Taxing Wealth and Capital Income when Returns are Heterogeneous

Guvenen, Kambourov, Kuruscu, Ocampo

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This paper: Theoretical analysis of optimal combination of taxes

- Analytical model with workers, heterogeneous entrepreneurs, and innovation
- **Result:** characterize **(i)** productivity **(ii)** welfare **(iii)** optimal taxes **(iv)** innovation

Why Study Capital Taxation with Heterogeneous Returns?

1. **Empirical:** A growing literature documents persistent return heterogeneity.

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   - Models struggle to generate plausible wealth inequality. Pareto Tail vs. Models
   - Return heterogeneity $\longrightarrow$ concentration at the very top + Pareto tail + fast wealth growth

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4. **Theoretical:** Interesting **new economic mechanisms** ⟶ Example next.

   Allais 1977, Piketty 2014, Guvenen, Kambourov, Kuruscu, Ocampo, Chen 2023

Return Heterogeneity: A Simple Example

- One-period model.
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- **Objective:** illustrate main tradeoff by taxing *either* capital income (τ_k) or wealth (τ_a)

Capital Income (τ_k) vs. Wealth Tax (τ_a)

	Capital income tax		Wealth tax
	$a_{i,\text{after-tax}} = a_i + (1-\tau_k) r_i a_i$		
	Fredo ($r_f = 0\%$)	Mike ($r_m = 20\%$)	
Wealth	\$1M	\$1M	
Before-tax Income	\$0	\$200K	
Tax liability			
After-tax return			
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- Replacing $\boldsymbol{\tau_k}$ with $\boldsymbol{\tau_a} \rightarrow$ reallocates assets to high-return agents (**use it or lose it**) + increases dispersion in after-tax returns & wealth.

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5. Endogenous innovation: increase effect of τ_a on TFP, leading to higher opt. wealth taxes

Baseline Model with

Exogenous Entrepreneurial Productivity

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   - Produce final goods using capital and labor ($y_i = (z_i k_i)^{\alpha}\, n_i^{1-\alpha}$) + consume/save
   - Heterogeneity in wealth (a) and productivity (z)
   - Productivity ($z_i \in \{z_\ell, z_h\}$) determined at birth: μ $(1-\mu)$ fraction w/ permanent z_h (z_ℓ)
   - Initial (inherited) wealth $\overline{a}$ common across entrepreneurs *($\overline{a}$ determined endogenously)*

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Preferences (of workers and entrepreneurs): $E_0 \sum_{t=0}^{\infty} (\beta\delta)^t \log(c_t)$

Government: Finances exogenous expenditure G with τ_k and τ_a

Financial Markets & Entrepreneurs' Problem

Financial markets:

- Collateral constraint: $k \leq \lambda a$, where a is entrepreneur's wealth and $\lambda \geq 1$
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Entrepreneurs' Production Decision:

details

$$\Pi^{\star}(z, a) = \max_{\mathbf{k} \leq \lambda \mathbf{a}, n} (zk)^{\alpha} n^{1-\alpha} - rk - wn$$

Solution: $$\Pi^{\star}(z, a) = \underbrace{\pi^{\star}(z)}_{\text{Excess return above } r} \times a$$

Entrepreneur's Dynamic Problem

$$V(a,z) = \max_{c,a'} \log(c) + \beta\delta V(a',z)$$

$$\text{s.t. } c + a' = \underbrace{(1-\tau_a)\,a + (1-\tau_k)\,(r + \pi^{\star}(z))\,a}_{\text{After-tax wealth}}.$$

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- Define gross (after-tax) returns as:

$$R_i \equiv (1-\tau_a) + (1-\tau_k)\,(r+\pi^\star(z_i)) \quad \text{for } i \in \{\ell, h\}$$

- The savings decision (CRS + Log Utility):

$$a' = \beta\delta R_i a \quad \longrightarrow \quad \text{linearity allows aggregation}$$

Financial Market Equilibrium with Heterogenous Returns

If $(\lambda - 1)\,\mu A_h < (1-\mu)\,A_\ell$:

- Low-productivity entrepreneurs bid down interest rate, $r = \text{MPK}\,(z_\ell)$
- **Unique steady state** with:
  return heterogeneity, capital misallocation, wealth tax $\neq$ capital inc tax
- **Empirically relevant:** $R_h > R_l$ and $\frac{\text{Debt}}{\text{GDP}} \gg 1.5$ when $\lambda = \overline{\lambda}$

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$$(\lambda - 1)\,\mu A_h < (1-\mu)\,A_\ell \longleftrightarrow \tau_a < \overline{\tau}_a = 1 - \frac{1}{\beta\delta}\left(1 - \frac{1-\delta}{\delta}\frac{1-\lambda\mu}{(\lambda-1)\left(1-\frac{z_\ell}{z_h}\right)}\right)$$

Upper Bound on τ_a

Equilibrium Values: Aggregation

Lemma: Aggregate output is

$$Y = (ZK)^{\alpha} L^{1-\alpha} \qquad (Z^{\alpha} \text{ is measured TFP})$$

where

$$K \equiv \mu A_h + (1-\mu) A_\ell \qquad K = \text{Aggregate capital}$$

$$Z \equiv s_h z_\lambda + (1-s_h) z_\ell \qquad Z = \text{Wealth-weighted productivity}$$

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Key variables:

- $s_h = \frac{\mu A_h}{K}$: wealth share of high-productivity entrepreneurs.
- $z_\lambda \equiv z_h + (\lambda - 1)(z_h - z_\ell)$: effective productivity of high-productivity entrepreneurs.

