Taxing Wealth and Capital Income When Returns are Heterogeneous

Guvenen, Kambourov, Kuruscu, Ocampo

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- **Find:** Large efficiency & welfare gains from replacing capital income tax with wealth tax

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This paper: Theoretical analysis of optimal combination of taxes

- Analytical model with workers, heterogeneous entrepreneurs, and innovation
- **Find:** conditions for **(i)** efficiency gains **(ii)** welfare effects **(iii)** optimal taxes **(iv)** effects on innovation

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   - Return heterogeneity generates concentration at the very top, Pareto tail, and fast wealth growth

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Pareto Tail vs. Models

3. **Practical:** Wealth taxation has been used by governments
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4. **Theoretical:** Interesting **new economic mechanisms** $\longrightarrow$ Example next.

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

Return Heterogeneity: A Simple Example

- One-period model.
- Government taxes to finance $G = \$50K$.
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- Two brothers, Fredo and Mike, each with \$1M of wealth.
- **Key heterogeneity:** investment/entrepreneurial ability.
  - (Fredo) Low ability: earns $r_f = 0\%$ rate of return.
  - (Mike) High ability: earns $r_m = 20\%$ rate of return.

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 ($r_m = 20\%$)	
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Before-tax Income	**\$0**	**\$200K**	
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After-tax return			
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$+$ increases dispersion in after-tax returns & wealth.

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In contrast, market value reflects productivity → taxing it has a limited **use it or lose it** effect.

Baseline Model with Exogenous Entrepreneurial Productivity

Perpetual Youth Model with Exogenous Entrepreneurial Productivity

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     - productivity ($z_i \in \{z_\ell, z_h\}$) determined at birth: μ $(1-\mu)$ fraction w/ permanent z_h (z_ℓ)
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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 with τ_k and τ_a

Financial Markets & Equilibrium with Heterogenous Returns

Financial markets:

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- If $\mu(\lambda - 1) A_h < (1 - \mu) A_\ell$:
  - low-type entrepreneurs bid down interest rate, $r = \text{MPK}(z_\ell)$.
  - **Unique steady state** with: return heterogeneity, misallocation of capital, wealth tax $\neq$ capital income tax.
  - **Empirically relevant:** $R_h > R_l$ and $\frac{\text{Debt}}{\text{GDP}} \gg 1.5$ when $\lambda = \overline{\lambda}$.

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- $\mu(\lambda - 1) A_h < (1-\mu) A_\ell \longleftrightarrow \tau_a < \overline{\tau}_a = 1 - \frac{1}{\beta\delta}\left(1 - \frac{1-\delta}{\delta}\frac{1-\lambda\mu}{(\lambda-1)\left(1-\frac{z_\ell}{z_h}\right)}\right)$ 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 Neoclassical Growth Model... 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 evolution of assets imply this quadratic equation:

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

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- **Note:** Both taxes affect capital, output, wages...

Main Result 1: Efficiency Gains from Wealth Taxation

Proposition:

Proof

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- Wealth concentration: $s_h \uparrow$ $(Z \uparrow = s_h z_\lambda + (1 - s_h) z_\ell)$
- Dispersion of after-tax returns rises:

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

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Lemma:

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

- **Increases** capital (K), output (Y), wage (w), & h-type wealth (A_h)

Government Budget and Aggregate Variables

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

- In what follows, τ_k adjusts in the background when $\tau_a \uparrow$

Lemma:

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

- **Increases** capital (K), output (Y), wage (w), & h-type wealth (A_h)
- **Key:** Higher $\alpha \longrightarrow$ Larger pass-through of TFP 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 ($\frac{dV_\ell(\bar{a})}{d\tau_a} < 0$) 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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Note: The last two conditions imply a threshold on α for welfare gains that are high in practice, so average entrepreneur welfare is typically lowered when τ_a increases.

α Thresholds

Main Result 3: Optimal Taxes

α thresholds

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

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

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

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

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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:

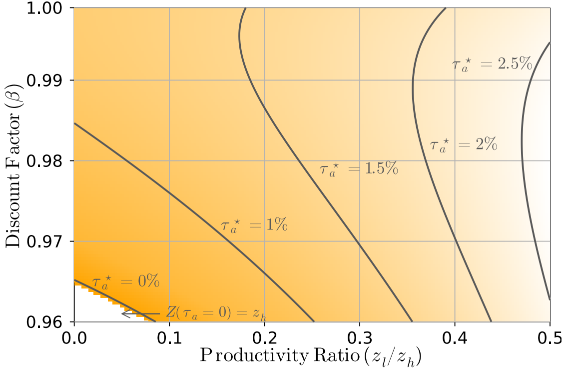
$$0 = \left(\underbrace{n_w \xi_w^Z + (1-n_w)\,\xi_K^Z}_{\text{Level Effect } (+) = \frac{\alpha}{1-\alpha}} + \underbrace{\frac{1-n_w}{1-\beta\delta}\left(\mu \xi_{R_h}^Z + (1-\mu)\,\xi_{R_\ell}^Z\right)}_{\text{Return Productivity Effect (-)}} \right) \frac{d \log Z}{d\tau_a}$$

