Book-Value Wealth Taxation, Capital Income Taxation, and Innovation

Fatih Guvenen, Gueorgui Kambourov, Burhan Kuruscu, Sergio 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

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

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2. **Technical:** Capital taxes paid by the very wealthy.

   - But models struggle to generate plausible wealth inequality. Pareto Tail vs. Models
   - Return heterogeneity $\longrightarrow$ concentration at very top $+$ Pareto tail $+$ fast wealth growth
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4. **Theoretical:** Interesting **new economic mechanisms** $\longrightarrow$ Example next
   Allais (1977), Guvenen, Kambourov, Kuruscu, Ocampo, Chen (2023)

Return Heterogeneity: A Simple Example

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- **Objective:** illustrate key tradeoffs b/w capital income tax (τ_k) and wealth tax (τ_a)

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

	Capital Income 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 τ_k with $\tau_a \rightarrow$ reallocates assets to high-return agents (use it or lose it)
  + increases dispersion in after-tax returns & wealth.

Outline

1. **Benchmark model with exogenous entrepreneurial productivity process**
2. Efficiency gains from wealth taxation
3. Welfare and optimal taxation
4. Models with endogenous entrepreneurial productivity

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Preferences (of workers and entrepreneurs):

$$E_0 \sum_{t=0}^{\infty} (\beta\delta)^t \log(c_t)$$

where $\beta < 1$ and $\delta < 1$ is the conditional survival probability

Technology, Production, and Taxes

Entrepreneurial technology:

$$y_i = (z_i k_i)^{\alpha} \, n_i^{1-\alpha}$$

- Productivity $z_i \in \{z_\ell, z_h\}$, where $z_h > z_\ell \geq 0$
- Each entrepreneur draws z_i randomly at birth
  - μ fraction of entrepreneurs have $z_i = z_h$, $1 - \mu$ have $z_i = z_\ell$
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Aggregate output: $Y = \int y_i di = \int (z_i k_i)^{\alpha} \, n_i^{1-\alpha} di$

Government: Finances exogenous expenditure G and transfers T 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

$$\Pi^{\star}(z,a) = \max_{\mathbf{k} \leq \lambda \mathbf{a}, n} \left\{ (zk)^{\alpha} n^{1-\alpha} - rk - wn \right\} \quad \longrightarrow \quad \Pi^{\star}(z,a) = \underbrace{\pi^{\star}(z)}_{\text{Excess return above } r} \times a$$

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$$\text{If} \quad \underbrace{(\lambda - 1)\,\mu A_h}_{K \text{ Demand from H-Type}} < \underbrace{(1-\mu)\,A_{\ell}}_{K \text{ Supply from L-Type}} \quad \longleftrightarrow \quad \underbrace{\lambda < \overline{\lambda}}_{\text{Bound on Leverage}} \quad \longleftrightarrow \quad \tau_a < \overline{\tau}_a$$

Entrepreneur's Dynamic Problem

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

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

- Define (after-tax) gross return as:

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Note: log utility $\rightarrow$ No behavioral response to taxes.
$\rightarrow$ All effects come from use-it-or-lose-it *(conservative lower bound)*

Equilibrium Values: Aggregation

Key variables:

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

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Lemma: Aggregate output can be written as:

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

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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Note: 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 Neoclassical Growth Model... but 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 R: Returns reflect MPK + effective entrepreneurial productivity $z_i \in \{z_\ell, z_\lambda\}$

$$R_i = (1-\tau_a) + \overbrace{\left(\alpha Z^{\alpha}\left(K/L\right)^{\alpha-1}\right)}^{\text{MPK}}\frac{z_i}{Z} \quad \longrightarrow \quad R_i = (1-\tau_a) + \left(\frac{1}{\beta\delta} - (1-\tau_a)\right)\frac{z_i}{Z}$$

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Steady State Z: Returns + evolution of assets imply this quadratic equation:

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

- Wealth tax affects returns, wealth shares, productivity. Capital income tax does not.
- Both taxes affect capital, output, wages...

