Wealth Taxation, Capital Gains Taxation and the Inequality–Mobility Trade-Off

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Abstract

We compare wealth taxes and capital gains taxes in a random growth model with idiosyncratic investment risk. At equal tax revenue, wealth taxes generate higher wealth inequality but also higher wealth mobility than capital gains taxes. The mechanism operates through variance: wealth taxes shift the mean of post-tax wealth growth without affecting variance, while capital gains taxes compress the upper tail and reduce variance. Lower variance compresses the stationary distribution, reducing wealth inequality, but also dampens rank changes, reducing wealth mobility. The variance effect dominates the fact that lower inequality shrinks the wealth gaps agents must overcome. Policymakers who value both low wealth inequality and high wealth mobility therefore face a trade-off. This trade-off is robust to type and scale dependence in returns, hand-to-mouth households, aggregate risk, and tax progressivity.

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1 Introduction

Wealth taxes and capital gains taxes generate different combinations of wealth inequality and wealth mobility, even when raising the same tax revenue. For a given effective tax rate, wealth taxes produce higher wealth inequality but also higher wealth mobility than capital gains taxes. Policymakers who value both low wealth inequality and high wealth mobility therefore face a trade-off.

The mechanism operates through the cross-sectional variance of post-tax wealth growth rates. A wealth tax subtracts a constant from each agent's wealth growth, shifting the mean but leaving dispersion unchanged. Capital gains taxes apply only to positive wealth changes, compressing the upper tail and reducing variance. Lower variance compresses the stationary distribution, which reduces wealth inequality. For wealth mobility, two forces operate in opposite directions. Lower variance dampens rank changes. But lower inequality also reduces the wealth gaps agents must overcome to switch ranks. In our case, the variance effect dominates: despite smaller wealth gaps, agents under capital gains taxes switch wealth ranks less.

We formalize this in a partial equilibrium random growth model with idiosyncratic investment risk and lump-sum redistribution. Agents hold undiversified portfolios and therefore face multiplicative shocks. We compare three tax instruments at equal effective tax rates: a wealth tax, an unrealized capital gains tax and a realized capital gains tax. We characterize how each tax affects the variance of wealth growth, the stationary distribution, and rank-switching probabilities. We show that the trade-off is robust under type-dependent returns, scale-dependent returns, hand-to-mouth households, aggregate investment risk and tax progressivity.

Why do these results matter? Rising wealth inequality has renewed interest in wealth taxation (e.g., Guvenen et al., 2023, 2024; Saez & Zucman, 2019; Scheuer & Slemrod, 2021). But the desirability of reducing wealth inequality may depend on wealth mobility: high inequality with high mobility differs from high inequality with low mobility (Van Langenhove, 2025a). Standard comparisons assume deterministic returns, under which wealth and capital income taxes are equivalent at appropriate rates (Guvenen et al., 2023). Stochastic multiplicative dynamics break this equivalence.

Related literature Our paper speaks to three strands of the literature on wealth inequality, taxation, and mobility.

First, there exists a literature on wealth and capital gains taxation. Bastani & Waldenström (2020) and Scheuer & Slemrod (2021) survey the theory and evidence on wealth and capital income taxation. On behavioral responses, Jakobsen et al. (2020) and Jakobsen et al. (2025) use Danish administrative data, Advani & Tarrant (2021) UK data, Brülhart et al. (2022) Swiss data, and Ring (2024) and Thoresen et al. (2022) Norwegian data to estimate elasticities of wealth with respect to taxation. On optimal taxation, Guvenen et al. (2023) compare wealth and capital income taxes, showing equivalence under homogeneous returns but not under heterogeneous returns. Guvenen et al. (2024) extend this analysis to book-value wealth taxation and innovation. Boar & Knowles (2024) study optimal wealth taxation with entrepreneurial risk. Boadway & Spiritus (2025), Gahvari & Micheletto (2016), Gerritsen et al. (2025) and Kristjánsson (2016) analyze optimal capital taxation with heterogeneous returns. Boar & Midrigan (2022) and Gaillard & Wangner (2023) study the macroeconomic effects of wealth taxes. We complement these studies by focusing on the wealth mobility implications of different tax instruments.

Second, we build on the literature on random growth models of wealth inequality. Wold & Whittle (1957) showed that multiplicative shocks generate Pareto tails in the stationary distribution. Schulz & Weber (2025) survey the empirical evidence on power laws in economic outcomes. Bouchaud & Mézard (2000) introduced mean-reverting redistribution to ensure stationarity. Lorenz et al. (2013) show that redistribution can enhance aggregate growth in multiplicative environments by reducing variance drag. Jones (2015) and Benhabib & Bisin (2018) survey this random growth literature and its implications for macroeconomics. Benhabib et al. (2011) and Benhabib et al. (2015) micro-founded these dynamics in heterogeneous-agent models with stochastic returns. Gabaix et al. (2016) study how redistribution affects the stationary distribution and derive closed-form expressions for tail exponents. We extend this random growth framework to compare tax instruments and focus explicitly on their impact on wealth mobility.

Third, there exists a growing literature on (relative) wealth mobility. On the empirical side, a growing number of studies quantifies inter- and intra-generational wealth mobility in the United States (Fisher & Johnson, 2023; Fisher et al., 2022; Van Langenhove, 2025a), Nordic countries (Adermon et al., 2018; Audoly et al., 2024; Black et al., 2020; Boserup et al., 2017;

Fagereng et al., 2021) and the United Kingdom (Gregg & Kanabar, 2023; Levell & Sturrock, 2023). On the theoretical side, several studies use Aiyagari-Bewley-Huggett frameworks to study the joint determinants of wealth inequality and wealth mobility (Atkeson & Irie, 2022; Benhabib et al., 2019; Benhabib et al., 2022; Fisher, 2019; Hubmer et al., 2024; Van Langenhove, 2025b). We integrate wealth mobility into the discussion on wealth taxation and capital gains taxation.

Roadmap Section 2 presents the model. Section 3 presents simulation results and explains the mechanism. Section 4 examines robustness. Section 5 concludes.

2 Model

2.1 Wealth dynamics

Time is discrete, indexed by $t \in \{0, 1, 2, \ldots\}$. A population of N infinitely-lived agents, indexed by $i \in \{1, \ldots, N\}$, have logarithmic utility over consumption and discount at rate $\rho > 0$:

$$\mathbb{E}_0 \left[\sum_{t=0}^{\infty} \beta^t \log c_{i,t} \right] \tag{1}$$

where $\beta = 1/(1+\rho)$ is the discount factor. Each agent operates an individual investment technology.

Agent i's wealth earns an expected return $r > 0$ but faces idiosyncratic risk captured by $\varepsilon_{i,t} \overset{iid}{\sim} \mathcal{N}(0,1)$. The shocks $\varepsilon_{i,t}$ are independent across agents and time.

Consider first the case without taxation, then the case with taxes and redistribution. First, in the absence of taxation, wealth evolves as:

$$W_{i,t+1} = W_{i,t} \exp(\mu + \sigma \varepsilon_{i,t}) \tag{2}$$

where $\mu \equiv r - \rho - \frac{1}{2}\sigma^2$ is the expected log growth rate net of consumption and $\sigma > 0$ is volatility. The $-\frac{1}{2}\sigma^2$ term is a Jensen correction ensuring $\mathbb{E}[W_{i,t+1}/W_{i,t}] = \exp(r - \rho)$. With log utility, agents consume a constant fraction of wealth each period, which is absorbed into the drift term. Second, with taxes and redistribution, wealth evolves as:

$$W_{i,t+1} = W_{i,t} \exp(\mu + \sigma \varepsilon_{i,t}) - T_{i,t} + T_t^{\text{redist}} \tag{3}$$

where $T_{i,t}$ denotes taxes paid and T_t^{redist} denotes lump-sum transfers. The government redistributes tax revenue equally:

$$T_t^{\text{redist}} = \frac{1}{N} \sum_{j=1}^{N} T_{j,t} \tag{4}$$

which creates mean reversion in relative wealth (Benhabib et al., 2011; Gabaix et al., 2016). Without redistribution, relative wealth would be a martingale and no stationary distribution would exist.

2.2 Taxation

Tax instruments We compare three tax instruments that differ in their base. For the capital gains taxes, define pre-tax wealth as:

$$W_{i,t}^{\text{pre}} = W_{i,t} \exp(\mu + \sigma \varepsilon_{i,t}) \tag{5}$$

First, a wealth tax is a proportional tax on pre-tax wealth:

$$T_{i,t}^{(W)} = \tau_W W_{i,t}^{\text{pre}} \tag{6}$$

Second, an unrealized capital gains tax applies to positive capital gains, marked to market each period:

$$T_{i,t}^{(U)} = \tau_U \max\{W_{i,t}^{\text{pre}} - W_{i,t}, 0\} \tag{7}$$

Third, a realized capital gains tax is triggered when cumulative gains relative to basis exceed a threshold:

$$T_{i,t}^{(R)} = \begin{cases} \tau_R \max\{W_{i,t}^{\text{pre}} - B_{i,t}, 0\} & \text{if } W_{i,t}^{\text{pre}} / B_{i,t} \geq \theta \\ 0 & \text{otherwise} \end{cases} \tag{8}$$

where $B_{i,t}$ denotes agent i's cost basis and $\theta > 1$ is the realization threshold. The basis evolves as:

$$B_{i,t+1} = \begin{cases} W_{i,t}^{\text{pre}} - T_{i,t}^{(R)} & \text{if realization occurs} \\ B_{i,t} & \text{otherwise} \end{cases} \tag{9}$$

Upon realization of the realized capital gains tax, the basis resets to post-tax, pre-redistribution wealth. Otherwise it remains unchanged.

Equal-ETR comparisons We compare the three tax regimes at equal effective tax rates (ETR), defined as the ratio of total tax revenue to total wealth:

$$\text{ETR}_t \equiv \frac{\sum_{j=1}^{N} T_{j,t}}{\sum_{j=1}^{N} W_{j,t}^{\text{pre}}} \tag{10}$$

For the wealth tax, ETR $= \tau_W$ by construction. For capital gains taxes, the effective rate depends on the distribution of gains, requiring calibration of τ_U or τ_R to match a target ETR.

Equal-ETR comparisons isolate the distributional and wealth mobility implications of different tax instruments while remaining agnostic about welfare weights. This approach is appropriate if administrative, compliance, and enforcement costs depend on policy intensity only through the effective tax rate. As Slemrod & Yitzhaki (2002) emphasize, tax administration is costly, and higher rates increase avoidance incentives.

Under this assumption, if one tax instrument achieves lower wealth inequality than another at equal ETR, a policymaker who cares only about inequality would prefer it. Similarly, if one instrument generates higher wealth mobility at equal ETR, a policymaker who cares only about mobility would prefer it. Our equal-ETR framework therefore permits clear policy rankings under minimal normative assumptions, without committing to a social welfare function.

3 Simulation results

3.1 Baseline results

We simulate the model with $N = 10{,}000$ agents over $T = 200$ time periods in partial equilibrium. The expected return is $r = 0.08$, the consumption rate $\rho = 0.06$, and the volatility parameter $\sigma = 0.30$, yielding a log growth rate of $\mu = r - \rho - \frac{1}{2}\sigma^2 = -0.025$. All agents start the simulation with initial wealth $W_0 = 1$. The realization threshold for the realized capital gains tax is set equal to $\theta = 1.5$ for all agents. We vary the effective tax rate ETR from 0% to 5%.[1] Figure 1 reports the results.