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

$\tau_a^\star < 0$ and $\tau_k^\star > 0$	if $\alpha < \underline{\alpha}$
$\tau_a^\star > 0$ and $\tau_k^\star > 0$	if $\underline{\alpha} \leq \alpha \leq \bar{\alpha}$
$\tau_a^\star > 0$ and $\tau_k^\star < 0$	if $\alpha > \bar{\alpha}$

How the Optimal Wealth Tax Varies with β and productivity dispersion

Figure 1: Optimal Wealth Tax



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 $\alpha = 0.4$.*

Baseline Model with Innovation and Endogenous Entrepreneurial Productivity

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-productivity idea if successful

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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- Unique equilibrium with innovation. Efficiency gains with wealth tax. Same as before.

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We can show:

- Unique equilibrium with innovation. Efficiency gains with wealth tax. Same as before.
- Wealth tax increases innovation, hence fraction of high-type entrepreneurs.
- Optimal wealth tax is higher.

Equilibrium with Innovation

Steady State $\mu^\star$: For a given wealth tax level $\tau_a \leq \overline{\tau}_a$, the steady state share of high-productivity entrepreneurs, $\mu^\star$, is determined by 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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Corollary (efficiency 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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where $\xi_x^y \equiv \frac{d\log x}{d\log Z}$ is the elasticity of variable x with respect to y.

Extensions

Extension: Infinite-Horizon Model with Mean-Reverting Productivity

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

We further considered the following three 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
- Workers gain. High-productivity entrepreneurs gain. Low-productivity entrepreneurs (typically) lose.
- Equilibrium innovation increases (when innovation is endogenous).

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- Optimal wealth tax is higher with endogenous innovation.

Conclusions

Increasing τ_a (& reducing τ_k):

- Reallocates capital: less productive $\rightarrow$ more productive agents.
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Optimal taxes:

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Final Remark:

- We assumed the misallocation of capital arises due to a financing constraint.
- But the source of the misallocation is not critical for the "use-it-or-lose-it" to work.
- Fredo might (incorrectly) believe that he is as good as Mike. [in progress]

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:

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

Entrepreneurs' Production Decision:

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

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

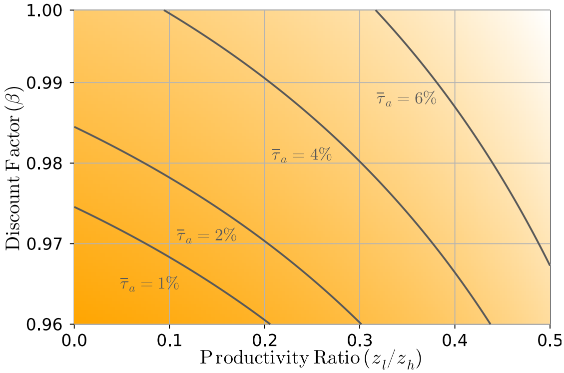
- $(\lambda - 1)\,a$: amount of external funds used by type-z if $MPK(z) > r$.