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2. **Efficiency gains from wealth taxation**
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Main Result 1: Efficiency Gains from Wealth Taxation

Proposition:

Proof

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

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- Dispersion of after-tax returns rises :

$$\frac{dR_\ell}{d\tau_a} < 0 \qquad \& \qquad \frac{dR_h}{d\tau_a} > 0$$

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- Dispersion of after-tax returns rises :

$$\frac{dR_\ell}{d\tau_a} < \mathbf{0} \qquad \& \qquad \frac{dR_h}{d\tau_a} > \mathbf{0}$$

- Average return decreases:

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

Government Budget and Aggregate Variables

$$G + T = \tau_k \alpha Y + \tau_a K.$$

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For all $\mu \in (0, 1)$ and $\tau_a < \overline{\tau}_a$, an increase in $\boldsymbol{\tau_a}$ has the following effects on aggregates:

- **Increases** capital (K), output (Y), wage (w), & high-type wealth (A_h)
- **Key:** Higher $\alpha \longrightarrow$ Larger pass-through of productivity to K, Y, w

$$\xi_Z^K = \xi_Z^Y = \xi_Z^w = \frac{\alpha}{1-\alpha} \qquad \xi_Z^x = \frac{d \log x}{d \log Z}$$

Outline

1. Benchmark model with exogenous entrepreneurial productivity process
2. Efficiency gains from wealth taxation
3. **Welfare and optimal taxation**
4. Models with endogenous entrepreneurial productivity

Main Result 3: Optimal Taxes

α thresholds

Objective: Choose taxes (τ_a, τ_k) to max newborn welfare ($n_w = L/(1+L)$ pop. share of workers)

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

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

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

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Key trade-off:

Welfare by type

1. Higher *levels* of worker income $(w+T)$ and wealth $(\bar{a}=K)$ — Depends on α!

   (higher welfare for workers and high-z entrepreneurs)

2. Lower *wealth growth* over lifetime from lower average return — Depends on τ_a

   (lower welfare for low-z entrepreneurs and entrepreneurs as a group)

Main Result 3: Optimal Taxes

▸ Diagram ▸ α thresholds ▸ $\tau_a^\star$ level

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 solution to:

$$0 = \left(\underbrace{n_w \xi_Z^{w+T} + (1-n_w)\,\xi_Z^K}_{\text{Level Effect } = \frac{\alpha}{1-\alpha}(+)} + (1-n_w) \underbrace{\xi_Z^g}_{\text{Growth Effect }(-)} \right) \frac{d \log Z}{d\tau_a}$$

where $\xi_Z^x \equiv \frac{d \log x}{d \log Z}$ is the elasticity of x with respect to Z.

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

Low Pass-Through: $\alpha < \underline{\alpha}$		High Pass-Through: $\alpha > \overline{\alpha}$
$\tau_a^\star < 0$, $\tau_k^\star > 0$	$\tau_a^\star > 0$, $\tau_k^\star > 0$	$\tau_a^\star > 0$, $\tau_k^\star < 0$

$0 \qquad \underline{\alpha} \qquad \overline{\alpha} \qquad 1$

Outline

1. Benchmark model with exogenous entrepreneurial productivity process

2. Efficiency gains from wealth taxation

3. Welfare and optimal taxation

4. **Models with endogenous entrepreneurial productivity**

Model with Innovation Effort

- 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

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Innovator's problem:

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

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Optimal innovation effort:

$$\underbrace{\Lambda^{'}(e)}_{\text{Mrg. Cost of Effort}} = (1-\beta\delta)^2 \left(V_h(\bar{a}) - V_\ell(\bar{a}) \right) = \underbrace{\log R_h - \log R_\ell}_{\text{Mrg. Benefit: Return Gap}}$$

- Return dispersion incentivizes effort $\longrightarrow$ Return dispersion necessary for innovation!

Stationary Equilibrium with Innovation

The stationary equilibrium share high-productivity entrepreneurs, $\tilde{\mu}$, solves

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

i. $Z\left(\tilde{\mu}\right)$ gives the steady state productivity given $\tilde{\mu}$.
ii. $e\left(Z\right)$ gives the optimal innovation effort given steady state productivity Z.

