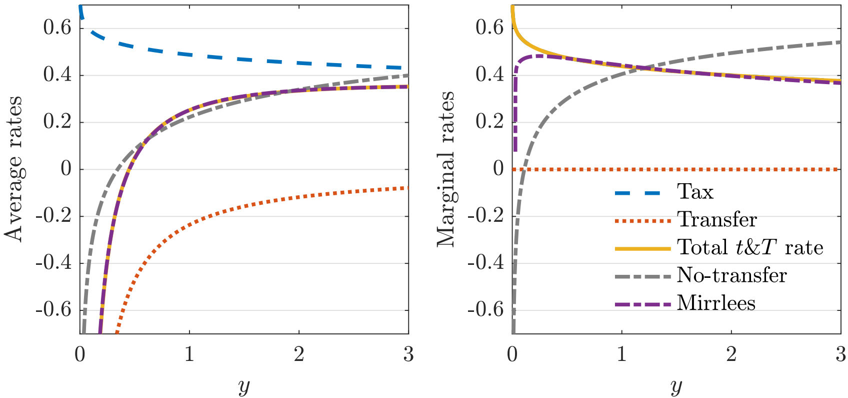
Optimal plan with transfers Comparison to second-best

- Welfare in CE terms: HSV: +0.14%, HSV+T: +0.90%



- Close to welfare gains of the Mirrlees/second-best allocation: +0.93%

Taking stock

- Loglinear taxes plus a transfer
  - Is still simple and tractable
  - Fits the data better
- Welfare gains from allowing for transfers
  - Break the link between average and marginal $t\&T$ rates
  - Systematically close to the second-best!