Use it or lose it effect increases efficiency if $s_h \uparrow (\longrightarrow Z \uparrow)$

Steady State: Capital, Returns, and Taxes

Steady State K: Same as in NGM... but with endogenous Z (Moll, 2014)

$$(1-\tau_a)+(1-\tau_k)\overbrace{\alpha Z^{\alpha}\left({}^{K}\!/_{L}\right)^{\alpha-1}}^{\text{MPK}}=\frac{1}{\beta\delta}$$

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Steady State Z: Returns and asset evolution imply quadratic equation (depends on τ_a):

$$\left(1-\delta^2\beta\left(1-\tau_a\right)\right)Z^2 - \left[\left(1-\delta\right)\left(\mu z_\lambda + \left(1-\mu\right)z_\ell\right) + \delta\left(1-\delta\beta\left(1-\tau_a\right)\right)\left(z_\lambda + z_\ell\right)\right]Z$$
$$+\delta\left(1-\delta\beta\left(1-\tau_a\right)\right)z_\ell z_\lambda = 0.$$

- Wealth tax affects returns, wealth shares, and productivity. Capital income tax does not.

Main Result 1: Efficiency Gains from Wealth Taxation

Proposition:

Proof

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Corollary: For all $\mu \in (0,1)$ and $\tau_a < \bar{\tau}_a$, an increase in $\boldsymbol{\tau_a}$ **increases**

- Wealth concentration: $s_h \uparrow \left(Z \uparrow = s_h z_\lambda + (1 - s_h)\, z_\ell\right)$ Distribution

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- Wealth concentration: $s_h \uparrow \left(Z \uparrow = s_h z_\lambda + (1-s_h)\, z_\ell\right)$ Distribution
- Dispersion of after-tax returns rises and average return decreases:

$$\frac{dR_\ell}{d\tau_a} < \mathbf{0} \qquad \& \qquad \frac{dR_h}{d\tau_a} > \mathbf{0} \qquad \& \qquad \mu \frac{d \log R_h}{d\tau_a} + (1-\mu) \frac{d \log R_\ell}{d\tau_a} < \mathbf{0}$$

Government Budget and Aggregate Variables

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- **Key:** Higher $\alpha \longrightarrow$ Larger pass-through of productivity to K, Y, w

$$\xi_K = \xi_Y = \xi_w = {}^{\alpha}/_{1-\alpha} \qquad \xi_x = \frac{d \log x}{d \log Z}$$

Main Result 2: Welfare Gains by Type

Proposition:

For all $\tau_a < \overline{\tau}_a$, a higher $\boldsymbol{\tau_a}$ changes welfare as follows:

- Workers: Higher welfare: $\frac{dV_{workers}}{d\tau_a} > 0$
- High-z entrepreneurs: Higher welfare: $\frac{dV_h(\bar{a})}{d\tau_a} > 0$ (since $\xi_K + \frac{1}{1-\beta\delta}\xi_{R_h} > 0$)
- Low-z entrepreneurs: Lower welfare $\left(\frac{dV_\ell(\bar{a})}{d\tau_a} < 0\right)$ iff $\xi_K + \frac{1}{1-\beta\delta}\xi_{R_\ell} < 0$
- Entrepreneurs: Lower average welfare iff $\xi_K + \frac{1}{1-\beta\delta}\left(\mu\xi_{R_h} + (1-\mu)\,\xi_{R_\ell}\right) < 0$

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- Entrepreneurs: Lower average welfare iff $\xi_K + \frac{1}{1-\beta\delta}\left(\mu\xi_{R_h} + (1-\mu)\,\xi_{R_\ell}\right) < 0$

Note: These conditions imply threshold on α for welfare gains that are high in practice, so average entrepreneur welfare is typically lowered when τ_a increases.

α Thresholds

Optimal Taxation

Objective: Choose taxes (τ_a, τ_k) to maximize newborn welfare

$$\mathcal{W} \equiv n_w V_w(w) + (1 - n_w)\left(\mu V_h(\bar{a}) + (1 - \mu) V_\ell(\bar{a})\right)$$

where $n_w = {}^{L}\!/_{(1+L)}$ is the share of workers in population.

- An interior solution satisfies ${}^{d\mathcal{W}}\!/_{d\tau_a} = 0$.

Optimal Taxation

Objective: Choose taxes (τ_a, τ_k) to maximize newborn welfare

$$\mathcal{W} = \frac{1}{1-\beta\delta}\left[n_w \log w + (1-n_w)\log \bar{a}\right] + \frac{1-n_w}{(1-\beta\delta)^2}\left[\mu \log R_h + (1-\mu)\log R_\ell\right] + \text{Constant}$$

where $n_w = {}^{L}/_{(1+L)}$ is the share of workers in population.

- An interior solution satisfies ${}^{d\mathcal{W}}/_{d\tau_a} = 0$.

