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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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

- One-period model.
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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			
After-tax wealth ratio			

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After-tax wealth ratio	1.15 ($= {}^{1150}/_{1000}$)		

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Before-tax Income	\$0	\$200K	0	\$200K
	$\tau_k = 50/200 = 25\%$		$\tau_a = 2.5\%$	
Tax liability	0	\$50K $(= 200\tau_k)$	\$25K $(= 1000\tau_a)$	\$25K $(= 1000\tau_a)$
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After-tax wealth ratio	$1.15 \; (= {}^{1150}/_{1000})$		$1.20 \; (\approx {}^{1175}/_{975})$	

- 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.

Theoretical Results: Preview

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3. Optimal Taxes: Depend on TFP pass-through to wages and K *(given by capital intensity, α)*

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

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

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4. Endogenous innovation: increase effect of τ_a on TFP $\longrightarrow$ higher optimal wealth tax

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

Perpetual Youth Model with Workers and Entrepreneurs

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   - Initial (inherited) wealth $\bar{a}$ common across entrepreneurs *($\bar{a}$ determined endogenously later)*

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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 $z_i = z_\ell$
  - Productivity constant over lifetime *(results robust to Markov productivity process)*

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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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Proposition:

Proof

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

- 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 :

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

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Proposition:

Proof

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

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

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

Distribution

- Dispersion of after-tax returns rises :

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

- Average return decreases:

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

Government Budget and Aggregate Variables

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

- In what follows, τ_k adjusts in the background when $\tau_a \uparrow$ so that $G + T = \theta \alpha Y$

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

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

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:

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

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
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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:

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

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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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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

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

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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

- 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:

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

- **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 $\left((1-\tau_k)\,\text{MPK} = \frac{1}{\beta\delta} - (1-\tau_a) \right) \longrightarrow Z$, R_h, R_ℓ depend only on τ_a!

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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;
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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:

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

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

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

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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 $\lambda = \bar{\lambda}$

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details

Condition implies an upper bound on wealth taxes:

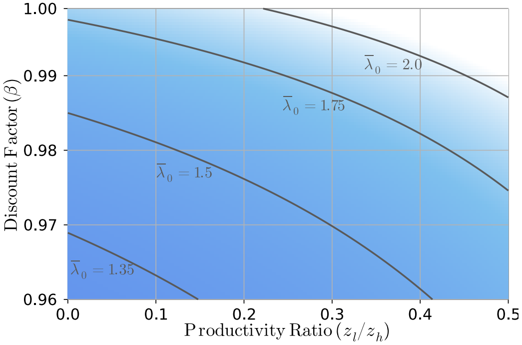
Upper Bound on τ_a

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

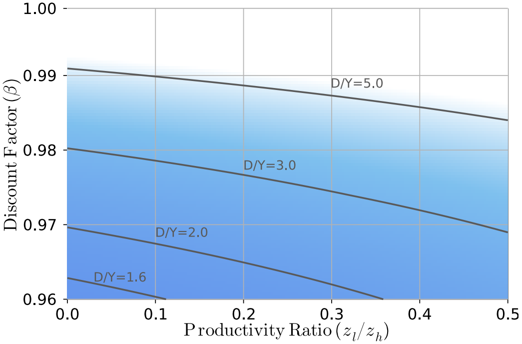
FIGURES

Conditions for Steady State with Heterogeneous Returns

Threshold $\overline{\lambda}_0$

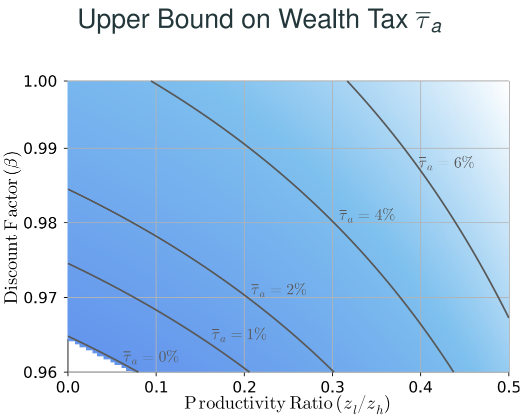


Debt-to-Output Ratio $(\lambda = \overline{\lambda}_0)$



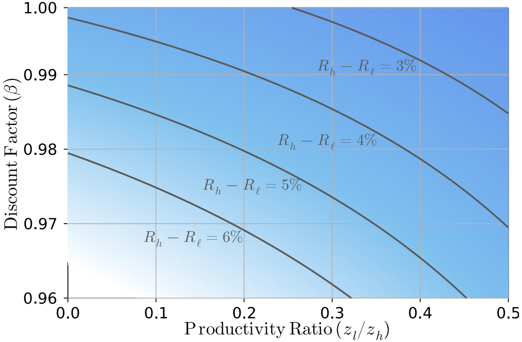
Condition for Steady State with Heterogeneous Returns