Three patterns emerge. First, the wealth tax generates higher wealth inequality than capital gains taxes, but also higher wealth mobility. Second, the unrealized capital gains tax generates higher inequality than the realized tax, but also higher mobility. Third, these differences widen at higher ETR. The patterns are robust to alternative indicators (Appendix A). These findings imply a trade-off: reducing wealth inequality comes at the cost of lower wealth mobility.

3.2 The variance mechanism

The trade-off arises because each tax affects the variance of wealth growth differently. Figure 2 illustrates.

Post-tax wealth growth rates Define the pre-tax log growth rate as $g_t = \mu + \sigma\varepsilon_t$, so that $W_t^{\text{pre}} = W_t \exp(g_t)$. We define the post-tax log growth rate $\tilde{g}_t$ by $W_{t+1} = W_t \exp(\tilde{g}_t)$, abstracting from redistribution. Each tax implies a different growth rate $\tilde{g}_t$. First, under the wealth tax:

$$\tilde{g}_t^W = g_t + \log(1 - \tau_W) \tag{11}$$

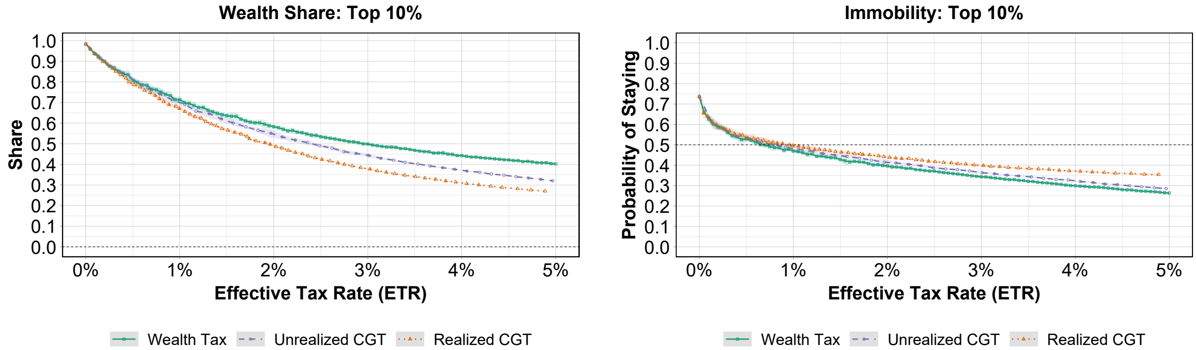
which shifts the mean, while the variance σ^2 is unchanged. Second, under the unrealized capital gains tax, taxes apply to positive level gains $W_t(\exp(g_t) - 1)$. Post-tax wealth satisfies $W_{t+1} = W_t[\exp(g_t) - \tau_U \max\{\exp(g_t) - 1, 0\}]$. This yields:

$$\tilde{g}_t^U = \begin{cases} \log((1 - \tau_U)\exp(g_t) + \tau_U) & \text{if } g_t > 0 \\ g_t & \text{if } g_t \leq 0 \end{cases} \tag{12}$$

which shows that positive growth rates are compressed by a concave transformation, reducing variance. Third, under the realized capital gains tax, compression occurs only above the realization threshold. For analytical tractability, let us consider a stylized single-period trigger

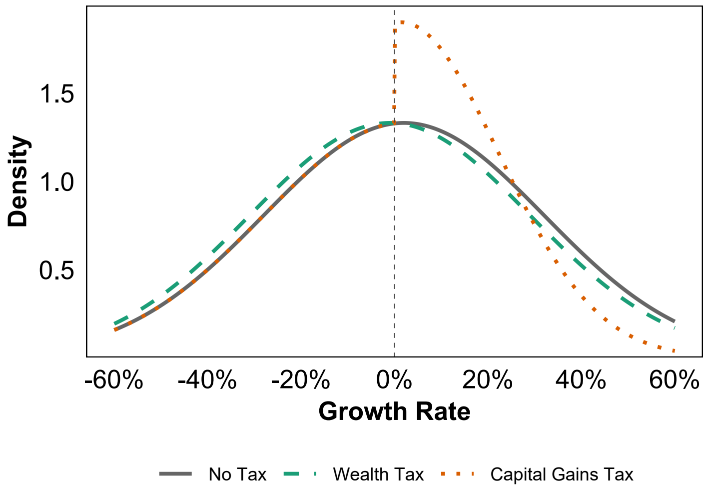
[1]For the wealth tax, ETR $= \tau_W$ by construction. For the unrealized capital gains tax, an ETR of 5% corresponds to $\tau_U \approx 0.35$. For the realized capital gains tax, an ETR of 5% corresponds to $\tau_R \approx 0.70$. A reported ETR corresponds to the ETR in the stationary distribution of the model.

Figure 1: Tax regime comparison and the inequality–mobility trade-off.



Notes: The left panel shows the top 10% wealth share. The right panel shows the probability of remaining in the top 10% after 20 periods. Parameters: $N = 10{,}000$, $T = 200$, $r = 0.08$, $\rho = 0.06$, $\sigma = 0.30$, $\theta = 1.5$. Each data point is the average over 25 independent simulations at a given statutory tax rate. Shaded areas show ± 1 standard deviation (barely visible due to low cross-run variance).

Figure 2: Pre-tax and post-tax wealth growth distributions.



Notes: The wealth tax (green) shifts the distribution leftward without changing its shape. Capital gains taxes (orange) compress the right tail. The realized capital gains tax compresses only the extreme upper tail. Capital gains taxes reduce variance, while wealth taxes do not.

at $\bar{g} > 0$[2]:

$$\tilde{g}_t^R = \begin{cases} \log((1-\tau_R)\exp(g_t) + \tau_R \exp(\bar{g})) & \text{if } g_t > \bar{g} \\ g_t & \text{if } g_t \leq \bar{g} \end{cases} \tag{13}$$

At equal ETR, $\tau_R > \tau_U$ since the base is narrower, so compression is stronger. The post-tax variances therefore satisfy (see Appendix B.1):

$$\tilde{\sigma}_W^2 > \tilde{\sigma}_U^2 > \tilde{\sigma}_R^2 \tag{14}$$

Wealth inequality & wealth mobility In random growth models with redistribution, the stationary distribution has a Pareto right tail with exponent ζ characterized by the Kesten (1973) condition $\mathbb{E}[\exp(\zeta\tilde{g}_t)] = 1$. For small growth rates, this yields (Benhabib and Bisin, 2018; Gabaix et al., 2016; Appendix B.2):

$$\zeta \approx 1 + \frac{2\gamma}{\tilde{\sigma}^2} \tag{15}$$

where γ captures mean reversion strength from redistribution. Lower variance implies higher ζ: a thinner tail and lower top wealth shares. The variance ordering therefore determines the wealth inequality ordering:

$$\zeta_W < \zeta_U < \zeta_R \tag{16}$$

What about wealth mobility? Consider two agents with log wealth gap $\Delta > 0$. With lognormal dynamics, the gap evolves exactly as $X_{t+1} - X_t = \tilde{g}_{1,t} - \tilde{g}_{2,t}$, a random walk with per-period variance $2\tilde{\sigma}^2$ (see Appendix B.3). We demonstrate that the probability of rank reversal at horizon h is:

$$P(\text{switch at } h) = \Phi\left(-\frac{\Delta}{\tilde{\sigma}\sqrt{2h}}\right) \tag{17}$$

which shows that two forces operate. Higher variance increases wealth mobility by generating more rank reversals. Smaller gaps increase wealth mobility by reducing the distance to bridge. These forces oppose each other: the wealth tax preserves higher variance but generates larger wealth gaps. In our simulations, the variance effect dominates: wealth tax agents switch ranks

[2] This captures the key mechanism: realized capital gains tax applies higher rates to a narrower base. Our simulations implement the cumulative trigger in Section 2: the variance ordering is verified numerically.

more frequently despite larger gaps. Hence:

$$P(\text{switch})_W > P(\text{switch})_U > P(\text{switch})_R \tag{18}$$

4 Robustness of the trade-off

The trade-off survives alternative model formulations as long as the variance ordering from Equation (14) remains intact. Each extension has a corresponding appendix with details and figures.

Type and scale dependence Returns may structurally vary across households. We consider two extensions (in line with e.g., Gabaix et al., 2016; Jones & Kim, 2018). First, type dependence implies that agents transition between types with distinct expected returns ($K = 5$ types with $r_k \in \{0.06, 0.07, 0.08, 0.09, 0.10\}$, centered on the baseline $r = 0.08$, persistence $p = 0.99$). Second, scale dependence implies that higher wealth deciles earn higher expected returns ($r(d)$ increasing linearly from 0.06 for the bottom decile to 0.10 for the top decile). Both extensions increase wealth inequality and reduce wealth mobility relative to baseline. However, the variance ordering across tax instruments is unchanged: capital gains taxes still compress variance more than wealth taxes, so the trade-off continues to hold. See Appendix C.

Hand-to-mouth households Not all households hold wealth. We introduce hand-to-mouth households who hold zero wealth (in line with e.g., Galí et al., 2007; Kaplan et al., 2018). A fraction $\lambda \in \{1.0, 0.9, 0.7\}$ are entrepreneurs following baseline dynamics. The remainder of households are hand-to-mouth. Only entrepreneurs pay taxes, but redistribution is shared equally. As λ declines, wealth inequality increases and wealth mobility falls due to diluted redistribution. The trade-off persists given that hand-to-mouth households do not affect the variance mechanism among entrepreneurs. See Appendix D for more details.

Aggregate risk The baseline model assumes purely idiosyncratic risk. We add aggregate shocks that affect all agents (in line with e.g., Krusell & Smith, 1998; Hubmer et al., 2021). Let $\kappa \in \{1.0, 0.9, 0.8\}$ denote the idiosyncratic share of total variance. With $\kappa = 0$, all agents move together and wealth inequality vanishes. For $\kappa > 0$, only idiosyncratic variance drives relative wealth dynamics, and capital gains taxes compress this component more than wealth taxes.

The trade-off between wealth inequality and wealth mobility therefore persists. We provide more details in Appendix E.

Tax progressivity Real-world tax proposals often include exemption thresholds (Drometer et al., 2018; Saez & Zucman, 2019; Scheuer & Slemrod, 2021; Wolff, 2020). We tax only wealth (capital gains) above $\chi \in \{0, 0.5, 1\}$ times mean wealth (mean positive capital gains). A higher threshold requires higher statutory rates for equal ETR. The trade-off between wealth inequality and wealth mobility persists because the variance ordering holds within the taxed population: under progressive wealth taxation, taxed agents face mean reversion but unchanged variance. Under progressive capital gains taxation, they face both mean reversion and variance compression. See Appendix F for more details.

5 Conclusion

This paper shows that wealth taxes and capital gains taxes generate different combinations of wealth inequality and wealth mobility, even at equal tax revenue. Wealth taxes shift the mean of wealth growth without affecting variance. Capital gains taxes compress the upper tail and reduce variance. Lower variance reduces both wealth inequality and wealth mobility, creating a trade-off.

