Unrealized Capital Gains Tax, Business Investment, and Wealth Inequality*

Saya Ikegawa

University of Washington

June 2026

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Abstract

Unrealized capital gains constitute a large share of wealth at the top of the U.S. wealth distribution and are concentrated in privately held businesses, yet they remain untaxed under the current realization-based capital-gains tax system. This paper studies the welfare consequences of replacing realization-based taxation with an accrual-based (mark-to-market) tax regime, with particular emphasis on entrepreneurial business assets. Using a quantitative general-equilibrium model, I find that an economy-wide switch to accrual-based taxation reduces private-business production by 11% and aggregate output by 6%, because the efficiency loss from firm-entry deterrence outweighs the efficiency gains from mitigating capital lock-in. In contrast, applying accrual-based taxation only to wealthy households yields a consumption-equivalent welfare gain of 1%. By targeting wealthy households, who are more likely to be incumbent entrepreneurs, this reform dampens entry deterrence while reducing inequality.

*I am indebted to my advisers Fabio Ghironi, Brian Greaney, and Ellen McGrattan for their invaluable guidance and support. I also thank Marco Bassetto, Philip Bond, V. V. Chari, Yu-chin Chen, Mariacristina De Nardi, Jonathan Dingel, Stephie Fried, Ippei Fujiwara, Kyle Herkenhoff, Yuhei Miyauchi, Toshihiko Mukoyama, Andrii Parkhomenko, Fernando Parro, John Stachurski, and Stephen Turnovsky for their comments and suggestions.

1 Introduction

In the United States, unrealized (accrued) capital gains—the increase in asset values that has not yet been realized through sale—account for roughly 42% of the net worth held by households in the top 1% of the wealth distribution, and most of these gains reflect appreciation in *privately held businesses*. Because such gains are untaxed under the current realization-based system, policymakers have recently debated broadening the capital-gains tax base to include unrealized gains, both at the federal level and in several U.S. states.[1]

Motivated by these policy discussions and by the empirical importance of private-business capital gains at the top of the wealth distribution, this paper studies how accrual-based capital-gains taxation affects welfare, with particular emphasis on entrepreneurial (privately held business) assets. Existing studies such as Bhandari et al. (2024) and Azevedo et al. (2025) examine the implications of taxing business capital values, but they primarily focus on firm dynamics; the aggregate welfare consequences remain less explored. This paper fills that gap by quantifying the welfare effects of accrual-based taxation in a quantitative general-equilibrium model calibrated to match salient features of the U.S. wealth distribution and firm dynamics. To clarify the underlying economic forces, I also develop a stylized model that isolates two central mechanisms—*capital lock-in* and *firm entry deterrence*—and uses them to interpret the quantitative results.

The *capital lock-in* effect is a classic implication of realization-based capital-gains taxation (e.g., Auerbach (1991)). Because tax liability is triggered only upon sale, entrepreneurs have an incentive to defer realization and retain existing firms even when reallocating effort toward new, more productive business opportunities would be efficient. By continuing to operate an appreciated business, they postpone tax payments and allow unrealized gains to compound tax free; by contrast, selling triggers an immediate tax bill, and restarting exposes subsequent gains to repeated taxation.

Accrual-based taxation can, in principle, mitigate lock-in by taxing gains regardless of whether they are realized. At the same time, however, accrual taxation imposes tax liability precisely upon successful business creation—a margin that is untaxed under realization-based regimes. As a result,

[1] The Biden administration has put forward a proposal to tax unrealized capital gains, and five U.S. states have introduced related legislation: AB 2088, the *Wealth Tax Act* (2019–20) in California; S 1570/A 3252, the *Billionaire Mark-to-Market Tax Act* (2023–24) in New York; HB 3039, the *Extremely High-Wealth Mark-to-Market Tax Act* (103rd GA, 2023–24) in Illinois; HB 1473, the *Washington Extreme-Wealth Tax* (2023–24) in Washington; and H 827 (2023–24), an act applying the personal income tax to unrealized gains in Vermont.

it may *deter firm entry* by reducing the expected payoff to starting a business. The central question, therefore, is which force dominates: does accrual taxation improve allocative efficiency primarily by reducing lock-in, or does it instead suppress entrepreneurial activity by discouraging entry?