Key trade-off:

1. Higher wages (w) and wealth $(\bar{a})$ (depends on α)
2. Lower log average return (higher return dispersion + negative GE effect)

Main Result 3: Optimal Taxes

α thresholds

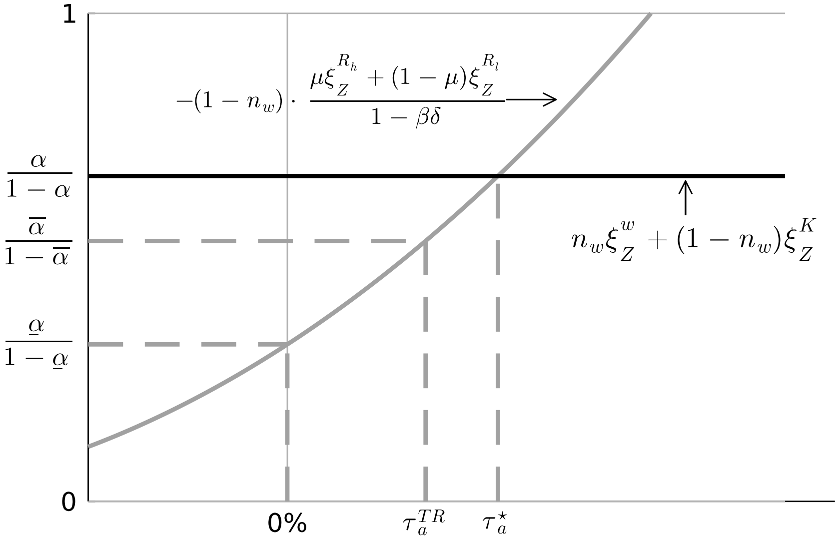
Proposition: There exists a unique optimal tax combination $(\tau_a^\star, \tau_k^\star)$ that maximizes $\mathcal{W}$. An interior optimum $(\tau_a^\star < \bar{\tau}_a)$ is the solution to:

$$0 = \left(\underbrace{n_w \xi_w^Z + (1 - n_w)\, \xi_K^Z}_{\text{Level Effect } (+)} + \underbrace{\frac{1 - n_w}{1 - \beta\delta} \left(\mu \xi_{R_h}^Z + (1 - \mu)\, \xi_{R_\ell}^Z\right)}_{\text{Return Productivity Effect (-)}} \right) \frac{d \log Z}{d \tau_a}$$

where $\xi_x \equiv \frac{d \log x}{d \log Z}$ is the elasticity of variable x with respect to Z. **Furthermore,**

$$\begin{array}{ll} \tau_a^\star < 0 \text{ and } \tau_k^\star > 0 & \text{if } \alpha < \underline{\alpha} \\ \tau_a^\star > 0 \text{ and } \tau_k^\star > 0 & \text{if } \underline{\alpha} \leq \alpha \leq \bar{\alpha} \\ \tau_a^\star > 0 \text{ and } \tau_k^\star < 0 & \text{if } \alpha > \bar{\alpha} \end{array}$$

Optimal Tax and $\underline{\alpha}$ and $\overline{\alpha}$ Thresholds



Endogenizing Productivity through Innovation

Innovation Effort and Productivity

- We interpret productivity z_i as the outcome of a risky innovation process
- Innovation requires costly effort, e, and can end with a high- or low-productivity idea

Innovator's problem:

$$\max_{e} \mu(e) V_h(\bar{a}) + (1-\mu(e)) V_\ell(\bar{a}) - \frac{1}{(1-\beta\delta)^2}\Lambda(e); \quad \Lambda(e) \text{ convex}+C^2;\ \mu(e) = e$$

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We show:

- Unique equilibrium with innovation.

$$\uparrow \tau_a \longrightarrow \uparrow \text{Productivity } (Z) \longrightarrow \uparrow \text{Innovation effort } (e) \longrightarrow \uparrow \text{High prod } (\mu) \longrightarrow \uparrow\uparrow Z$$

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We show:

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$\uparrow \tau_a \longrightarrow \uparrow$ Productivity $(Z) \longrightarrow \uparrow$ Innovation effort $(e) \longrightarrow \uparrow$ High prod $(\mu) \longrightarrow \uparrow\uparrow Z$

- Endogenizing innovation implies Higher optimal wealth taxes.

Equilibrium with Innovation

Steady State: For $\tau_a \leq \overline{\tau}_a$, the share $\mu^{\star}$ of high-productivity entrepreneurs is the solution to

$$\mu^{\star} = e\left(Z\left(\mu^{\star}\right)\right), \text{ where}$$

i. $Z(\mu)$ gives the steady state productivity given μ.

ii. $e(Z)$ gives the optimal innovation effort given steady state productivity Z.

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Prop. (innovation gains from wealth taxation): Equilibrium $\mu^\star$ is increasing in τ_a.

Corollary (productivity gains from wealth taxation):

The equilibrium $Z^\star$ is increasing in τ_a (+ Both $\mu^\star$ and $Z^\star$ are independent of τ_k).

Optimal taxes with innovation

Objective: Choose $(\tau_a^\star, \tau_k^\star)$ to maximize newborn welfare net of innovation costs

$$\mathcal{W} \equiv n_w V_w(w) + (1 - n_w)\left(\mu V_h(\bar{a}) + (1-\mu) V_\ell(\bar{a}) - \frac{\Lambda(\mu)}{(1-\beta\delta)^2}\right)$$

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$$+\underbrace{\frac{1-n_w}{1-\beta\delta}\left(\mu \xi_{R_h}^\mu + (1-\mu)\,\xi_{R_\ell}^\mu\right)\frac{d\mu}{d\tau_a}}_{\textbf{New! } \text{Return Innovation Effect } (+)} = 0$$

Extensions with Variable Productivity

Infinite-Horizon Model with Variable Productivity

- Productivity follows Markov process with persistence ρ (first-order autocorrelation)
- All results hold as long as entrepreneurial productivity is persistent: $\rho > 0$

Further extensions:

- Corporate sector that faces no borrowing constraint Details
  - If $z_\ell < z_C < z_h$, then low-productivity agents invest in the corporate sector.
- Rents: Return $\neq$ marginal productivity. Details
  - Introduce zero-sum return wedges so that $R_h <> R_\ell$.
  - Efficiency gains from $\tau_a \uparrow$ if $R_h > R_\ell$.
- Per-period entrepreneurial effort in production (still exogenous z): Details
  - With GHH preferences, aggregate entrepreneurial effort increases with wealth tax.