Several limitations suggest directions for future work. First, we abstract from behavioral responses such as tax avoidance, tax evasion, or portfolio reallocation. Second, our model features a single asset class: in practice, tax treatment may vary across asset types (e.g., housing versus non-housing assets). Third, we do not model general equilibrium effects on asset prices or capital accumulation.

Our paper does not take a stand on optimal tax policy. The desirability of trading off wealth inequality against wealth mobility depends on the social welfare function. A policymaker who cares only about wealth inequality would prefer capital gains taxes, one who cares only about wealth mobility would prefer wealth taxes. When both objectives matter, the optimal choice depends on their relative weights and may involve a mix of instruments. Characterizing optimal policy in this case requires specifying preferences over both objectives.

6 References

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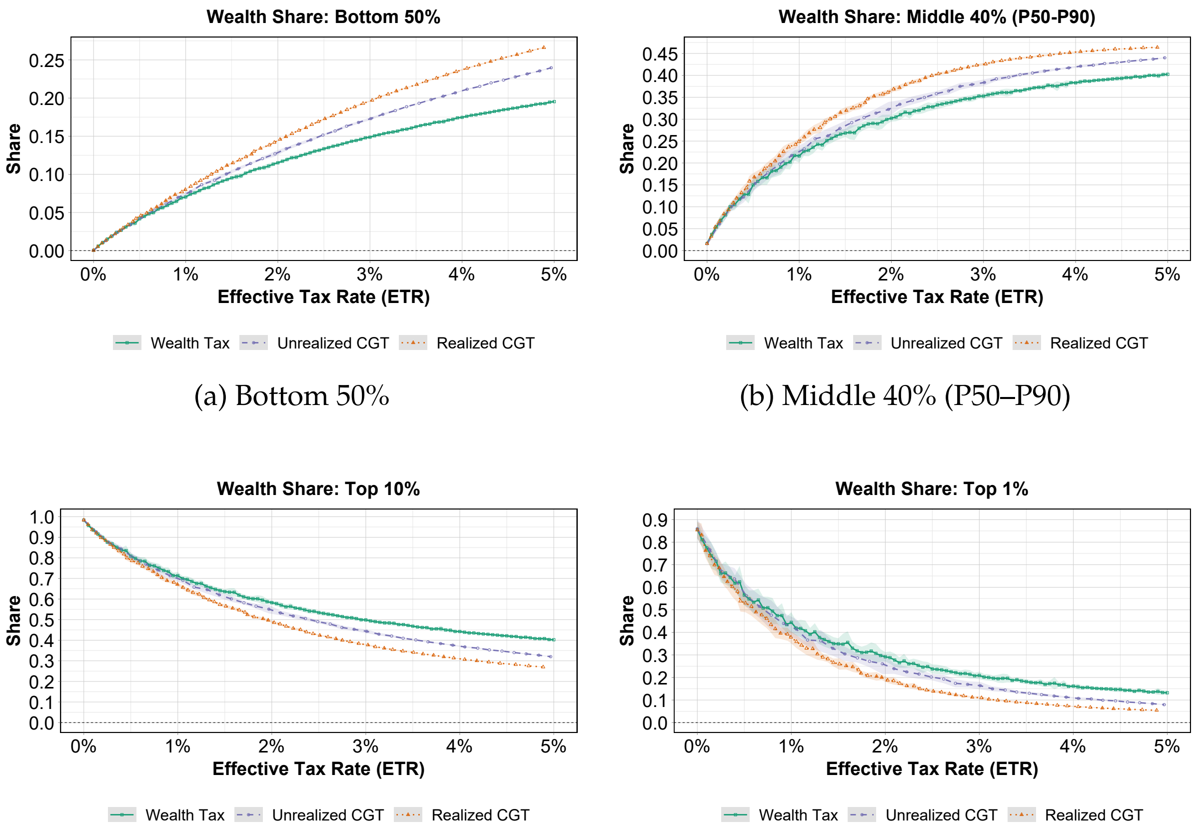
A Additional baseline results

Figure 3 reports wealth shares across the distribution. Capital gains taxes generate lower wealth inequality than the wealth tax at equal tax revenue: higher wealth shares at the bottom and middle, lower wealth shares at the top. Figure 4 reports wealth mobility across the distribution. The probability of remaining in a given wealth group is higher under capital gains taxes, confirming lower wealth mobility. This pattern holds throughout the wealth distribution.

Figure 3: Wealth inequality across the distribution in three tax regimes.



(a) Bottom 50%

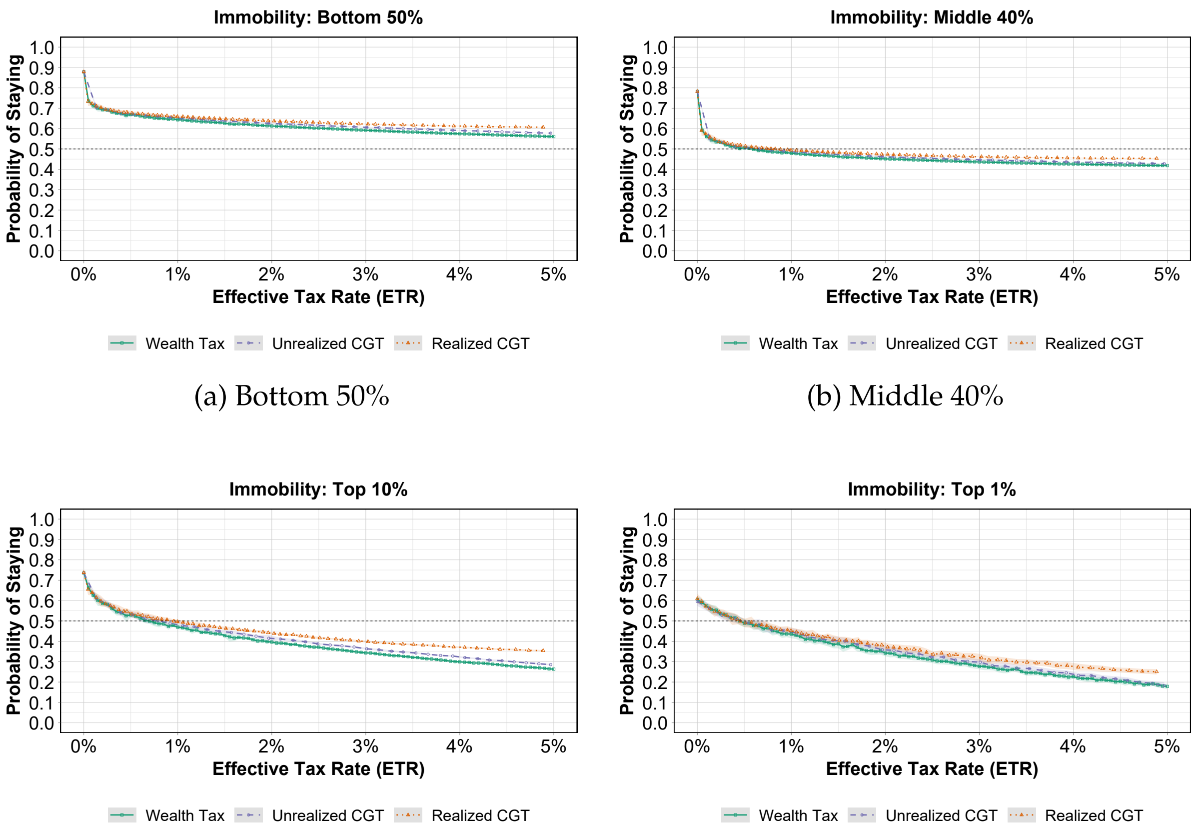
(b) Middle 40% (P50–P90)

(c) Top 10%

(d) Top 1%

Notes: Each panel shows the wealth share held by the indicated group. Parameters: $N = 10{,}000$, $T = 200$, $r = 0.08$, $\rho = 0.06$, $\sigma = 0.30$, $\theta = 1.5$. Each data point is the average over 25 independent simulations at a given statutory tax rate. Shaded areas show ± 1 standard deviation (barely visible due to low cross-run variance).

Figure 4: Wealth mobility across the distribution in three tax regimes.



(a) Bottom 50% (b) Middle 40%

(c) Top 10% (d) Top 1%

Notes: Each panel shows the probability of remaining in the indicated wealth group after 20 periods. Higher values indicate lower mobility. Parameters: $N = 10{,}000$, $T = 200$, $r = 0.08$, $\rho = 0.06$, $\sigma = 0.30$, $\theta = 1.5$. Each data point is the average over 25 independent simulations at a given statutory tax rate. Shaded areas show ± 1 standard deviation (barely visible due to low cross-run variance).

B Analytical results

This appendix provides formal derivations for the results in Section 3. Section B.1 establishes the variance ordering across tax regimes. Section B.2 links variance to wealth inequality via the Pareto tail exponent. Section B.3 derives the relationship between variance and wealth mobility.

B.1 Variance ordering

We show that post-tax growth variance satisfies $\tilde{\sigma}_W^2 > \tilde{\sigma}_U^2 > \tilde{\sigma}_R^2$. Intuitively, wealth taxes shift the growth distribution without changing its shape, while capital gains taxes compress the right tail, reducing variance. Realized capital gains taxes compress more strongly than unrealized capital gains taxes at equal revenue because they apply higher rates to a narrower base.

Recall from Section 3 that the (pre-tax) log growth rate is $g_t = \mu + \sigma \varepsilon_t$, where $\varepsilon \sim N(0,1)$. Consistent with discrete-time geometric Brownian motion, pre-tax wealth evolves as:

$$W_{i,t+1}^{\text{pre}} = W_{i,t} \exp(g_{i,t}) \tag{19}$$

We define the post-tax log growth rate $\tilde{g}_{i,t}$ by $W_{i,t+1} = W_{i,t} \exp(\tilde{g}_{i,t})$, abstracting from redistribution (which is common across regimes in this variance comparison), and write $\tilde{\sigma}^2 \equiv \text{Var}(\tilde{g})$.