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

We show:

i. There exists a unique equilibrium with innovation.
ii. An increase in wealth taxes τ_a increase $\tilde{\mu}$ and Z (+ $\tilde{\mu}$ and Z are independent of τ_k)

$$\uparrow \tau_a \longrightarrow \uparrow Z \quad + \uparrow \text{Return Dispersion} \longrightarrow \uparrow \text{Innovation}\,(e) \longrightarrow \uparrow \tilde{\mu} \longrightarrow \uparrow\uparrow Z$$

Optimal Taxes with Innovation

▸ Diagram

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

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

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- Innovation effect increase lifetime wealth growth by increasing average return
- Optimal tax combination has higher wealth taxes: $\tau_a^\star \uparrow$

Model with Entrepreneurial Effort

▸ Details

Model with Entrepreneurial Effort

Details

- Entrepreneurial effort in production: (maintain CRS)

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

- Entrepreneurial preferences: (avoid income effects)

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

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Entrepreneurial problem becomes:

$$\hat{\pi}(z, k) = \max_{n,e} \left\{ y - wn - rk - \underbrace{\frac{\psi}{\mathbf{1 - \tau_k}}}_{\text{Effective Cost of Effort}} e \right\}$$

- **Key:** Effective cost of effort *increases* with capital income tax τ_k but not with τ_a!

Model with Entrepreneurial Effort: Results

1. Efficiency gains from wealth taxation go through

   - Neutrality holds $\Big((1-\tau_k)\,\mathrm{MPK} = \frac{1}{\beta\delta} - (1-\tau_a) \Big) \longrightarrow Z$, R_h, R_ℓ depend only on τ_a!

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   - Aggregate effort increases, increasing output, capital, wages, etc.

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

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3. Optimal taxes: higher wealth tax and lower capital income tax

Conclusions

Increasing τ_a (& reducing τ_k):

- Use it or Lose it Effect: Reallocates capital from less to more productive agents.
  - Higher TFP, output, and wages;
  - Higher dispersion in returns and wealth and lower average returns
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Extensions: Stochastic Productivity | Corporate Sector | Rents

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

Entrepreneur's Problem

Financial Markets & Entrepreneurs' Production Problem

Entrepreneurs' Production Decision:

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

Entrepreneurs' Production Decision:

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

$$\pi^{\star}(z) = \begin{cases} (MPK(z) - r)\,\lambda & \text{if } MPK(z) > r \\ 0 & \text{otherwise.} \end{cases}$$

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

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

back

Financial Market Equilibrium with Heterogenous Returns

back

Three types of equilibria can arise depending on parameter values.

Financial Market Equilibrium with Heterogenous Returns

back

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We focus on "interesting one": if $\underbrace{(\lambda - 1)\,\mu A_h}_{K \text{ Demand from H-Type}} < \underbrace{(1 - \mu)\,A_\ell}_{K \text{ Supply from L-Type}} \longleftrightarrow \underbrace{\lambda < \overline{\lambda}}_{\text{Bound on Leverage}}$

Financial Market Equilibrium with Heterogenous Returns

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- 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 $\lambda = \bar{\lambda}$

details

Financial Market Equilibrium with Heterogenous Returns

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details

Condition implies an upper bound on wealth taxes:

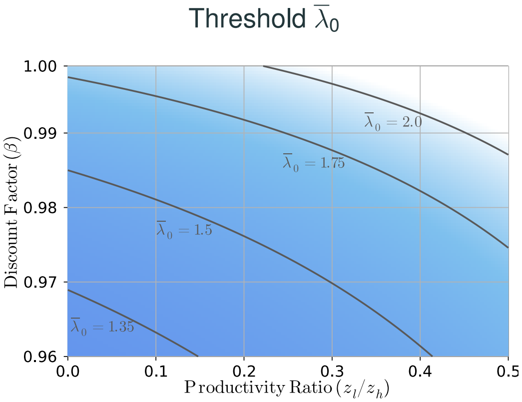
Upper Bound on τ_a

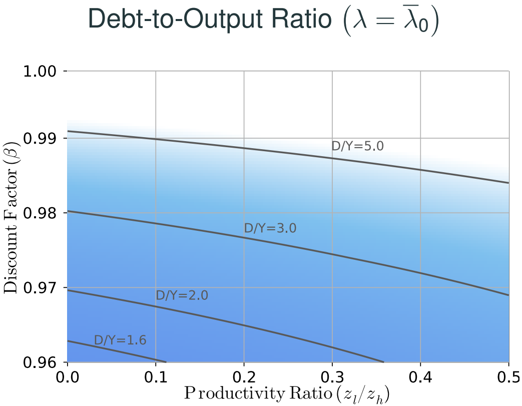
$$(\lambda - 1)\,\mu A_h < (1-\mu)\,A_\ell \longleftrightarrow \tau_a < \overline{\tau}_a = 1 - \frac{1}{\beta\delta}\left(1 - \frac{1-\delta}{\delta}\,\frac{1-\lambda\mu}{(\lambda-1)\left(1-\frac{z_\ell}{z_h}\right)}\right)$$

FIGURES

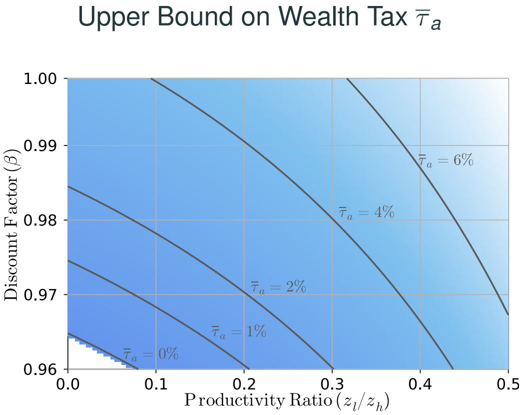
Conditions for Steady State with Heterogeneous Returns

▸ Returns ◂ back





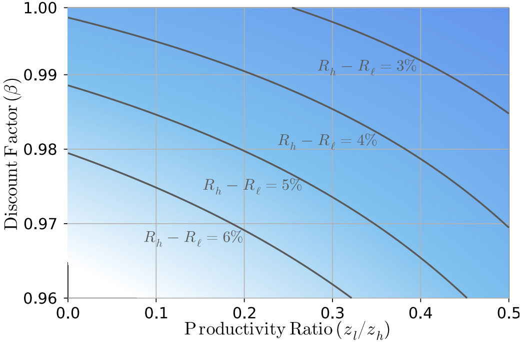
Condition for Steady State with Heterogeneous Returns



Return Dispersion in Steady State of the Benchmark Economy

back

Dispersion of Returns in Equilibrium, $R_h - R_\ell$

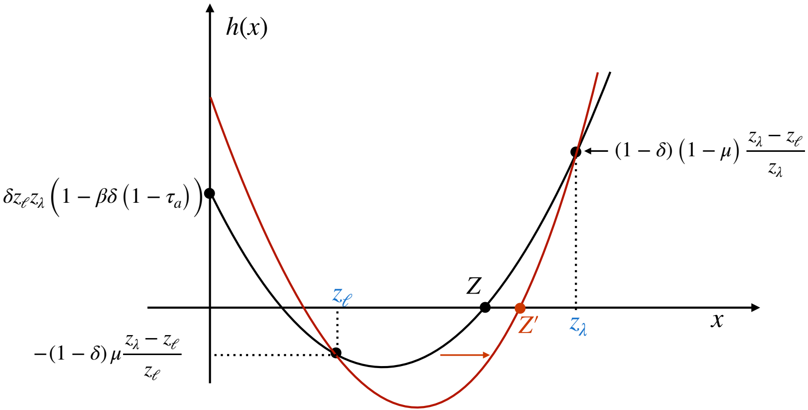


Note: *The figure reports the value return dispersion in steady state for combinations of the discount factor (β) and productivity dispersion (z_ℓ/z_h). We set the remaining parameters as follows: $\delta = 49/50$, $\beta\delta = 0.96$, $\mu = 0.10$, $z_h = 1$, $\tau_k = 25\%$, and $\alpha = 0.4$.*