Conclusions

Increasing τ_a (& reducing τ_k):

- Reallocates capital: less productive $\rightarrow$ more productive agents.
  - Higher TFP, output, and wages;
  - Higher dispersion in returns and wealth and lower average returns
- Equilibrium innovation increases (when innovation is endogenous)

Optimal taxes:

- Combination of taxes depends on pass-through of TFP to wages and wealth
- Optimal wealth tax is higher with endogenous innovation.

Extra

Outline

1. Benchmark model with exogenous entrepreneurial productivity process
2. Efficiency gains from wealth taxation
3. Welfare effects of wealth taxation
4. Optimal taxation
5. Model with endogenous entrepreneurial productivity
6. Extensions
7. Quantitative Analysis

Entrepreneur's Problem

Financial Markets & Entrepreneurs' Production Problem

Entrepreneurs' Production Decision:

$$\Pi^{\star}(z, a) = \max_{\mathbf{k} \leq \lambda \mathbf{a}, n} (zk)^{\alpha} n^{1-\alpha} - rk - wn.$$

Financial Markets & Entrepreneurs' Production Problem

Entrepreneurs' Production Decision:

$$\textbf{Solution:} \quad \Pi^{\star}(z,a) = \underbrace{\pi^{\star}(z)}_{\text{Excess return above } r} \times a$$

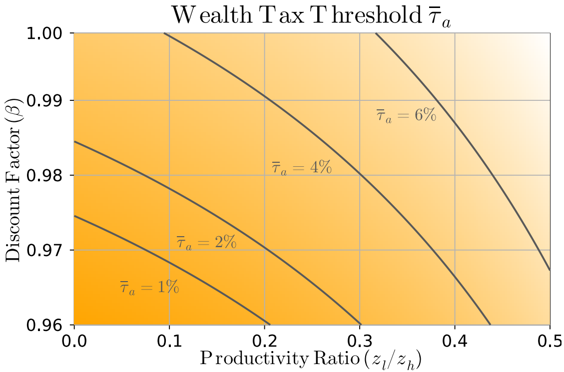
$$\pi^{\star}(z) = \begin{cases} (MPK(z) - r)\,\lambda & \text{if } MPK(z) > r \\ 0 & \text{otherwise.} \end{cases} \qquad k^{\star}(z) \begin{cases} = \lambda a & \text{if } MPK(z) > r \\ \in [0, \lambda a] & \text{if } MPK(z) = r \\ = 0 & \text{if } MPK(z) < r \end{cases}$$

- $(\lambda - 1)\, a$: amount of external funds used by type-z if $MPK(z) > r$.

back

FIGURES

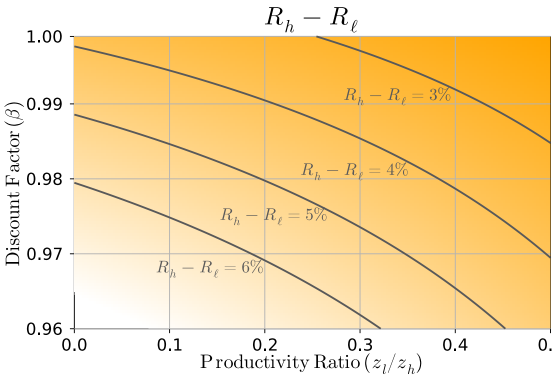
Condition for Steady State with Heterogeneous Returns



Note: *The figure reports the upper bound on wealth taxes for combinations of the discount factor (β) and productivity dispersion (z_ℓ/z_h). We set the remaining parameters as follows: $\delta = 49/50$, $\beta\delta = 0.96$, $\mu = 0.10$, $z_h = 1$, $\tau_k = 25\%$, and $\alpha = 0.4$. λ is such that the debt-to-output ratio in our baseline calibration is 1.5.*

Return Dispersion in Steady State of the Benchmark Economy

back

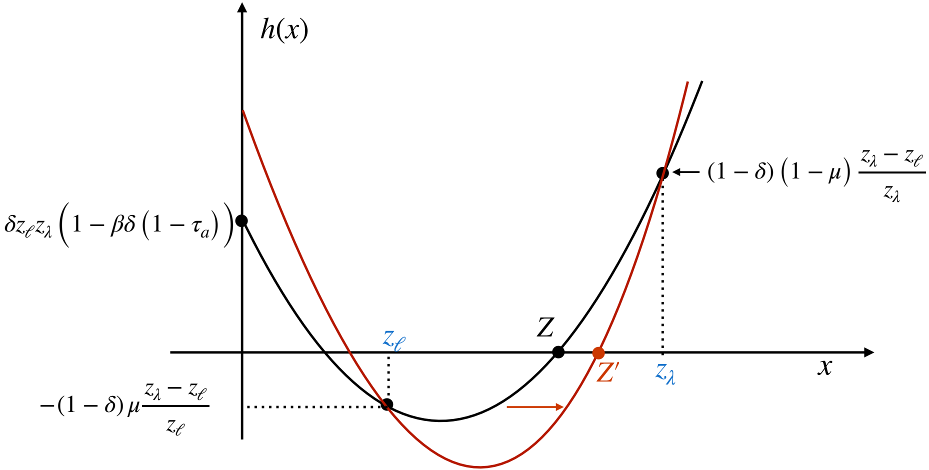


Note: *The figure reports the value return dispersion in steady state for combinations of the discount factor* (β) *and productivity dispersion* (z_ℓ/z_h)*. We set the remaining parameters as follows:* $\delta = 49/50$, $\beta\delta = 0.96$, $\mu = 0.10$, $z_h = 1$, $\tau_k = 25\%$, *and* $\alpha = 0.4$.