First, under a wealth tax, post-tax wealth is proportional to pre-tax wealth. If the wealth tax applies at rate τ_W, then:

$$W_{i,t+1} = (1 - \tau_W) W_{i,t+1}^{\text{pre}} = W_{i,t}(1 - \tau_W) \exp(g_{i,t}) \tag{20}$$

so post-tax log growth is:

$$\tilde{g}^W = g + \log(1 - \tau_W) \tag{21}$$

Since $\log(1 - \tau_W)$ is a constant, variance is unchanged:

$$\tilde{\sigma}_W^2 = \sigma^2 \tag{22}$$

Second, for the unrealized capital gains tax, the tax applies only to positive gains. Since gains are proportional to $\exp(g) - 1$, taxation occurs if $g > 0$. Post-tax wealth is:

$$W_{i,t+1} = W_{i,t}\left(\exp(g_{i,t}) - \tau_U \max\{\exp(g_{i,t}) - 1, 0\}\right) \tag{23}$$

meaning that the post-tax gross growth factor equals:

$$\exp(\tilde{g}^U) = \exp(g) - \tau_U \max\{\exp(g) - 1, 0\} = \begin{cases} (1-\tau_U)\exp(g) + \tau_U & \text{if } g > 0 \\ \exp(g) & \text{if } g \leq 0 \end{cases} \tag{24}$$

For $g > 0$, this simplifies to $e^{\tilde{g}^U} = e^g - \tau_U(e^g - 1) = (1-\tau_U)e^g + \tau_U$, where the constant term τ_U reflects that the tax applies only to gains $\left(e^g - 1\right)$ while the principal is untaxed. Taking logs, the post-tax log growth rate is:

$$\tilde{g}^U = \begin{cases} \log((1-\tau_U)\exp(g) + \tau_U) & \text{if } g > 0 \\ g & \text{if } g \leq 0 \end{cases} \tag{25}$$

Positive realizations are thus transformed by a concave mapping of g (in levels, the right tail of $\exp(g)$ is compressed), while negative realizations pass through unchanged. This asymmetric compression reduces variance. To compute $\tilde{\sigma}_U^2$, we use the law of total variance:

$$\text{Var}(\tilde{g}^U) = \mathbb{E}[\text{Var}(\tilde{g}^U \mid S)] + \text{Var}(\mathbb{E}[\tilde{g}^U \mid S]) \tag{26}$$

where $S = \mathbf{1}\{g > 0\}$. Let $p = \Pr(g > 0) = \Phi(\mu/\sigma)$. For the truncated normal $g \sim N(\mu, \sigma^2)$, define:

$$\mu^+ = \mathbb{E}[g \mid g > 0], \quad \mu^- = \mathbb{E}[g \mid g \leq 0] \tag{27}$$

$$v^+ = \text{Var}(g \mid g > 0), \quad v^- = \text{Var}(g \mid g \leq 0) \tag{28}$$

In addition, define the conditional moments of the post-tax log growth rate on the positive region:

$$\tilde{\mu}_U^+ = \mathbb{E}[\tilde{g}^U \mid g > 0], \qquad \tilde{v}_U^+ = \text{Var}(\tilde{g}^U \mid g > 0) \tag{29}$$

On the negative region, $\tilde{g}^U = g$, so the corresponding moments are $\mathbb{E}[\tilde{g}^U \mid g \leq 0] = \mu^-$ and $\mathrm{Var}(\tilde{g}^U \mid g \leq 0) = v^-$. Applying Equation (26) and comparing to the untaxed case yields:

$$\tilde{\sigma}_U^2 = \tilde{v}_U^+ p + v^-(1-p) + p(1-p)\left[\tilde{\mu}_U^+ - \mu^-\right]^2 \tag{30}$$

$$\sigma^2 = v^+ p + v^-(1-p) + p(1-p)\left[\mu^+ - \mu^-\right]^2 \tag{31}$$

The key difference is that on the positive region $g > 0$, post-tax log wealth growth is:

$$\tilde{g}^U = \log((1-\tau_U)\exp(g) + \tau_U)$$

This is a strictly increasing and strictly concave function of g for $\tau_U > 0$, with slope strictly between 0 and 1. The mapping is therefore a contraction that compresses dispersion: $\tilde{v}_U^+ < v^+$. Moreover, the between-state mean gap is reduced, $\tilde{\mu}_U^+ - \mu^- < \mu^+ - \mu^-$. For $\tau_U > 0$, these compression effects dominate:

$$\tilde{\sigma}_U^2 < \sigma^2 \tag{32}$$

Third, for the realized capital gains tax, the model specifies a cumulative trigger: taxation occurs when $W_t^{\text{pre}}/B_t \geq \theta$. For analytical tractability, consider a stylized single-period trigger at threshold $\bar{g} > 0$ in log growth. The corresponding gains threshold in levels is $\exp(\bar{g}) - 1$, and taxation applies only to gains above this cutoff. Post-tax wealth is:

$$W_{i,t+1} = W_{i,t}\left(\exp(g_{i,t}) - \tau_R \max\{\exp(g_{i,t}) - \exp(\bar{g}), 0\}\right) \tag{33}$$

The post-tax gross growth factor is therefore:

$$\exp(\tilde{g}^R) = \exp(g) - \tau_R \max\{\exp(g) - \exp(\bar{g}), 0\} = \begin{cases} (1-\tau_R)\exp(g) + \tau_R \exp(\bar{g}) & \text{if } g > \bar{g} \\ \exp(g) & \text{if } g \leq \bar{g} \end{cases} \tag{34}$$

Taking logs:

$$\tilde{g}^R = \begin{cases} \log((1-\tau_R)\exp(g) + \tau_R \exp(\bar{g})) & \text{if } g > \bar{g} \\ g & \text{if } g \leq \bar{g} \end{cases} \tag{35}$$

Only sufficiently large positive gains are compressed. Let $q = \Pr(g > \bar{g}) < p$. At equal ETR, the narrower base requires a higher rate. Since:

$$\mathbb{E}[\max\{\exp(g) - \exp(\bar{g}), 0\}] < \mathbb{E}[\max\{\exp(g) - 1, 0\}] \tag{36}$$

we need $\tau_R > \tau_U$ to raise the same revenue. The resulting upper-tail transformation is therefore stronger than under unrealized taxation, yielding stronger compression and lower variance:

$$\tilde{\sigma}_R^2 < \tilde{\sigma}_U^2 \tag{37}$$

Combining these results, we obtain the variance ordering (confirmed in our simulations):

$$\tilde{\sigma}_W^2 > \tilde{\sigma}_U^2 > \tilde{\sigma}_R^2 \tag{38}$$

B.2 Stationary distribution

We show that lower variance implies a higher Pareto tail exponent ζ, and therefore lower wealth inequality. Intuitively, with less dispersed growth shocks, extreme wealth accumulation becomes less likely, producing a thinner right tail.

Kesten process & Pareto tail From the wealth accumulation equation (Equation (3)), wealth evolves as:

$$W_{i,t+1} = A_{i,t} W_{i,t} + B_{i,t} \tag{39}$$

where $A_{i,t} = \exp(\tilde{g}_{i,t})$ is the multiplicative component and $B_{i,t} = T_t^{\text{redist}}$ is the additive component. This is a Kesten process. Redistribution ensures mean reversion: wealthy agents pay more in taxes than they receive in transfers. Under regularity conditions, Kesten (1973) established that the stationary distribution has a Pareto right tail:

$$\Pr(W > w) \sim C \cdot w^{-\zeta} \quad \text{as } w \to \infty \tag{40}$$

The tail exponent $\zeta > 0$ solves $\mathbb{E}[A_t^{\zeta}] = 1$. Two forces determine ζ: multiplicative shocks spread out the wealth distribution (lower ζ), while mean-reverting redistribution compresses it (higher ζ).

Variance and tail exponent Holding redistribution fixed, lower dispersion of A_t increases ζ. To see why, note that $\mathbb{E}[A_t^{\zeta}] = 1$ pins down ζ. If A_t has less dispersion, its ζ-th moment is smaller for any given ζ, so a higher ζ is needed to satisfy the condition. In our setting, dispersion differences across tax regimes are driven by the variance of post-tax log growth $\tilde{\sigma}^2 = \text{Var}(\tilde{g})$, which maps one-to-one into dispersion of $A = \exp(\tilde{g})$. At equal ETR, variance differs but aggregate redistribution intensity is held constant. Concretely, for small growth rates (so that $|\tilde{g}|$ is typically small), we approximate $A = \exp(\tilde{g}) \approx 1 + \tilde{g} + O(\tilde{g}^2)$ and write the tail condition as $\mathbb{E}\left[(1+\tilde{g})^{\zeta}\right] \approx 1$. A second-order expansion yields:

$$(1+\tilde{g})^{\zeta} \approx 1 + \zeta\tilde{g} + \frac{\zeta(\zeta-1)}{2}\tilde{g}^2 \tag{41}$$

Writing mean reversion as $\mathbb{E}[\tilde{g}] = -\gamma$ with $\gamma > 0$ and using $\mathbb{E}[\tilde{g}^2] \approx \tilde{\sigma}^2$ for small drift, the condition $\mathbb{E}[(1+\tilde{g})^{\zeta}] = 1$ becomes:

$$-\gamma + \frac{\zeta - 1}{2}\tilde{\sigma}^2 \approx 0 \text{ which implies } \zeta \approx 1 + \frac{2\gamma}{\tilde{\sigma}^2} \tag{42}$$

Our numerical simulations show that variance compression is the primary driver of inequality differences, since redistribution intensity and therefore γ is equal across taxation regimes. The variance ordering $\tilde{\sigma}_W^2 > \tilde{\sigma}_U^2 > \tilde{\sigma}_R^2$ therefore implies:

$$\zeta_W < \zeta_U < \zeta_R \tag{43}$$

B.3 Wealth mobility

We show that higher variance increases wealth mobility. Intuitively, larger shocks generate more wealth rank reversals.

Consider two agents with $W_{1,t} > W_{2,t}$. Their log wealth gap is:

$$X_t = \log W_{1,t} - \log W_{2,t}, \quad X_0 = \Delta > 0 \tag{44}$$

Abstracting from redistribution, wealth evolves as $W_{i,t+1} = W_{i,t}\exp(\tilde{g}_{i,t})$, so:

$$X_{t+1} - X_t = \tilde{g}_{1,t} - \tilde{g}_{2,t} \tag{45}$$

With lognormal dynamics, this decomposition is exact and requires no small-growth approximation. If idiosyncratic shocks are independent across agents and over time, then the per-period variance of the gap change is $2\tilde{\sigma}^2$. Over h periods, the gap change is approximately Gaussian by the central limit theorem:

$$X_{t+h} - X_t \sim N(0, 2h\tilde{\sigma}^2) \tag{46}$$

The probability that ranks have reversed at horizon h is:

$$P(X_{t+h} \leq 0 \mid X_t = \Delta) = \Phi\left(-\frac{\Delta}{\sqrt{2h}\tilde{\sigma}}\right) \tag{47}$$

Redistribution creates mean reversion: wealthy agents face net outflows, inducing negative drift $\mu_X < 0$. The switching probability becomes:

$$P(X_{t+h} \leq 0 \mid X_t = \Delta) = \Phi\left(-\frac{\Delta + h\mu_X}{\sqrt{2h}\tilde{\sigma}}\right) \tag{48}$$

For weak redistribution ($|h\mu_X| \ll \Delta$), this reduces to Equation (47). Equation (47) reveals two effects. First, higher variance $\tilde{\sigma}^2$ increases wealth mobility (larger shocks close wealth gaps faster). Second, smaller gaps Δ increase wealth mobility (less distance to bridge). These forces oppose each other across tax regimes: wealth taxes preserve high variance but generate larger equilibrium wealth gaps (due to higher wealth inequality). In our simulations, the variance effect dominates. Hence:

$$P(\text{switch})_W > P(\text{switch})_U > P(\text{switch})_R \tag{49}$$

C Type and scale dependence

The baseline assumes identical expected return r and volatility σ for all agents. We consider two extensions. First, with type dependence, agents are assigned to one of K types with expected return r_k and volatility σ_k. Agent i's wealth evolves as:

$$W_{i,t+1} = W_{i,t} \exp(\mu_{k_{i,t}} + \sigma_{k_{i,t}} \varepsilon_{i,t}) - T_{i,t} + T_t^{\text{redist}} \tag{50}$$