back

FIGURES

Condition for Steady State with Heterogeneous Returns

Figure 2: Upper Bound Wealth Tax



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.*

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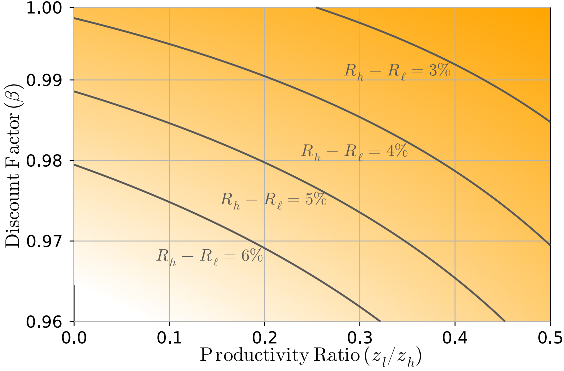
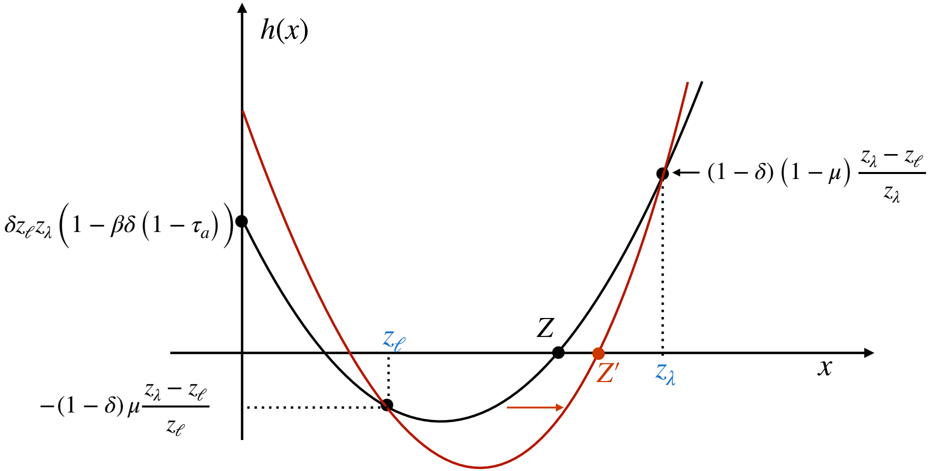
Figure 3: Dispersion of Returns in Steady State



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* $\alpha = 0.4$.

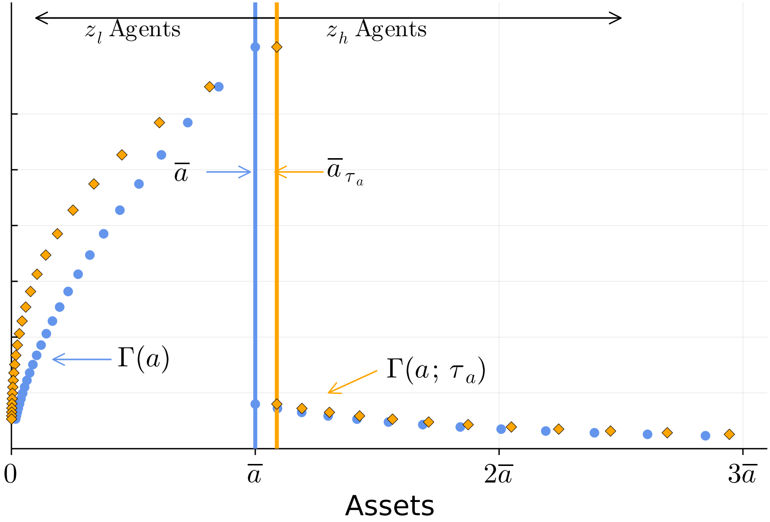
What happens to Z if $\tau_a \uparrow$?