What happens to Z if $\tau_a \uparrow$?

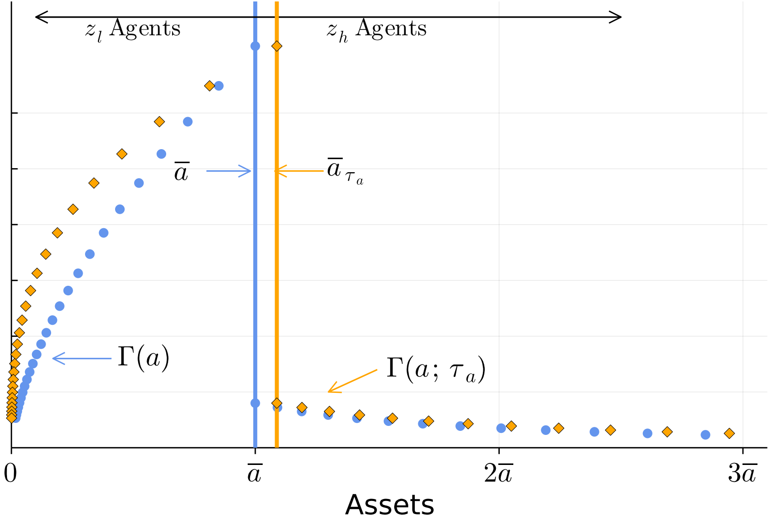
Back to eff. gain

$$\frac{dh(x)}{d\tau_a} = \beta\delta^2 \left(1-\tau_a\right)\left(x - z_\ell\right)\left(z_\lambda - x\right) < 0 \text{ iff } z_\ell < x < z_\lambda$$



Stationary wealth distribution and wealth taxes

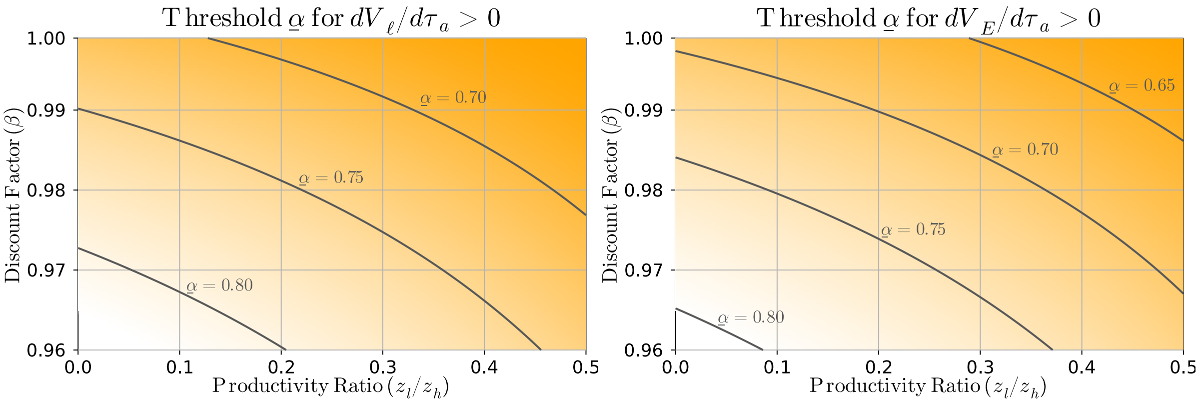
back



Welfare Gains

Conditions for Entrepreneurial Welfare Gain

back

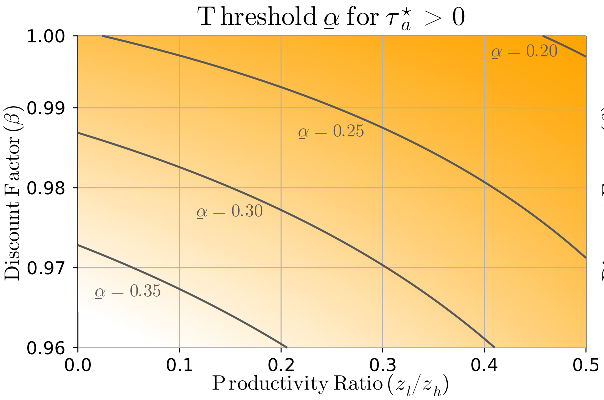


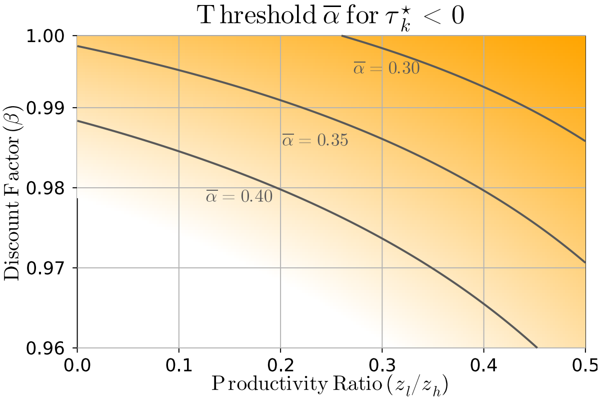
Note: *The figures report the threshold value of α above which entrepreneurial welfare increases after an increase in wealth taxes for combinations of the discount factor (β) and productivity dispersion (z_ℓ/z_h). We set the remaining parameters as follows: $\delta = 49/50$, $\beta\delta = 0.96$, $\mu = 0.10$, $z_h = 1$, $\tau_k = 25\%$, and $\alpha = 0.4$.*