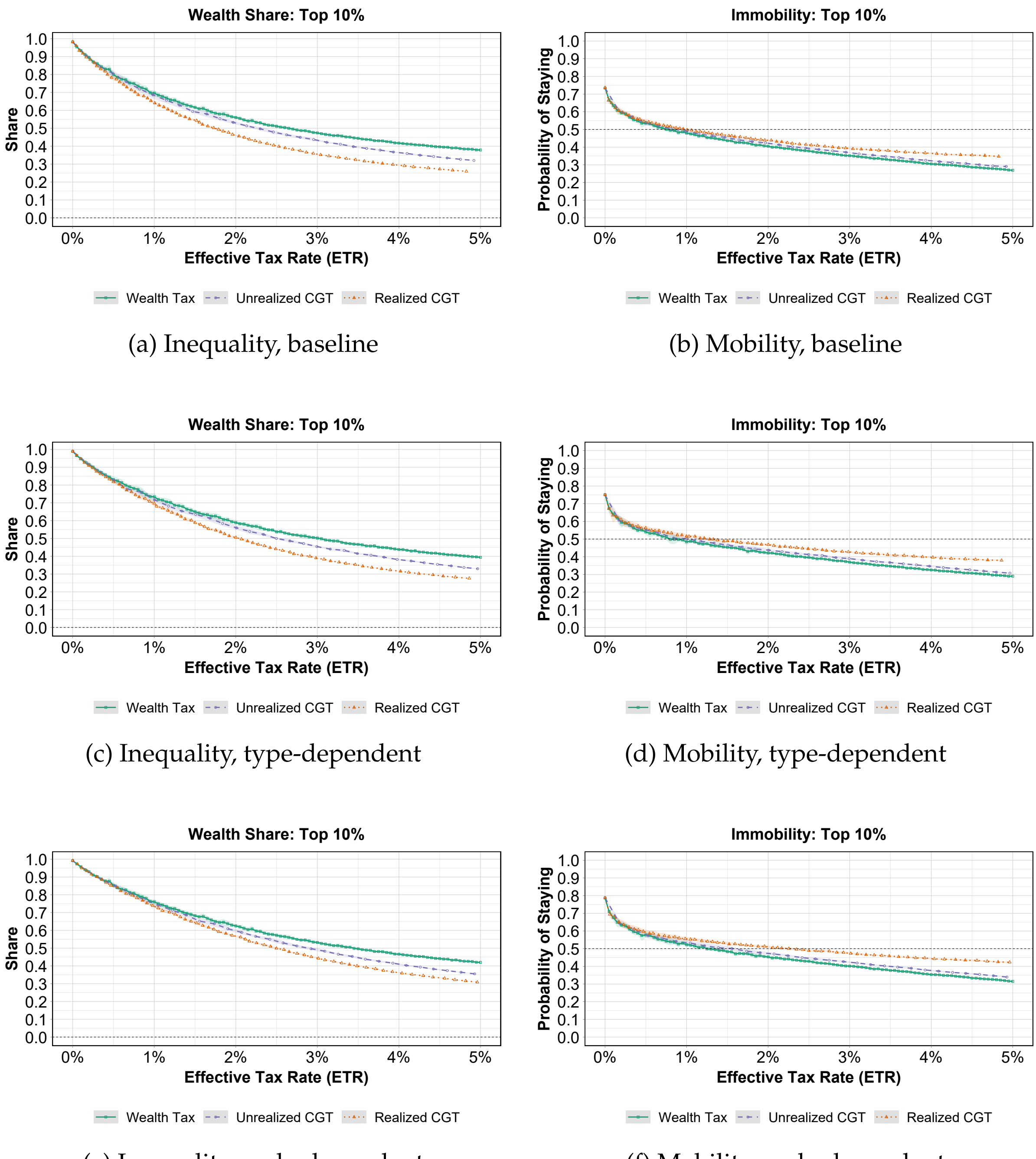
where $\mu_k = r_k - \rho - \frac{1}{2}\sigma_k^2$ is the drift implied by expected return r_k. Types evolve according to a symmetric Markov chain with persistence p: agents remain in their current type with probability p and transition uniformly otherwise. Second, with scale dependence, returns depend on current wealth through the decile. Let $d_{i,t} \in \{1, \ldots, 10\}$ denote agent i's decile. Wealth evolves as:

$$W_{i,t+1} = W_{i,t} \exp(\mu(d_{i,t}) + \sigma(d_{i,t})\varepsilon_{i,t}) - T_{i,t} + T_t^{\text{redist}} \tag{51}$$

where $\mu(d) = r(d) - \rho - \frac{1}{2}\sigma(d)^2$ and $r(d)$ is increasing in d: under scale dependence, richer agents earn higher expected returns.

Figure 5 compares tax regimes within each scenario. The wealth inequality−wealth mobility trade-off from Section 3 persists: capital gains taxes generate lower wealth inequality and lower wealth mobility than the wealth tax in all cases. Figure 6 shows how return heterogeneity affects outcomes within each tax regime. Both extensions increase wealth inequality and reduce wealth mobility relative to baseline. The latter follows from the higher wealth gaps between agents.

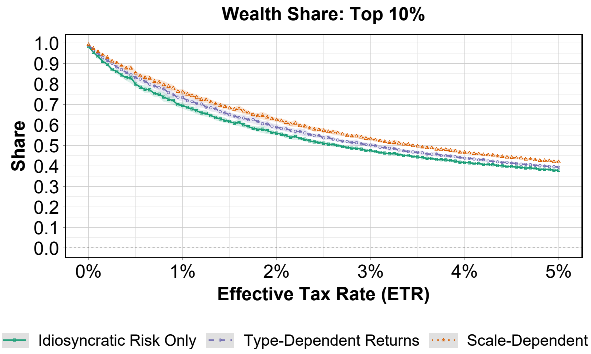
Figure 5: Tax regime comparison under type dependence and scale dependence in returns.



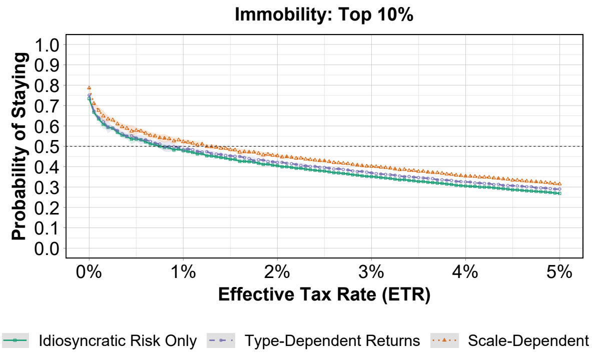
(a) Inequality, baseline
(b) Mobility, baseline
(c) Inequality, type-dependent
(d) Mobility, type-dependent
(e) Inequality, scale-dependent
(f) Mobility, scale-dependent

Notes: Each row shows a different scenario. Left panels: top 10% wealth share. Right panels: probability of remaining in top 10% after 20 periods. Type dependence: $K = 5$ types with $r_k \in \{0.06, 0.07, 0.08, 0.09, 0.10\}$, $\sigma = 0.30$, persistence $p = 0.99$. Scale dependence: $r(d)$ increasing linearly from 0.06 to 0.10 across deciles, $\sigma = 0.30$. Parameters: $N = 10{,}000$, $T = 200$, $\theta = 1.5$. Each data point is the average over 25 independent simulations at a given statutory tax rate. Shaded areas show ± 1 standard deviation (barely visible due to low cross-run variance).

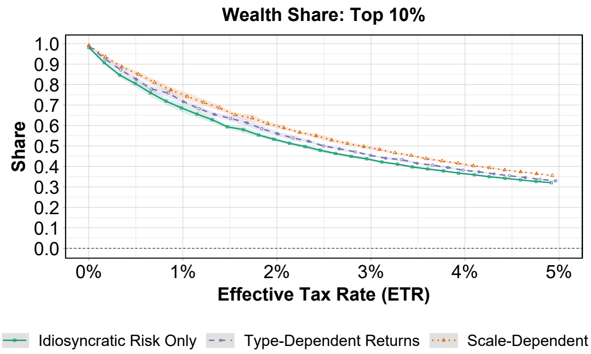
Figure 6: Effect of type-and scale-dependent returns on wealth inequality and wealth mobility by tax regime.



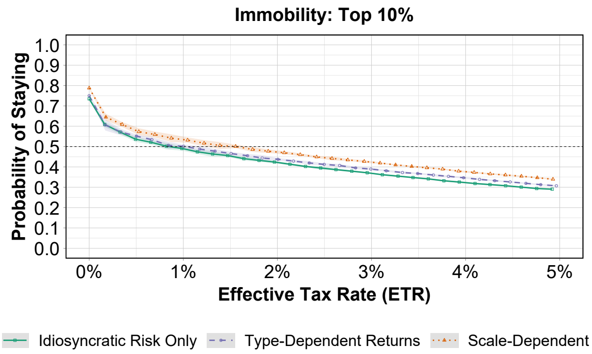
(a) Inequality, wealth tax



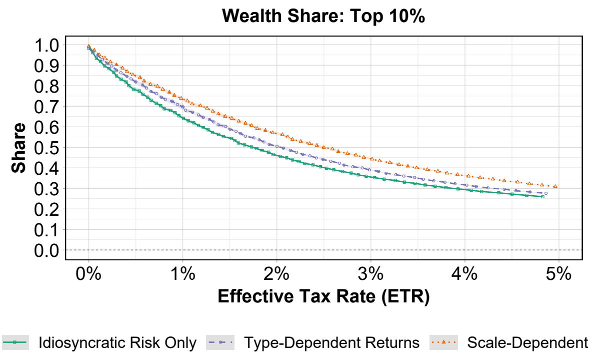
(b) Mobility, wealth tax



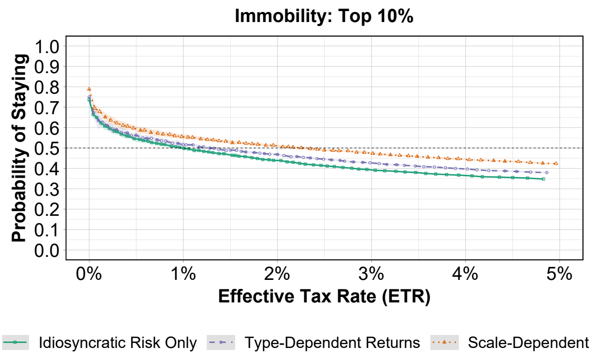
(c) Inequality, unrealized CGT



(d) Mobility, unrealized CGT



(e) Inequality, realized CGT



(f) Mobility, realized CGT

Notes: Each row shows a different tax regime. Left panels: top 10% wealth share. Right panels: probability of remaining in top 10% after 20 periods. Lines compare baseline (homogeneous returns), type-dependent, and scale-dependent returns. Both extensions increase wealth inequality and reduce wealth mobility. See Figure 5 notes for calibration details. Each data point is the average over 25 independent simulations at a given statutory tax rate. Shaded areas show ±1 standard deviation (barely visible due to low cross-run variance).