I address this question in a quantitative general-equilibrium model in which a corporate sector produces final goods using labor, capital, and differentiated intermediate inputs supplied by a private business sector. Households are heterogeneous and choose between working and entrepreneurship. Entrepreneurs operate monopolistically competitive private businesses and can either continue to manage their firms or transfer them through sale. This environment provides a unified and empirically disciplined framework for evaluating how alternative capital-gains tax regimes shape entrepreneurial activity, aggregate production, and welfare.

To organize the analysis, I first develop a tractable stylized version of the quantitative model and compare the decentralized equilibrium to a constrained social planner (who cannot use lump-sum transfers). Even absent capital-gains taxation, the model economy features wedges that distort both the intensive margin (capital investment) and the extensive margin (occupational choice, including firm entry and the decision to sell). On the intensive margin, monopolistic competition generates markups that depress private incentives to accumulate capital, leading to underinvestment relative to the planner. On the extensive margin, the decentralized equilibrium exhibits inefficiently low firm entry and too few business transfers. Entry is inefficiently low because market power reduces the private return to creating new firms. Business transfers are inefficiently rare because individual entrepreneurs do not internalize the aggregate benefit of higher turnover: selling allows entrepreneurs to restart more quickly and expands the variety of intermediate inputs, generating an aggregate-demand externality. A realization-based capital-gains tax amplifies this distortion by further discouraging sales and strengthening lock-in. Accrual-based taxation, in contrast, mitigates lock-in but exacerbates entry deterrence by taxing successful creation.

These mechanisms carry over to the quantitative model. Replacing the current realization-based regime with accrual-based taxation reduces lock-in but strengthens entry deterrence. In the calibrated economy, the entry-deterrence effect dominates: private-business production falls by 11%, and final-good output falls by 6%. The decline in final-good output is smaller than the decline in private-business production because discouraged potential entrants become workers, increasing labor supply.

I then evaluate a hybrid regime that resembles prominent policy proposals: accrual-based taxation applies only to wealthy households, while the rest of the population remains subject to realization-based taxation.[2] This targeted design can dampen the entry-deterrence margin because top-wealth households are more likely to be incumbent entrepreneurs than marginal entrants. However, it may also have a limited effect on reducing lock-in, since wealthy households are less financially constrained and may be less likely to remain locked in solely to defer capital-gains taxes.

The hybrid regime also generates a general-equilibrium price effect. By reducing capital accumulation among wealthy households, the policy can lower the equilibrium wage. A lower wage reduces the opportunity cost of entrepreneurship for low-income households, making entry into entrepreneurship more attractive, as discussed in Brüggemann (2021). Under a policy that applies accrual-based taxation to households above the top 2 percent wealth threshold under the current realization-based tax regime, entrepreneurial production rises by 0.2%, and the consumption Gini coefficient falls to 0.38, compared with 0.39 under realization-based taxation. As a result, consumption-equivalent welfare increases by 1% relative to the realization-based status quo.

However, these results are highly sensitive to the choice of the wealth cutoff. On the one hand, targeting a broader set of wealthy households can strengthen the general-equilibrium price effect. On the other hand, broadening the target group also strengthens the firm-entry deterrence effect. When the entry-deterrence effect dominates the gains from reducing capital lock-in and improving the allocation of entrepreneurial entry, the hybrid regime generates welfare losses. These findings suggest that designing a welfare-improving hybrid accrual-based tax requires careful targeting.

Finally, the analysis focuses on long-run stationary effects. It therefore does not capture the potentially large transitional revenues that could arise from taxing unrealized gains already accumulated by wealthy households.[3] In the long run, however, accrual-based taxation has only a limited effect on tax revenue because it mainly changes the timing of capital-gains taxation, especially when capital losses are fully refunded.

[2] The Biden administration's proposal applies accrual-based taxation to households with wealth above $100 million, which corresponds to approximately the top 0.02% of the wealth distribution.