Returns back



Return Dispersion in Steady State of the Benchmark Economy

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

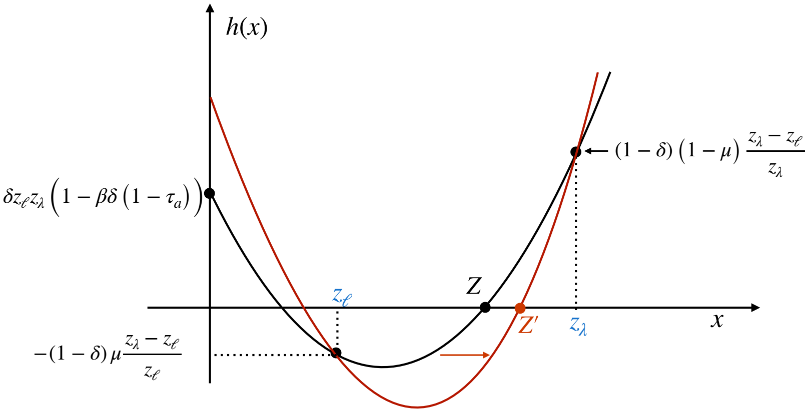


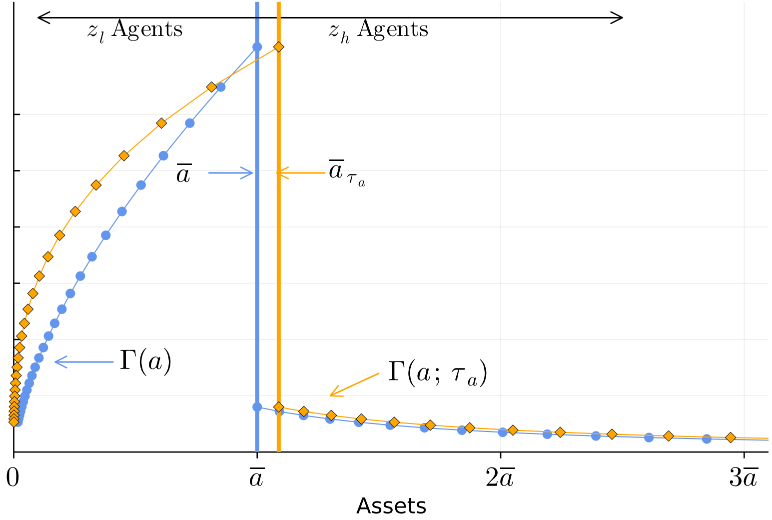
Note: *The figure reports the value return dispersion in steady state for combinations of the discount factor* (β) *and productivity dispersion* (z_ℓ/z_h)*. We set the remaining parameters as follows:* $\delta = 49/50$, $\beta\delta = 0.96$, $\mu = 0.10$, $z_h = 1$, $\tau_k = 25\%$, *and* $\alpha = 0.4$.

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

Back to eff. gain

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





z_l Agents
z_h Agents
$\overline{a}$
$\overline{a}_{\tau_a}$
$\Gamma(a)$
$\Gamma(a;\tau_a)$
0
$\overline{a}$
$2\overline{a}$
$3\overline{a}$
Assets

Welfare Gains

back

Proposition:

α Thresholds

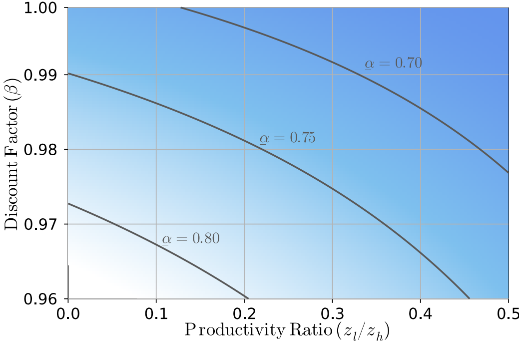
For all $\tau_a < \overline{\tau}_a$, a higher $\boldsymbol{\tau_a}$ changes welfare as follows:

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

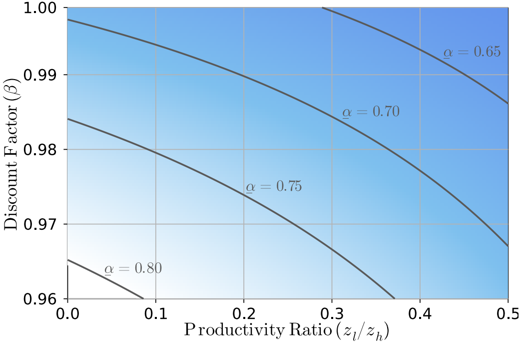
Conditions for Entrepreneurial Welfare Gain

back

Low-Productivity Entrepreneurs: ${}^{dV_\ell}/_{d\tau_a} > 0$



Average Entrepreneur: ${}^{dV_E}/_{d\tau_a} > 0$

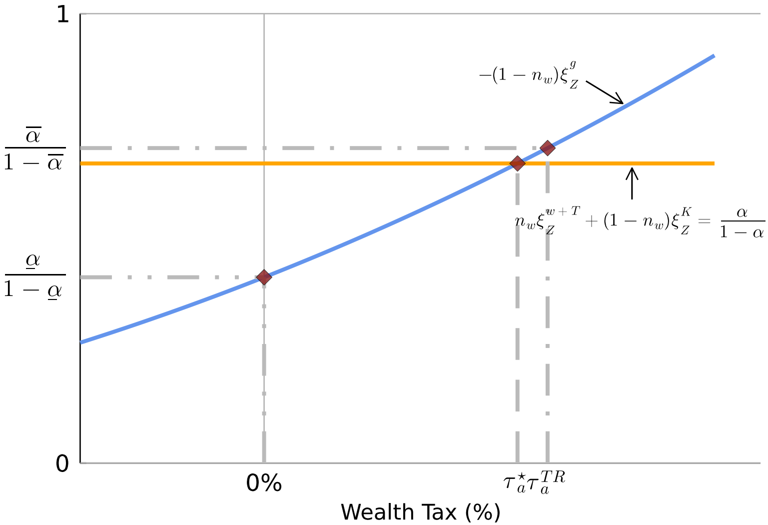


Note: *The figures report the threshold value of $\underline{\alpha}$ above which entrepreneurial welfare increases after an increase in wealth taxes for combinations of the discount factor (β) and productivity dispersion (${}^{z_\ell}/_{z_h}$). We set the remaining parameters as follows:* $\delta =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

Optimal Taxes

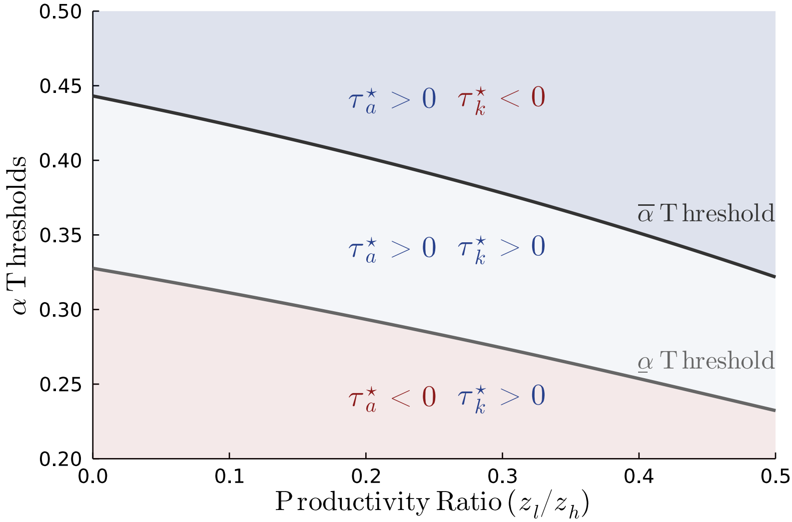
Optimal Tax and $\underline{\alpha}$ and $\overline{\alpha}$ Thresholds