D Hand-to-mouth households

A fraction $\lambda \in (0, 1]$ of agents are entrepreneurs who operate the investment technology. The remaining fraction $1 - \lambda$ are hand-to-mouth (HtM) households with zero wealth. Agent types are fixed at $t = 0$. Entrepreneur i's wealth evolves as in the baseline:

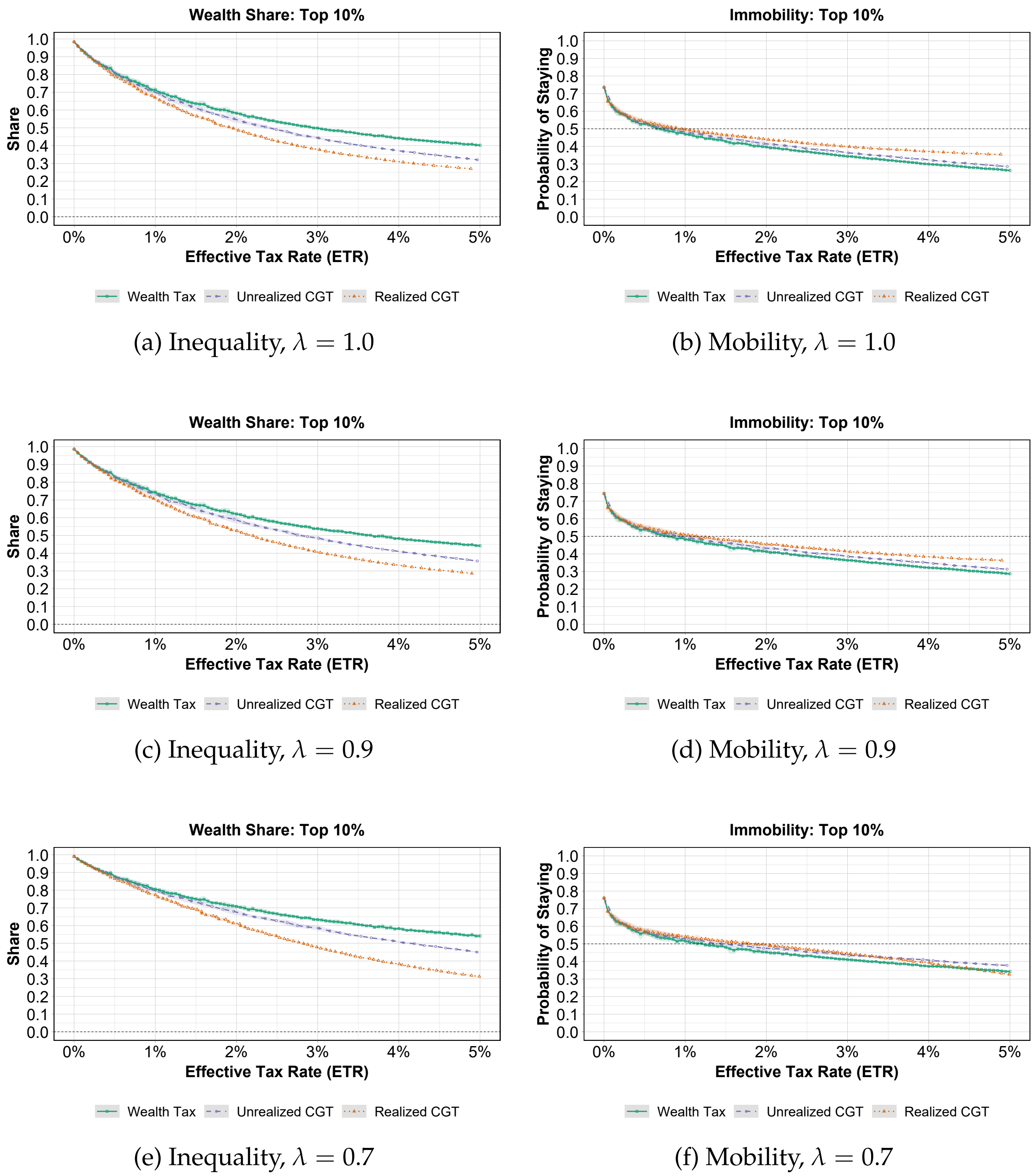
$$W_{i,t+1} = W_{i,t} \exp(\mu + \sigma \varepsilon_{i,t}) - T_{i,t} + T_t^{\text{redist}} \tag{52}$$

HtM households hold $W_{i,t}^{\text{HtM}} = 0$ for all t. They receive transfers but consume them immediately. Tax revenue is collected only from entrepreneurs but redistributed equally across all N households:

$$T_t^{\text{redist}} = \frac{1}{N} \sum_{j \in \text{entrepreneurs}} T_{j,t} \tag{53}$$

We consider $\lambda \in \{1.0, 0.9, 0.7\}$, where $\lambda = 1$ is the baseline with entrepreneurs-only. Figure 7 compares tax regimes within each λ. The trade-off persists for all hand-to-mouth shares: capital gains taxes generate lower wealth inequality and lower wealth mobility than the wealth tax. Figure 8 shows how λ affects outcomes within each tax regime. Higher hand-to-mouth shares (lower λ) increase wealth inequality and reduce wealth mobility.

Figure 7: Tax regime comparison under different hand-to-mouth household shares.



(a) Inequality, $\lambda = 1.0$

(b) Mobility, $\lambda = 1.0$

(c) Inequality, $\lambda = 0.9$

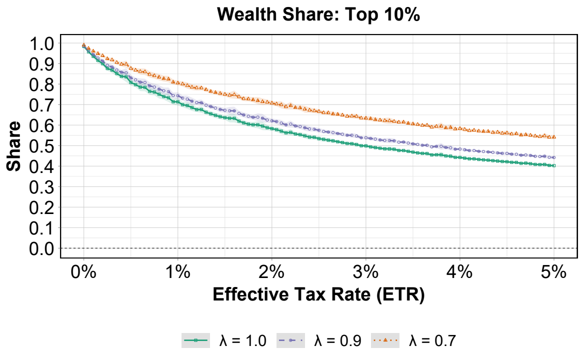
(d) Mobility, $\lambda = 0.9$

(e) Inequality, $\lambda = 0.7$

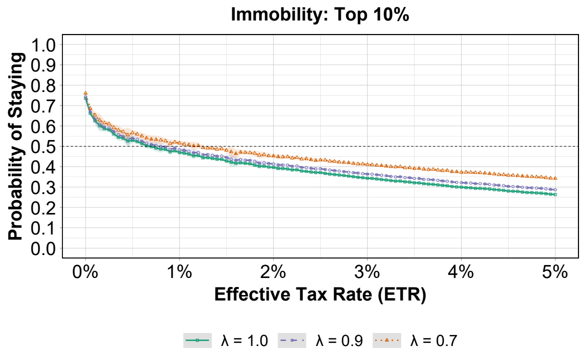
(f) Mobility, $\lambda = 0.7$

Notes: Each row shows a different entrepreneur share λ. Left panels: top 10% wealth share. Right panels: probability of remaining in top 10% after 20 periods. Outcomes are computed over the full population, and HtM households are always ranked at the bottom. Parameters: $N = 10{,}000$, $T = 200$, $r = 0.08$, $\rho = 0.06$, $\sigma = 0.30$, $\theta = 1.5$. Each data point is the average over 25 independent simulations at a given statutory tax rate. Shaded areas show ± 1 standard deviation (barely visible due to low cross-run variance).

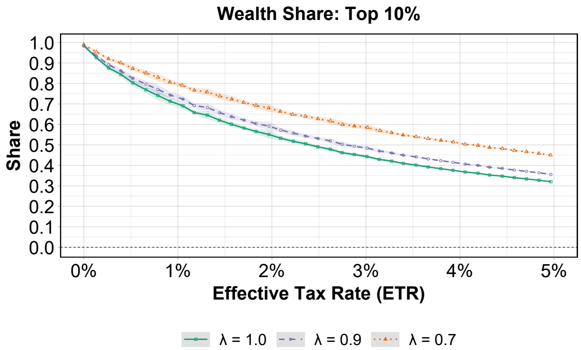
Figure 8: Effect of hand-to-mouth share on wealth inequality and wealth mobility by tax regime.



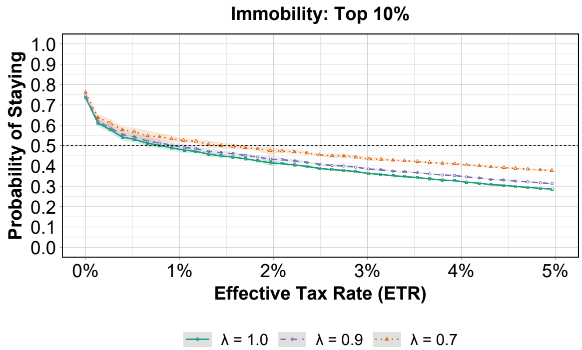
(a) Inequality, wealth tax



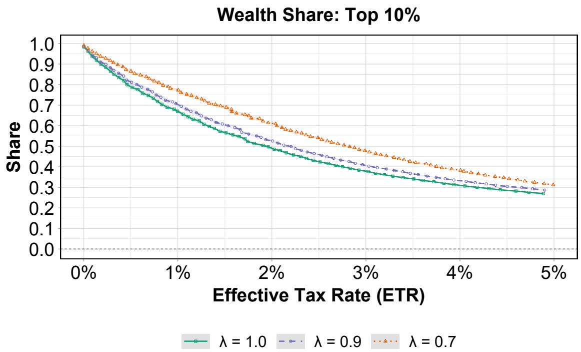
(b) Mobility, wealth tax



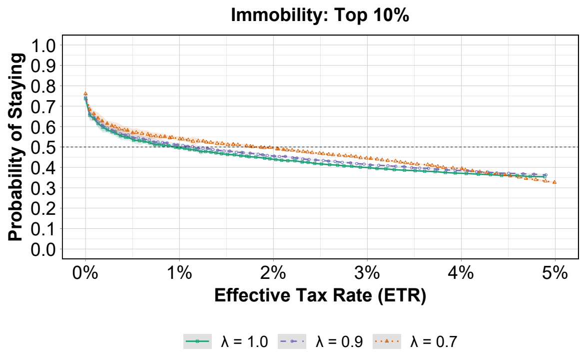
(c) Inequality, unrealized CGT



(d) Mobility, unrealized CGT



(e) Inequality, realized CGT



(f) Mobility, realized CGT

Notes: Each row shows a different tax regime. Left panels: top 10% wealth share. Right panels: probability of remaining in top 10% after 20 periods. Lines compare $\lambda \in \{1.0, 0.9, 0.7\}$. Lower λ (more HtM households) increases inequality and reduces mobility due to diluted redistribution. Parameters: $N = 10{,}000$, $T = 200$, $r = 0.08$, $\rho = 0.06$, $\sigma = 0.30$, $\theta = 1.5$. Each data point is the average over 25 independent simulations at a given statutory tax rate. Shaded areas show ± 1 standard deviation (barely visible due to low cross-run variance).