[3] The top 0.02% of wealthy households hold about $6 trillion in unrealized capital gains, and about 64% of these gains are held in private-business shares Saez et al. (2021).

1.1 Related Literature

This paper contributes to three strands of literature. First, it relates to the literature on capital-gains taxation, capital lock-in, and business transfers. A classic implication of realization-based capital-gains taxation is that it discourages asset sales by allowing taxpayers to defer tax liabilities until realization. Chari et al. (2005) study this lock-in effect in the context of entrepreneurial business transfers. I build on this insight by incorporating accrual-based taxation and showing that it creates a central trade-off for entrepreneurship. On the one hand, accrual-based taxation mitigates lock-in by taxing gains regardless of whether the business is sold. On the other hand, it may deter firm entry by reducing the after-tax payoff from successful business creation. This trade-off is closely related to Bhandari et al. (2024), who quantitatively study taxes on business capital values. My model also incorporates an accrual-tax feature that rebates previously paid taxes when capital losses occur, allowing the analysis to capture the insurance channel emphasized by Azevedo et al. (2025). Relative to this firm-dynamics literature, my contribution is to quantify the aggregate welfare consequences of accrual-based capital-gains taxation in a model disciplined by key features of the U.S. wealth distribution. The framework is also suited to evaluating hybrid regimes in which accrual-based taxation applies only to very wealthy households, while the rest of the population remains subject to realization-based taxation.

Second, this paper contributes to the wealth-inequality literature by emphasizing the role of unrealized capital gains embedded in privately held businesses. A large body of work studies entrepreneurship and wealth concentration, including Quadrini (2000), Cagetti and De Nardi (2006), and Gomez and Gouin-Bonenfant (2024). Another strand studies heterogeneous returns to capital as an important source of wealth inequality, including Benhabib et al. (2011), Bach et al. (2020), Fagereng et al. (2020), Xavier (2021), and Brüggemann and Mahone (2025). Related work also highlights the role of illiquid, high-return assets in wealth accumulation, such as Robbins (2018); Fagereng et al. (2019, 2024); Smith et al. (2023). My paper complements these studies by focusing on privately held business wealth as an illiquid entrepreneurial asset with heterogeneous returns, whose sale decision determines the timing of capital-gains taxation. This framework allows me to study how the tax treatment of unrealized business gains affects both wealth concentration and business reallocation.

Third, this paper contributes to the literature on taxation and entrepreneurship. Existing work studies how tax policy affects entrepreneurial decisions, wealth accumulation, and aggregate outcomes, including Kitao (2008), Cagetti and De Nardi (2009), Scheuer (2014), Brüggemann (2021), Guvenen et al. (2023), and Boar and Midrigan (2023). I add to this literature by introducing endogenous business transfers as a key margin of adjustment. This margin is important because capital-gains taxation affects not only the decision to become an entrepreneur, but also the decision to retain or sell an existing business. The model therefore captures how alternative capital-gains tax regimes shape both firm entry and capital lock-in, and how the interaction of these two margins determines aggregate production and welfare.

The remainder of the paper is organized as follows. Section 2 presents the stylized model and clarifies the two core mechanisms. Section 3 sets out the quantitative model under the current realization-based tax system. Section 4 describes the calibration. Section 5 extends the model to incorporate accrual-based taxation. Section 6 reports the counterfactual results, and Section 7 concludes.

2 Simple model

This section develops a stylized model to clarify the mechanisms through which capital-gains tax reforms affect entrepreneurial activity. The framework highlights responses on both the intensive margin (capital used by operating private businesses) and the extensive margin (occupational choice and business transfer). It combines (i) the business-transfer mechanism and occupational-choice structure in Chari et al. (2005), (ii) differentiated intermediate inputs produced by private businesses as in Guvenen et al. (2023) and Rotberg and Steinberg (2024), and (iii) a private-business technology in which capital is the sole input, following Cagetti and De Nardi (2006). I first characterize the baseline economy without capital-gains taxation and then study reforms under realization-based and accrual-based capital-gains taxes.