back



α Thresholds

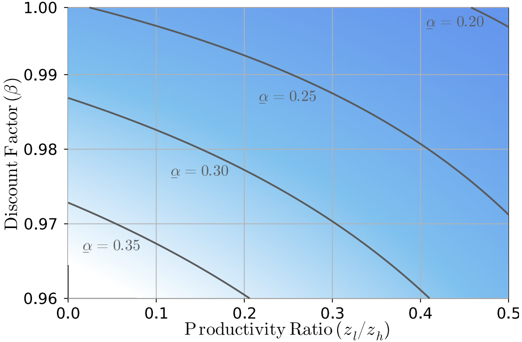
more α thresholds back



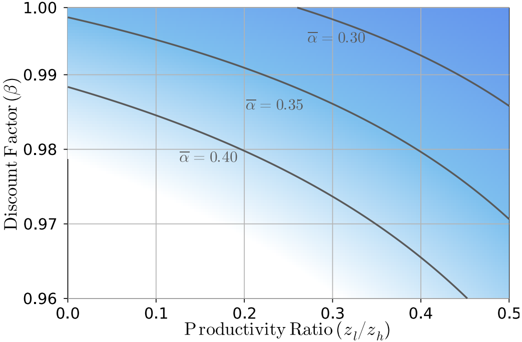
α-thresholds for Optimal Wealth Taxes

Back to opt. tax

Lower Threshold $\underline{\alpha}$ for $\tau_a^\star > 0$



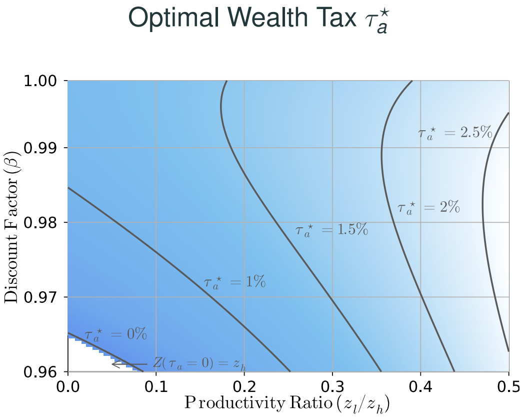
Upper Threshold $\overline{\alpha}$ for $\tau_k^\star < 0$



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 $\alpha = 0.4$.*

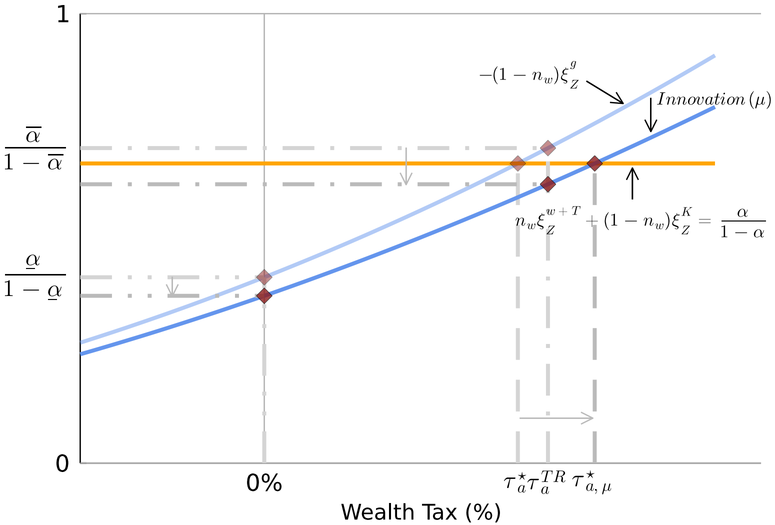
Optimal Wealth Tax: β & Productivity Dispersion

back



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



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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Back to extensions

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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

back

- 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:

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

Extension: Entrepreneurial Effort

back

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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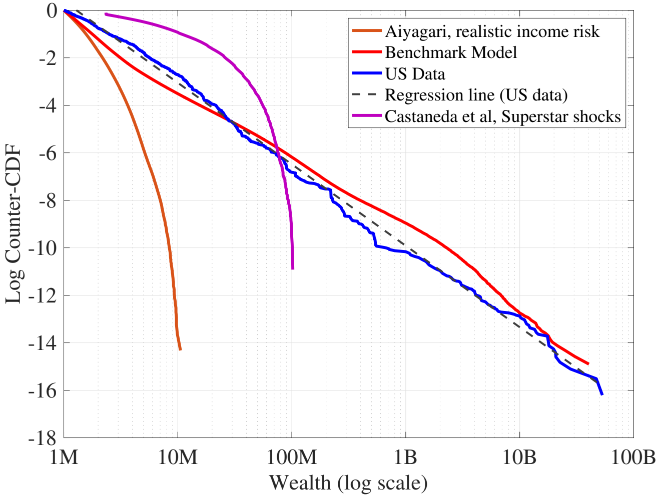

Note: *Both axes are in natural logs.*