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



Stationary wealth distribution and wealth taxes

back

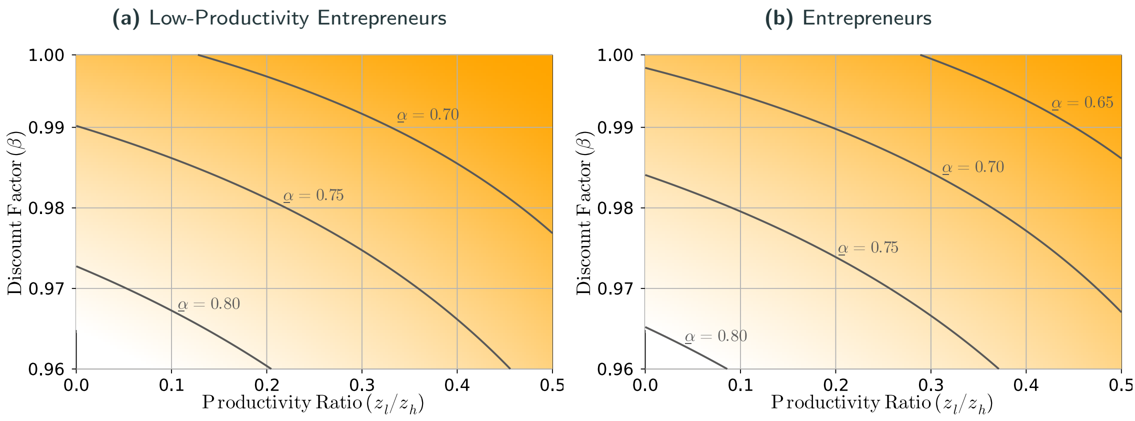


Welfare Gains

Conditions for Entrepreneurial Welfare Gain

back

Figure 4: α Thresholds for Entrepreneurial Welfare Gains

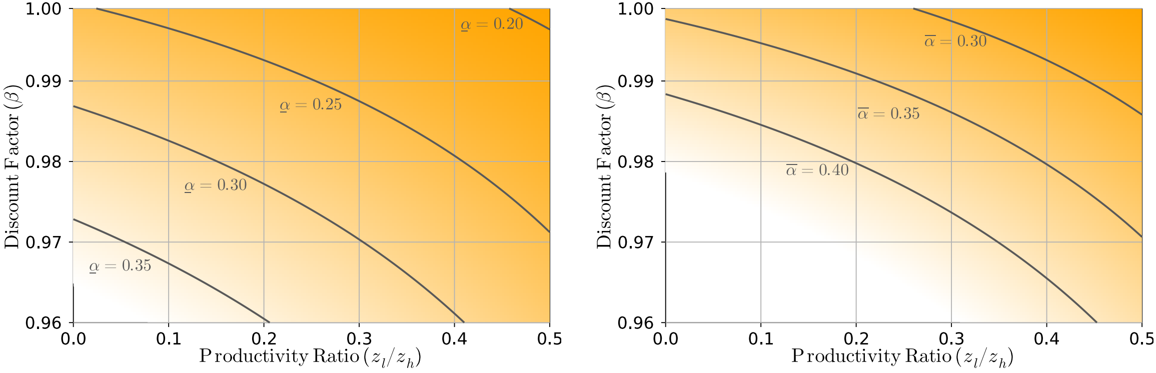


Note: *The figures report the threshold value of α above which entrepreneurial welfare increases after an increase in wealth taxes for combinations of the discount factor (β) and productivity dispersion (z_ℓ/z_h). We set the remaining parameters as follows: $\delta = 49/50$, $\beta\delta = 0.96$, $\mu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

Extensions

Extension: Corporate sector

- Corporate sector produces final goods using CRS 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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- 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:

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

- Solution is just as before (linear policy functions a', n, **and e**)
- **Key:** Effective cost of effort depends on capital income tax $\boldsymbol{\tau_k}$!
    - 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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Back

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Entrepreneurs: monopolistic competition → **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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  - top wealth concentration (overall and in the hands of entrepreneurs)
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Calibration summary

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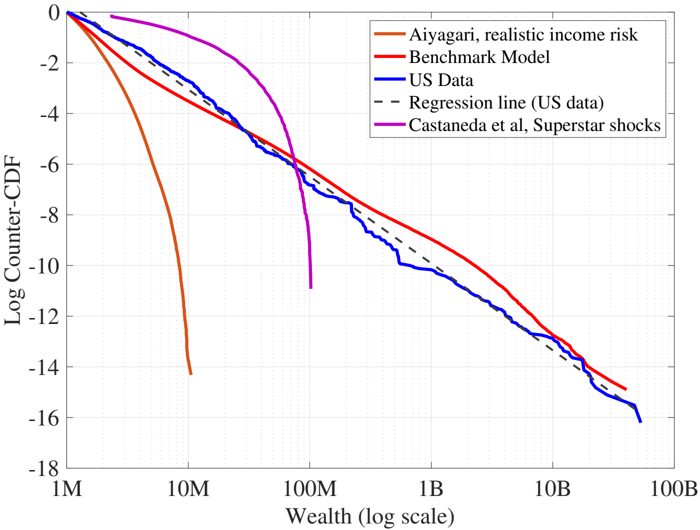
- Bequest motive $\rightarrow$
  - level and concentration of bequests
- Entrepreneurial productivity $\rightarrow$
  - top wealth concentration (overall and in the hands of entrepreneurs)
  - shares of entrepreneurs and self-made billionaires
- Entrepreneurs' collateral constraint $\rightarrow$
  -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

Details

Pareto Tail of Wealth Distribution: Model vs. Data

Back



Note: Both axes are in natural logs.

Performance of the benchmark model: return heterogeneity

Back

Table 1: Distribution of Rates of Return (Untargeted) in the Model and the Data

	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

*Notes: 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+						

Tax Reform: Who Gains? Who Loses?

Back

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	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	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?

Back

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	Productivity group (Percentile)					
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20	**6.7**	**6.3**	**6.8**	**8.5**	**11.5**	**13.4**
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

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

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				
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				

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

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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 $\left(\bar{c}, \bar{\ell}\right)$	8.9	14.7	
Dist. $\left(c, \ell\right)$	-1.5	**−8.3**	

Welfare: Levels vs Redistribution

Back

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- 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	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)