E Aggregate investment risk

We extend the baseline model to include aggregate shocks affecting all agents. Agent i's wealth evolves as:

$$W_{i,t+1} = W_{i,t} \exp(\mu + \sigma_{\text{idio}} \varepsilon_{i,t} + \sigma_{\text{agg}} \eta_t) - T_{i,t} + T_t^{\text{redist}} \tag{54}$$

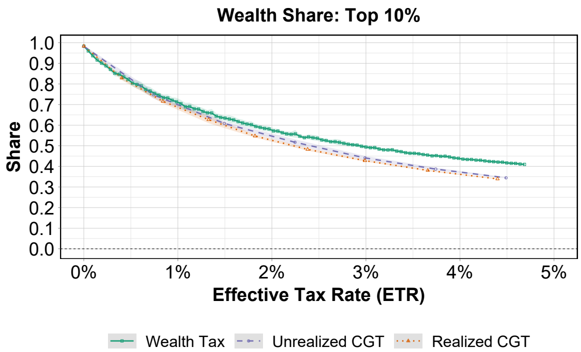
where $\varepsilon_{i,t} \overset{iid}{\sim} N(0,1)$ is idiosyncratic and $\eta_t \overset{iid}{\sim} N(0,1)$ is common to all agents. The total variance is preserved:

$$\sigma_{\text{idio}} = \sqrt{\kappa}\,\sigma, \qquad \sigma_{\text{agg}} = \sqrt{1-\kappa}\,\sigma \tag{55}$$

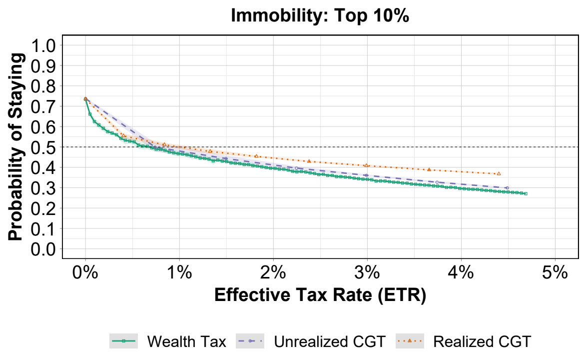
so that $\sigma_{\text{idio}}^2 + \sigma_{\text{agg}}^2 = \sigma^2$. The parameter $\kappa \in [0,1]$ governs the idiosyncratic share: $\kappa = 1$ recovers the baseline, while $\kappa = 0$ implies pure aggregate risk where all agents move together.

We consider $\kappa \in \{1.0, 0.9, 0.8\}$. Figure 9 compares tax regimes within each κ. The trade-off persists for all idiosyncratic shares: capital gains taxes generate lower wealth inequality and lower wealth mobility than the wealth tax. However, the difference between tax regimes declines as the idiosyncratic share declines. Figure 10 shows how κ affects outcomes within each regime. Lower κ reduces both wealth inequality and wealth mobility, as agents move together.

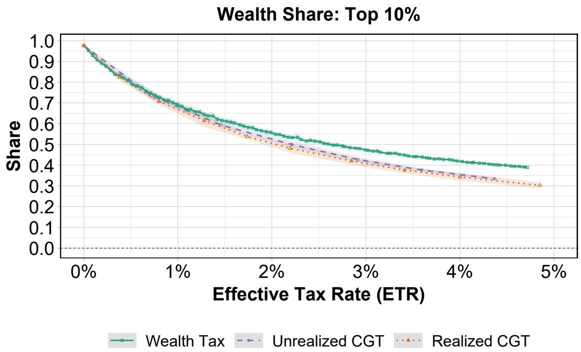
Figure 9: Tax regime comparison under three aggregate risk settings.



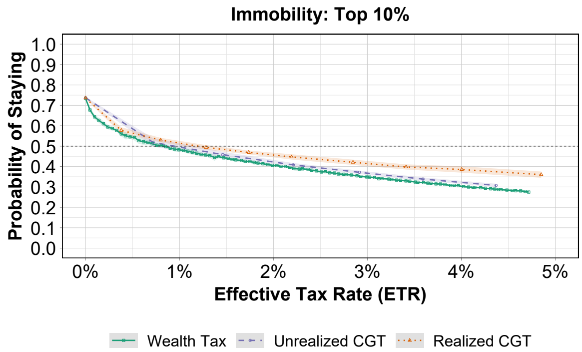
(a) Inequality, $\kappa = 1.0$



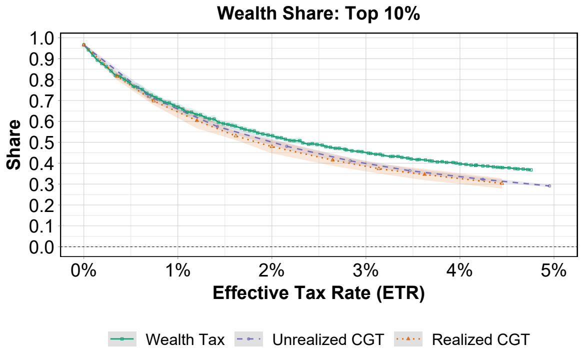
(b) Mobility, $\kappa = 1.0$



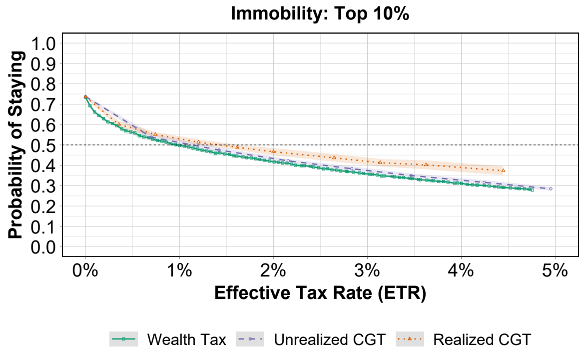
(c) Inequality, $\kappa = 0.9$



(d) Mobility, $\kappa = 0.9$



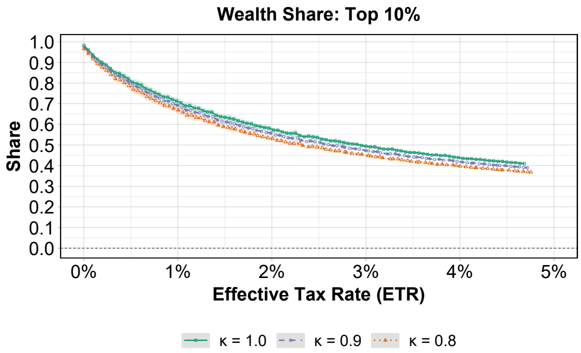
(e) Inequality, $\kappa = 0.8$



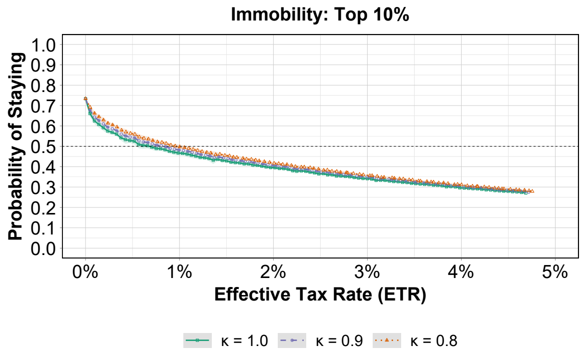
(f) Mobility, $\kappa = 0.8$

Notes: Each row shows a different idiosyncratic share κ. Left panels: top 10% wealth share. Right panels: probability of remaining in top 10% after 20 periods. Parameters: $N = 10{,}000$, $T = 200$, $r = 0.08$, $\rho = 0.06$, $\sigma = 0.30$, $\theta = 1.5$. Each data point is the average over 25 independent simulations at a given statutory tax rate. Shaded areas show ± 1 standard deviation (often barely visible due to low cross-run variance).

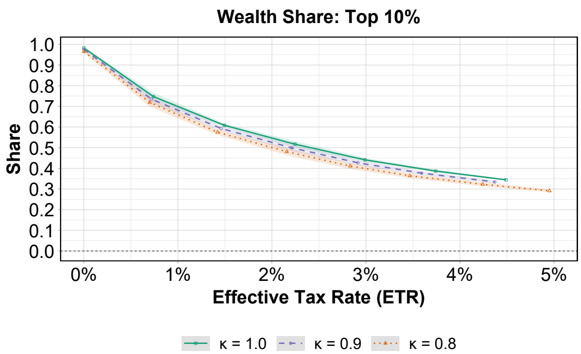
Figure 10: Effect of idiosyncratic share on wealth inequality and wealth mobility by tax regime.



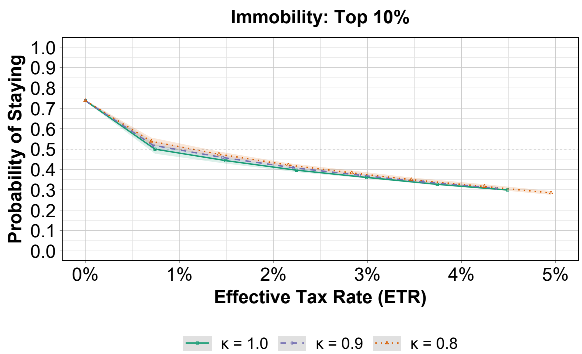
(a) Inequality, wealth tax



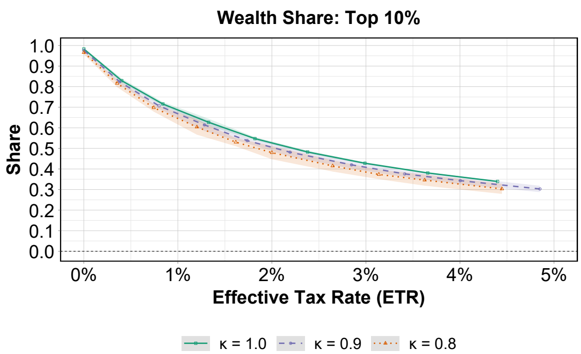
(b) Mobility, wealth tax



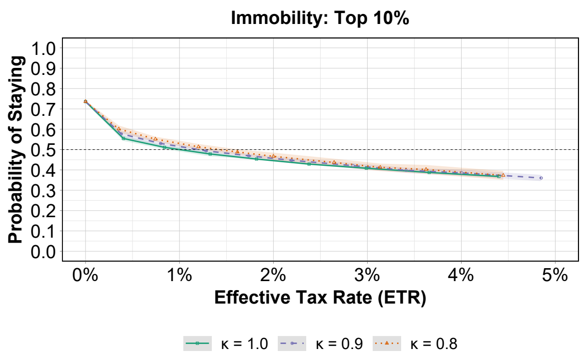
(c) Inequality, unrealized CGT



(d) Mobility, unrealized CGT



(e) Inequality, realized CGT



(f) Mobility, realized CGT

Notes: Each row shows a different tax regime. Left panels: top 10% wealth share. Right panels: probability of remaining in top 10% after 20 periods. Lines compare $\kappa \in \{1.0, 0.9, 0.8\}$. Lower κ (more aggregate risk) reduces both inequality and mobility. Parameters: $N = 10{,}000$, $T = 200$, $r = 0.08$, $\rho = 0.06$, $\sigma = 0.30$, $\theta = 1.5$. Each data point is the average over 25 independent simulations at a given statutory tax rate. Shaded areas show ± 1 standard deviation (often barely visible due to low cross-run variance).