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

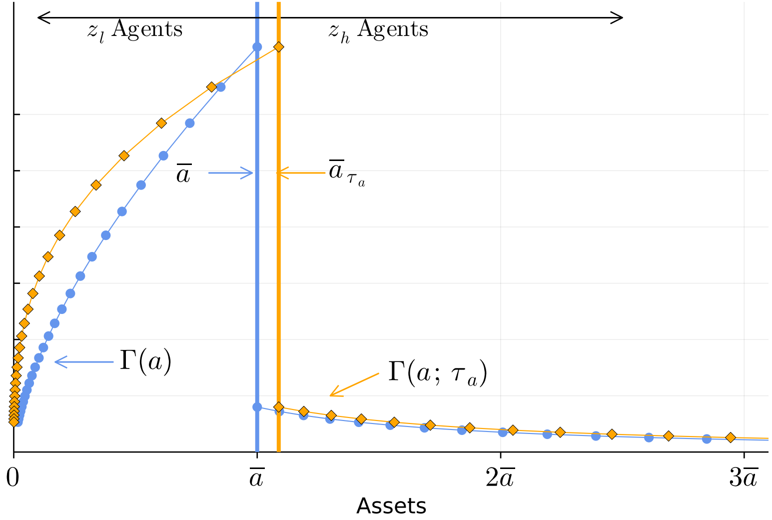
Back to eff. gain

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



Stationary wealth distribution and wealth taxes

back



Welfare Gains

Main Result 2: Welfare Gains by Type

back

Proposition:

α Thresholds

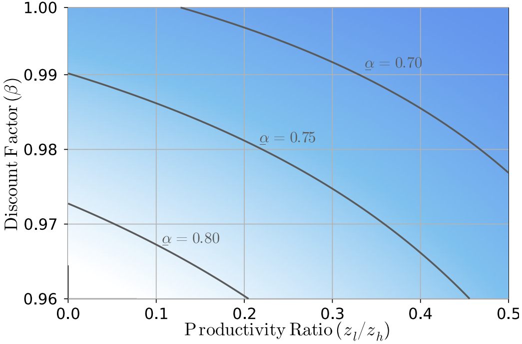
For all $\tau_a < \overline{\tau}_a$, a higher $\boldsymbol{\tau_a}$ changes welfare as follows:

- Workers: Higher welfare: $\frac{dV_{workers}}{d\tau_a} > 0$
- High-z entrepreneurs: Higher welfare $\left(\frac{dV_h(\bar{a})}{d\tau_a} > 0\right)$ because $\xi_Z^K + \frac{1}{1-\beta\delta}\xi_Z^{R_h} > 0$
- Low-z entrepreneurs: Lower welfare $\left(\frac{dV_\ell(\bar{a})}{d\tau_a} < 0\right)$ iff $\xi_Z^K + \frac{1}{1-\beta\delta}\xi_Z^{R_\ell} < 0; \alpha < \underline{\alpha}_\ell$
- Entrepreneurs: Lower average welfare iff $\xi_Z^K + \frac{1}{1-\beta\delta}\left(\mu\xi_Z^{R_h} + (1-\mu)\,\xi_Z^{R_\ell}\right) < 0; \alpha < \underline{\alpha}_E$

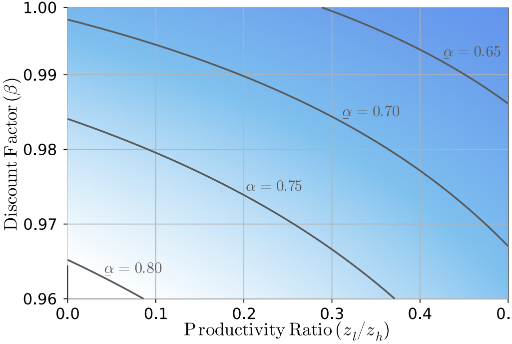
Conditions for Entrepreneurial Welfare Gain