Optimal Taxes

α-thresholds for Optimal Wealth Taxes

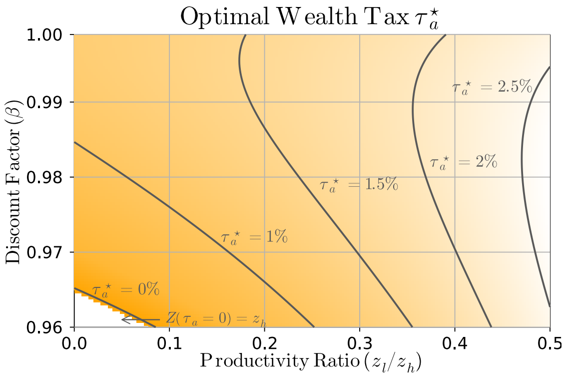
Back to opt. tax





Note: *The figures report the threshold value of α for the optimal wealth taxes to be positive (left) and capital income taxes to be positive (right) for combinations of the discount factor (β) and productivity dispersion (z_ℓ/z_h). We set the remaining parameters as follows: $\delta = 49/50$, $\beta\delta = 0.96$, $\mu = 0.10$, $z_h = 1$, $\tau_k = 25\%$, and $\alpha = 0.4$.*

How the Optimal Wealth Tax Varies with β and productivity dispersion



Note: *The figure reports the value of the optimal wealth tax for combinations of the discount factor* (β) *and productivity dispersion* (z_ℓ/z_h)*. We set the remaining parameters as follows:* $\delta = 49/50$, $\beta\delta = 0.96$, $\mu = 0.10$, $z_h = 1$, $\tau_k = 25\%$, *and* $\alpha = 0.4$.

back

Extensions

Extension: Corporate sector

Back to extensions

- Technology: $Y_c = (z_c K_c)^\alpha L_c^{1-\alpha}$
  - No financial constraints!
- Corporate sector imposes lower bound on r:

$$r \geq \alpha z_c \left(\frac{1-\alpha}{w}\right)^{\frac{1-\alpha}{\alpha}}.$$

Interesting case: $z_\ell < z_c < z_h$

- Corporate sector and high-productivity entrepreneurs produce
- Low-productivity entrepreneurs lend all of their funds.
- No real changes in the aggregates of the economy! z_c takes the place of z_ℓ

$$Y = (ZK)^\alpha L^{1-\alpha}$$

but now $Z = s_h z_\lambda + s_l \mathbf{z_c}$, where $z_\lambda = z_h + (\lambda - 1)(z_h - \mathbf{z_c})$.

Extension: Rents

Back to extensions

- Introduce wedge for returns above/below productivity:

$$R_i = (1-\tau_a) + (1-\tau_k)\ \underbrace{(1+\omega_i)}_{\text{Return Wedge}}\ \alpha\left({}^{ZK}\!/_{L}\right)^{\alpha-1} z_i$$

- Zero-sum condition on wedges: $\omega_l z_\ell A_\ell + \omega_h z_\lambda A_h = 0$
- Characterization of eq. in terms of "effective productivity" $\tilde{z}_i = (1+\omega_i)\, z_i$

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- Characterization of eq. in terms of "effective productivity" $\tilde{z}_i = (1+\omega_i)\, z_i$

Proposition:

For all $\tau_a < \overline{\tau}_a$, a marginal increase in wealth taxes (τ_a) increases Z, $\frac{dZ}{d\tau_a} > 0$, **iff**

1. $\rho > 0$ and $R_h > R_\ell \longrightarrow$ Same mechanism as before
2. $\rho < 0$ and $R_h < R \longrightarrow$ Reallocates wealth to the true high types next period

Extension: Entrepreneurial Effort

Back to extensions

- Entrepreneurial production:

$$y = (zk)^{\alpha} e^{\gamma} n^{1-\alpha-\gamma} \quad \longrightarrow \quad e: \ \text{effort}$$

  - Production functions is CRS $\longrightarrow$ Aggregation

- Entrepreneurial preferences:

$$u(c, e) = \log(c - \psi e) \qquad \psi > 0$$

  - GHH preferences with no income effects $\longrightarrow$ Aggregation
  - ψ plays an important role: Cost of effort in consumption units

Extension: Entrepreneurial Effort

Back to extensions

Problem is isomorphic to having preferences

$$u(\hat{c}) = \log \hat{c} \qquad \text{where } \hat{c} = c - \psi e$$

and modifying entrepreneurial problem to:

$$\hat{\pi}(z, k) = \max_{n,e} y - wn - rk - \underbrace{\frac{\psi}{1 - \tau_k}}_{\text{Effecive cost of effort}} e$$

- Solution is just as before (linear policy functions a', n, **and e**)
- **Key:** Effective cost of effort depends on capital income tax τ_k!
  - Effort affects entrepreneurial income
  - Income subject to capital income taxes but not to **book value** wealth taxes

Extension: Entrepreneurial Effort

Back to extensions

- Aggregate effort:

$$E = \left(\frac{(1-\tau_k)\,\gamma}{\psi} \right)^{\frac{1}{1-\gamma}} (ZK)^{\frac{\alpha}{1-\gamma}} \, L^{\frac{1-\alpha-\gamma}{1-\gamma}}$$