F Tax progressivity

We introduce tax progressivity through tax exemption thresholds. For the wealth tax, only wealth above $\chi \cdot \bar{W}_t$ is taxed:

$$T_{i,t}^{(W)} = \tau_W \max\{W_{i,t} - \chi \cdot \bar{W}_t, 0\} \tag{56}$$

For the unrealized capital gains tax, only capital gains above χ times mean positive gains are taxed:

$$T_{i,t}^{(U)} = \tau_U \max\{\Delta W_{i,t}^{\text{pre}} - \chi \cdot \overline{\Delta W^+}_t, 0\} \tag{57}$$

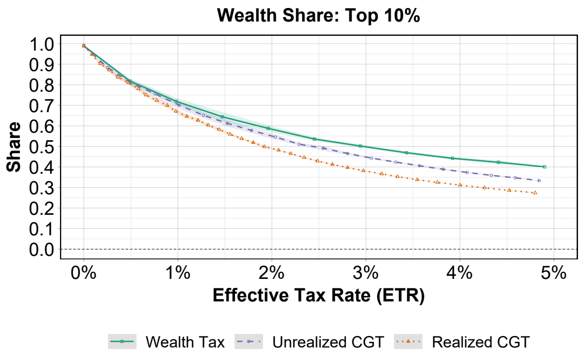
where $\overline{\Delta W^+}_t = \mathbb{E}[\Delta W_{i,t}^{\text{pre}} \mid \Delta W_{i,t}^{\text{pre}} > 0]$. For the realized capital gains tax, the threshold applies analogously to cumulative capital gains above basis.

The parameter $\chi \geq 0$ determines tax progressivity: $\chi = 0$ recovers the baseline, while $\chi > 0$ exempts agents below the threshold. Let $\phi \in (0, 1]$ denote the fraction of agents above the tax threshold. Higher χ implies lower ϕ and requires higher statutory rates to achieve the same effective tax rate ETR.

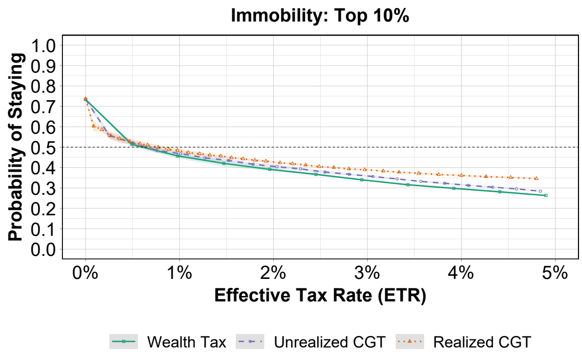
The wealth inequality−wealth mobility trade-off from Section 3 persists because the variance ordering holds within the taxed population. Under the progressive wealth tax, agents in ϕ face mean reversion but unchanged variance σ^2. Under the progressive capital gains tax, agents in ϕ face both mean reversion and variance compression. The ordering $\tilde{\sigma}_W^2 > \tilde{\sigma}_U^2 > \tilde{\sigma}_R^2$ holds at any tax threshold level.

We consider $\chi \in \{0, 0.5, 1\}$. Figure 11 compares tax regimes within each χ. The trade-off persists at all threshold levels: capital gains taxes generate lower wealth inequality and lower wealth mobility than the wealth tax. Figure 12 shows how χ affects outcomes within each tax regime. Higher tax exemption thresholds reduce wealth inequality while requiring higher statutory rates.

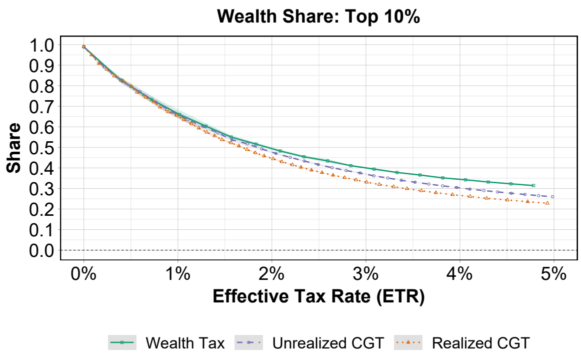
Figure 11: Tax regime comparison under different degrees of tax progressivity.



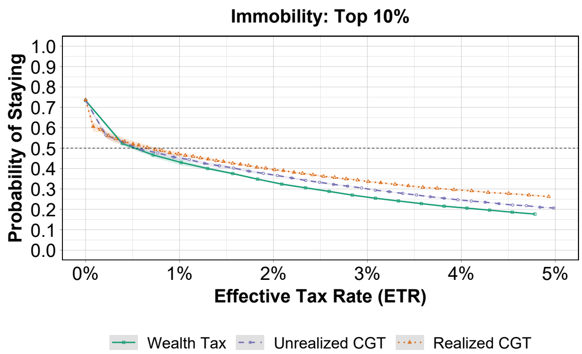
(a) Inequality, $\chi = 0$



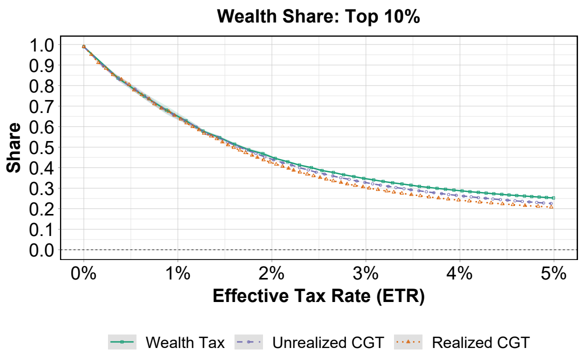
(b) Mobility, $\chi = 0$



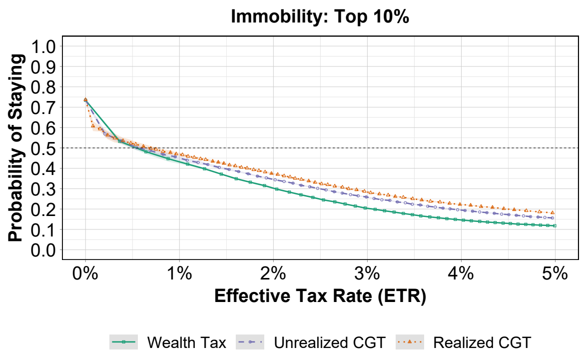
(c) Inequality, $\chi = 0.5$



(d) Mobility, $\chi = 0.5$



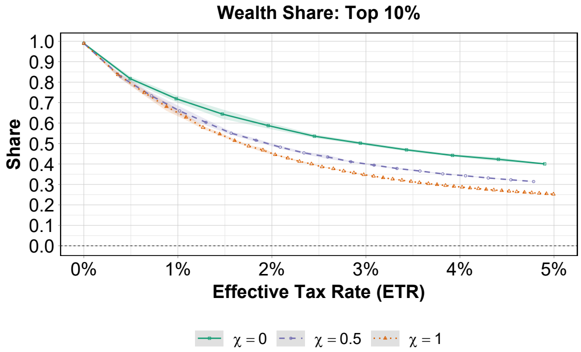
(e) Inequality, $\chi = 1$



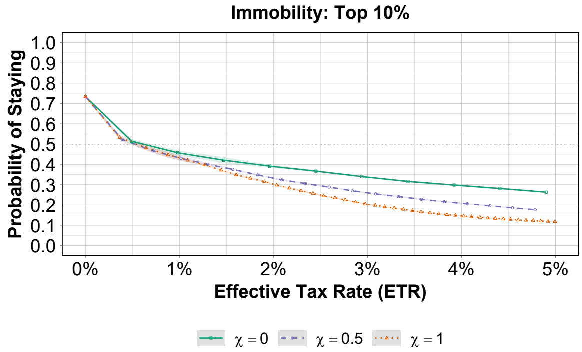
(f) Mobility, $\chi = 1$

Notes: Each row shows a different threshold level χ. Left panels: top 10% wealth share. Right panels: probability of remaining in top 10% after 20 periods. Parameters: $N = 10{,}000$, $T = 200$, $r = 0.08$, $\rho = 0.06$, $\sigma = 0.30$, $\theta = 1.5$. Each data point is the average over 25 independent simulations at a given statutory tax rate. Shaded areas show ± 1 standard deviation (often barely visible due to low cross-run variance).

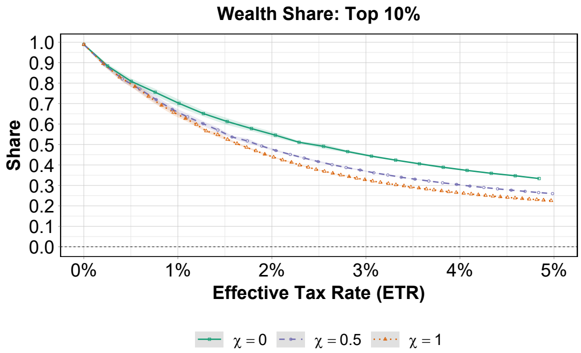
Figure 12: Effect of progressivity on wealth inequality and wealth mobility by tax regime.



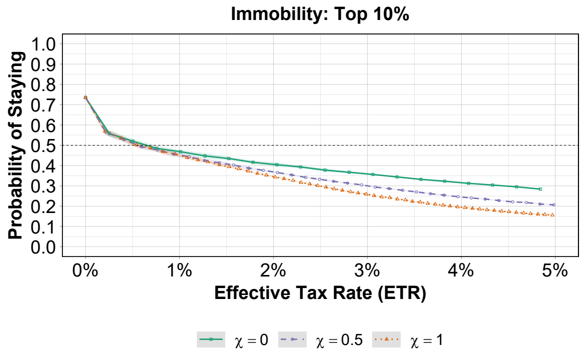
(a) Inequality, wealth tax



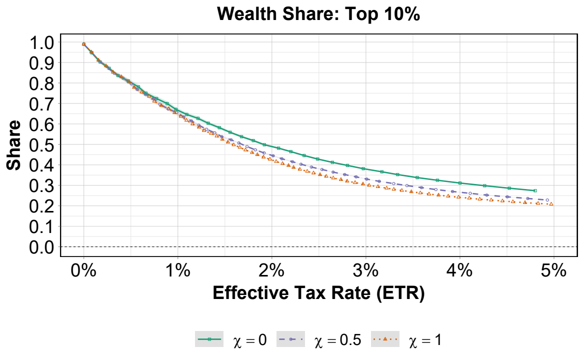
(b) Mobility, wealth tax



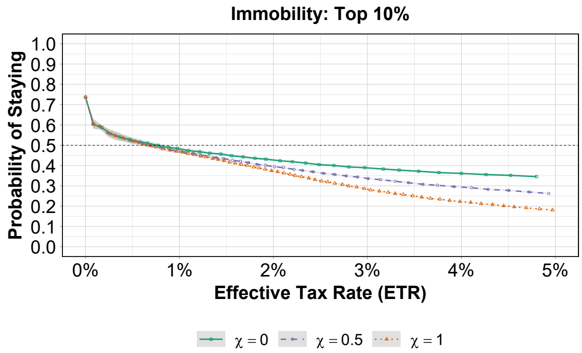
(c) Inequality, unrealized CGT



(d) Mobility, unrealized CGT



(e) Inequality, realized CGT



(f) Mobility, realized CGT

Notes: Each row shows a different tax regime. Left panels: top 10% wealth share. Right panels: probability of remaining in top 10% after 20 periods. Lines compare $\chi \in \{0, 0.5, 1\}$. Higher χ reduces inequality and requires higher statutory rates to achieve the same ETR. Parameters: $N = 10{,}000$, $T = 200$, $r = 0.08$, $\rho = 0.06$, $\sigma = 0.30$, $\theta = 1.5$. Each data point is the average over 25 independent simulations at a given statutory tax rate. Shaded areas show ± 1 standard deviation (often barely visible due to low cross-run variance).