back

Low-Productivity Entrepreneurs: $dV_\ell / d\tau_a > 0$



Average Entrepreneur: $dV_E / d\tau_a > 0$

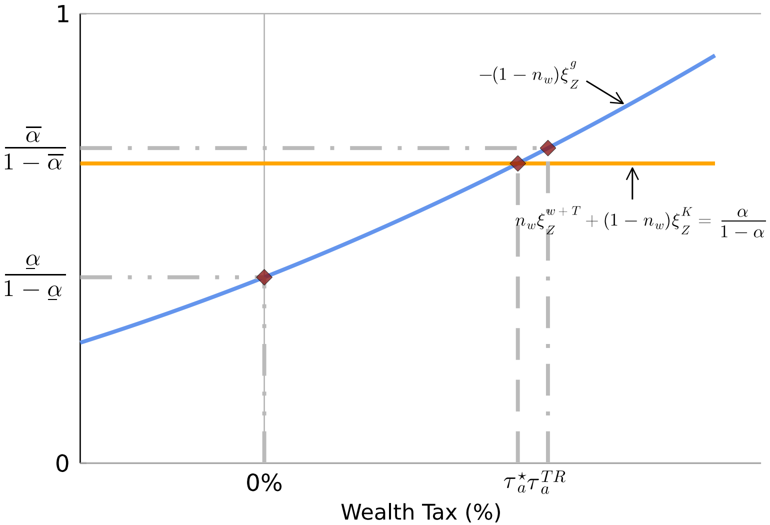


Note: *The figures report the threshold value of α above which entrepreneurial welfare increases after an increase in wealth taxes for combinations of the discount factor (β) and productivity dispersion (z_ℓ/z_h). We set the remaining parameters as follows:* $\delta = 49/50$, $\beta\delta = 0.96$, $\mu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

Optimal Taxes

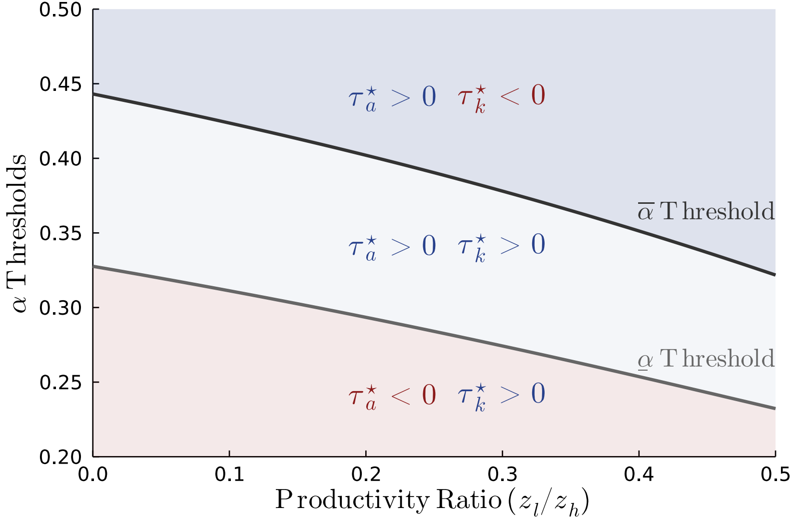
Optimal Tax and $\underline{\alpha}$ and $\overline{\alpha}$ Thresholds