  - Comparative statics: $K \uparrow$, $Z \uparrow$, and $\tau_k \downarrow$
- New wedge from capital income taxes on aggregate output and wages!
- Effort affects marginal product of capital $\longrightarrow$ Affects K_{ss}

A neutrality result:

- **No changes to steady state productivity!**
- Steady state capital adjusts in background to satisfy:

$$(1-\tau_k)\,\text{MPK} - \tau_a = \frac{1}{\beta} - 1$$

Extension: Entrepreneurial Effort

Back to extensions

Results:

1. Efficiency gains from wealth taxation remain
2. Effect on aggregates is stronger if capital income taxes go down
   - **Effort increases with wealth taxes** (if $\rho > 0$)**!**
3. Characterization of optimal taxes is similar but
   higher wealth taxes and lower capital incomes taxes are optimal

Quantitative Framework with New Results

Model: Households

Back

- **OLG** demographic structure.
- **Uncertain lifetimes:** individuals face mortality risk every period.
- **Bequest motive**, inheritance goes to (newborn) offspring.

Model: Households

Back

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Individuals:

- Have preferences over consumption, **leisure** and bequests
- Make three decisions:

  consumption-savings ‖ **labor supply** ‖ portfolio choice

- Two exogenous characteristics:

  y_{ih} (**labor market productivity**) ‖ z_{ih} (entrepreneurial productivity)

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  y_{ih} (**labor market productivity**) $\parallel$ z_{ih} (entrepreneurial productivity)

Entrepreneurs: monopolistic competition $\rightarrow$ **decreasing returns to scale**

Entrepreneurial Productivity z_{ih}: Key Source of Heterogeneity

Back

- Idiosyncratic wage risk :
  - Modeled in a rich way, but does not turn out to be critical. Details

Entrepreneurial Productivity z_{ih}: Key Source of Heterogeneity

Back

- Idiosyncratic wage risk :
  - Modeled in a rich way, but does not turn out to be critical. Details
- Entrepreneurial productivity, z_{ih}, varies
  1. permanently across individuals
     - imperfectly correlated across generations
  2. stochastically over the life cycle

Government

Back

Government budget balances:

- **Outlays:** Expenditure (G) + Social Security pensions
- **Revenues:** tax on consumption (τ_c), labor income (τ_ℓ), bequests (τ_b) plus:

1. tax on capital income (τ_k), or
2. tax on wealth (τ_a).

Calibration summary

Back

Choose parameters of

- Bequest motive $\rightarrow$
  - level and concentration of bequests

Calibration summary

Back

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- Bequest motive $\rightarrow$
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- Entrepreneurial productivity $\rightarrow$
  - top wealth concentration (overall and in the hands of entrepreneurs)
  - shares of entrepreneurs and self-made billionaires

Calibration summary

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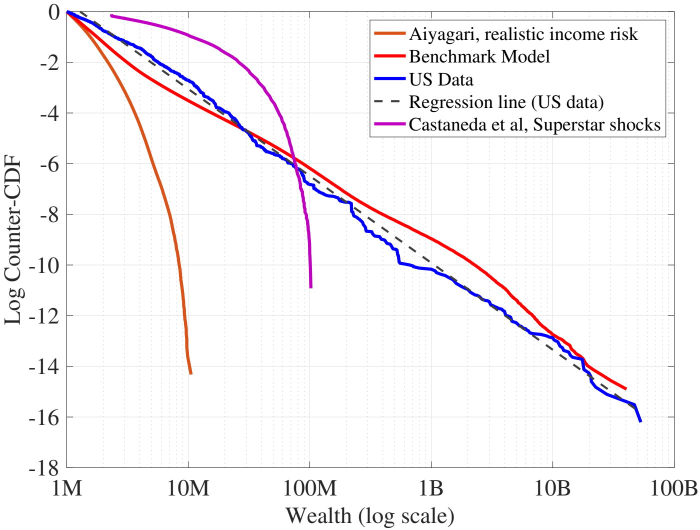
- Bequest motive $\rightarrow$
  - level and concentration of bequests
- Entrepreneurial productivity $\rightarrow$
  - top wealth concentration (overall and in the hands of entrepreneurs)
  - shares of entrepreneurs and self-made billionaires
- Entrepreneurs' collateral constraint $\rightarrow$
  - Business debt plus external funds/GDP

Details

Pareto Tail of Wealth Distribution: Model vs. Data

Back



Performance of the benchmark model: return heterogeneity

Back

	Annual Returns			Persistent Component of Returns					
	Std dev	P90-P10	Kurtosis	Std dev	P90-P10	Kurtosis	P90	P99	P99.9
Data (Norway)	8.6	14.2	47.8	6.0	7.7	78.4	4.3	11.6*	23.4*
Data (Norway, bus. own.)	–	–	–	4.8	10.9	14.2	10.1	–	–
Data (US, private firms)	17.7	33.8	8.3	–	–	–	–	–	–
Benchmark Model	8.4	17.1	7.6	4.1	9.2	6.1	5.8	13.9	19.7
L-INEQ Calibration	6.7	13.1	9.2	3.8	9.2	4.3	5.6	11.2	15.8

Note: *Returns on wealth in percentage points. All cross-sectional returns are value weighted. *The statistics for Norway are for individual returns on wealth (net worth) taken from Fagereng, Guiso, Malacrino, and Pistaferri (2020). The US statistics are from Smith, Zidar, and Zwick (2021) and are for S-corps' returns on investment; they also report statistics for partnerships, which are very similar (std dev of 17.8% and P90-P10 of 27.9). For each individual, the persistent component of returns is calculated following Fagereng et al as the unweighted average of annual, before-tax, returns between ages 25 and 75, after taking out the average return by age.*

Tax Reform and Optimal Taxes

Back

	τ_k	τ_ℓ	τ_a	ΔWelfare
Benchmark	25%	22.4%	–	–
RN Tax reform	–	22.4%	1.19%	7.2
Opt. $\boldsymbol{\tau_a}$				
Opt. $\boldsymbol{\tau_k}$				

Change in aggregate variables

Back

% change	K	Q	TFP	L	Y	w	w (net)
Tax reform	16.4	22.6	2.1	1.2	9.2	8.0	8.0
Optimal τ_a		.		.	.	.	.
Optimal τ_k		.		.	.	.	.

Tax Reform: Who Gains? Who Loses?

Back

Average (consumption equivalent) **welfare gain** by age-productivity groups:

	Productivity group (Percentile)					
Age	0-40	40-80	80-90	90-99	99-99.9	99.9+
20	**6.7**	**6.3**	**6.8**	**8.5**	**11.5**	**13.4**
21-34						
35-49						
50-64						
65+						

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21-34	6.3	5.5	5.5	6.5	8.5	9.7
35-49	4.9	3.8	3.3	3.3	3.1	2.8
50-64	2.2	1.5	1.1	0.9	0.4	-0.2
65+	-0.2	-0.3	-0.4	-0.4	-0.7	-1.0

Tax Reform: Who Gains? Who Loses?

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35-49	4.9	3.8	3.3	3.3	3.1	2.8
50-64	2.2	1.5	1.1	0.9	0.4	-0.2
65+	-0.2	-0.3	-0.4	-0.4	-0.7	-1.0

BB tax reform turns welfare losses of retirees to gains, ranging from 2.3% to 6.5%.

Tax Reform and Optimal Taxes

Back

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Opt. $\boldsymbol{\tau_k}$				

Tax Reform and Optimal Taxes

Back

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RN Tax reform	–	22.4%	1.19%	7.2
Opt. τ_a	–	**15.4%**	**3.03%**	8.7
Opt. τ_k				

Tax Reform and Optimal Taxes

Back

	τ_k	τ_ℓ	τ_a	ΔWelfare
Benchmark	25%	22.4%	–	–
RN Tax reform	–	22.4%	1.19%	7.2
Opt. τ_a	–	**15.4%**	**3.03%**	8.7
Opt. τ_k	**–13.6%**	**31.2%**	–	5.1

Change in aggregate variables

Back

% change	K	Q	TFP	L	Y	w	w (net)
Tax reform	16.4	22.6	2.1	1.2	9.2	8.0	8.0
Optimal τ_a	**2.6**	10.5	3.1	3.3	6.1	2.8	**12.0**
Optimal τ_k							

Change in aggregate variables

Back

% change	K	Q	TFP	L	Y	w	w (net)
Tax reform	16.4	22.6	2.1	1.2	9.2	8.0	8.0
Optimal τ_a	**2.6**	10.5	3.1	3.3	6.1	2.8	**12.0**
Optimal τ_k	**38.6**	46.1	2.2	–1.0	15.7	16.8	**3.6**

Welfare: Levels vs Redistribution

Back

Welfare gain comes from changes in consumption (c) and leisure(ℓ).

- How much comes from changes in the **level** vs **distribution** of c and ℓ?

Welfare: Levels vs Redistribution

Back

Welfare gain comes from changes in consumption (c) and leisure(ℓ).

- How much comes from changes in the **level** vs **distribution** of c and ℓ?

	Tax Reform	Opt.τ_k	Opt.τ_a
CE_2 (NB)	7.2	5.1	8.7
Level $(\bar{c}, \bar{\ell})$	8.9		
Dist. (c, ℓ)	-1.5		

Welfare: Levels vs Redistribution

Back

Welfare gain comes from changes in consumption (c) and leisure(ℓ).

- How much comes from changes in the **level** vs **distribution** of c and ℓ?

	Tax Reform	Opt.τ_k	Opt.τ_a
CE_2 (NB)	7.2	5.1	8.7
Level $(\bar{c}, \bar{\ell})$	8.9	14.7	
Dist. (c, ℓ)	-1.5	**−8.3**	

Welfare: Levels vs Redistribution

Back

Welfare gain comes from changes in consumption (c) and leisure(ℓ).

- How much comes from changes in the **level** vs **distribution** of c and ℓ?

	Tax Reform	Opt.τ_k	Opt.τ_a
CE_2 (NB)	7.2	5.1	8.7
Level $\left(\bar{c}, \bar{\ell}\right)$	8.9	14.7	5.9
Dist. (c, ℓ)	-1.5	**−8.3**	**2.6**

Optimal taxes with transition

Optimal Tax Equilibrium with Transition

Back

- Fix opt. tax level (τ_k or τ_a) and solve transition to new steady state
- Use labor income tax (τ_ℓ) to finance debt from deficits during transition

Optimal Tax Equilibrium with Transition

Back

- Fix opt. tax level (τ_k or τ_a) and solve transition to new steady state
- Use labor income tax (τ_ℓ) to finance debt from deficits during transition

	$\boldsymbol{\tau_k}$ Transition	$\boldsymbol{\tau_a}$ Transition
τ_k	–13.6*	0.00
τ_a	0.00	3.03*
τ_ℓ	39.90	17.01
$\overline{CE}_2$ (newborn)	**–8.4** (5.1)	**6.0** (8.7)
$\overline{CE}_2$ (all)	–6.1 (4.5)	3.5 (4.3)