back



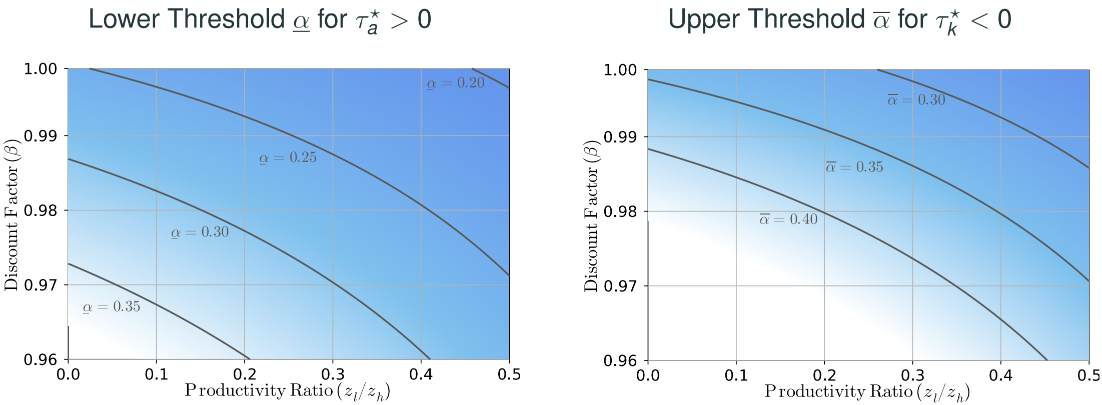
α Thresholds

more α thresholds
back



α-thresholds for Optimal Wealth Taxes

Back to opt. tax

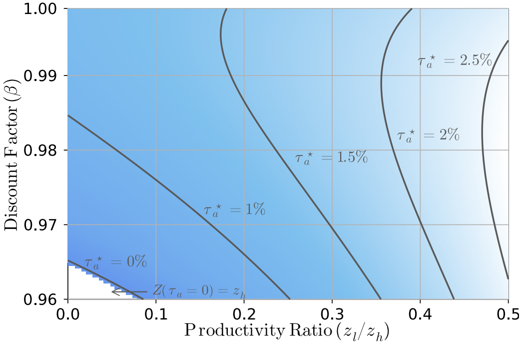


Note: *The figures report the threshold value of α for the optimal wealth taxes to be positive (left) and capital income taxes to be positive (right) for combinations of the discount factor (β) and productivity dispersion (z_ℓ/z_h). We set the remaining parameters as follows: $\delta = 49/50$, $\beta\delta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

Optimal Wealth Tax: β & Productivity Dispersion

back

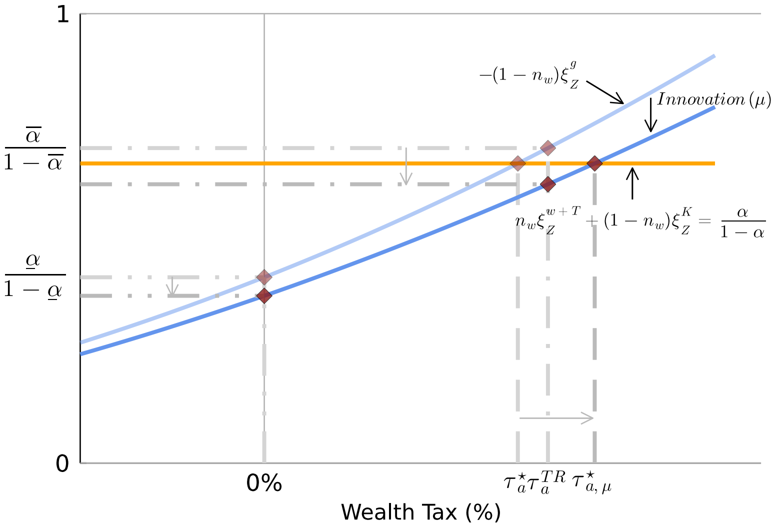
Optimal Wealth Tax $\tau_a^\star$



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 $\alpha = 0.4$.*

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

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" $\tilde{z}_i = (1+\omega_i)\, z_i$

Extension: Rents

Back to extensions

- Introduce wedge for returns above/below productivity:

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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

- 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

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:

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

- 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

- 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:

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

Extension: Entrepreneurial Effort

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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:**

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

3. Optimal taxes: higher wealth tax and lower capital income tax

Pareto Tail of Wealth Distribution: Model vs. Data

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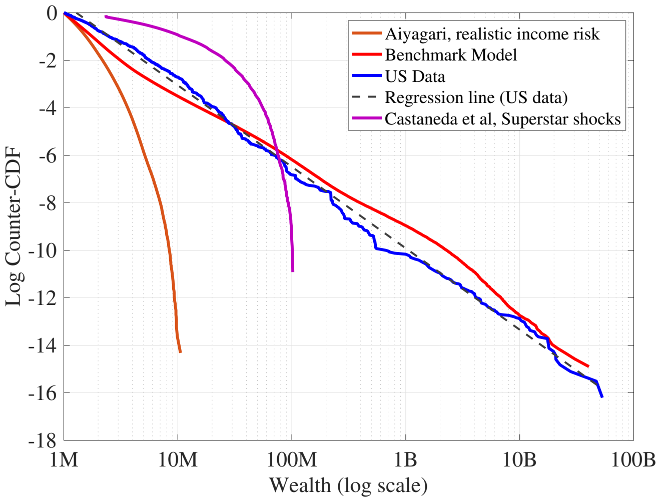

Note: *Both axes are in natural logs.*