2.1 Environment

Figure 1 illustrates the model structure. The economy is populated by a unit mass of infinitely lived households and a competitive "bank" sector (a representative price-taking firm) with two divisions:

(i) final-good production and (ii) mergers & acquisitions (M&A). Households are heterogeneous and choose an occupation: they either supply labor as workers or operate private businesses as entrepreneurs. The final-good division purchases differentiated intermediate inputs from operating private businesses. The M&A division acquires businesses from entrepreneurs and operates them thereafter, supplying intermediate inputs as well.

Capital used in private-business production is rented in a global market at an exogenously given interest rate r. Accordingly, this section takes r as given and focuses on a partial-equilibrium environment. In a later quantitative section, I endogenize the capital market and study general-equilibrium implications.

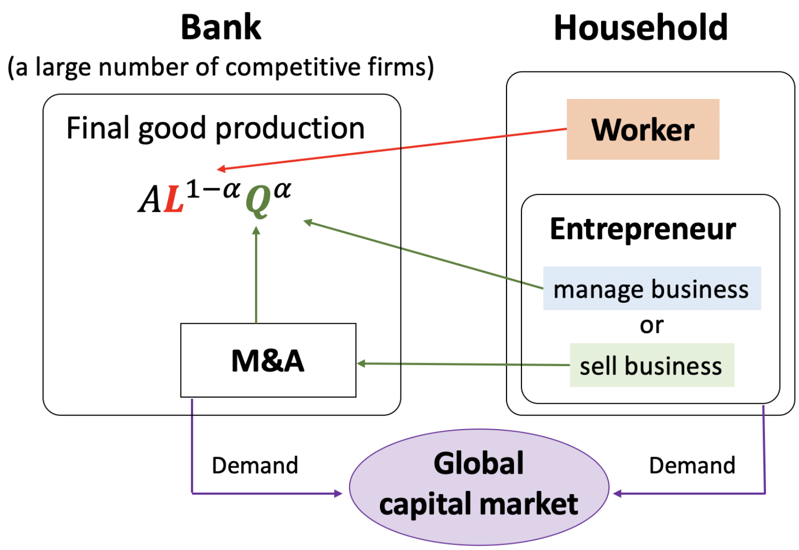


Figure 1: Production structure in the simple model economy

Households. Households are heterogeneous in business-idea ability $\theta \in [0, 1]$, which governs the probability of generating a viable startup opportunity. Ability is time-invariant and distributed according to a probability measure H with density h. Households cannot save (there is no storage technology), so they consume current income each period. Preferences are linear:

$$u(c_t) = c_t.$$

For convenience, I adopt the stationary representative-agent benchmark normalization,

$$r = \frac{1-\beta}{\beta}.$$

At the beginning of life, each household makes a lifetime occupational choice among: (i) worker; (ii) entrepreneur who starts a business and then sells it (*start-and-sell*); or (iii) entrepreneur who starts a business and then manages it (*start-and-manage*). The household's problem is to choose the occupation that maximizes its lifetime value,

$$\max\left\{V^w,\ V^s(z=0,\theta),\ V^m(z=0,\theta)\right\}. \tag{1}$$

Workers. V^w denotes the value function of a worker. A worker earns wage income w each period and consumes it. The value function satisfies

$$V^w = w + \beta V^w \qquad \Rightarrow \qquad V^w = \frac{w}{1-\beta}. \tag{2}$$

Entrepreneurs who start and sell. $V^s(z,\theta)$ denotes the value function of the *start-and-sell* entrepreneur. If a household chooses this occupation, he devotes one period to startup business. In the following period, he becomes a business owner with probability θ. Business quality is $z \in [0,\bar{z}]$, where $z=0$ denotes the non-ownership state and $\bar{z}$ denotes the quality of an operating business. For simplicity, here I assume a single quality level. Upon successful creation, the household draws quality $\bar{z}$, sells the business at price $p(\bar{z})$, and returns to the non-ownership state in the subsequent period. The value functions satisfy

$$\begin{cases} V^s(0,\theta) = \beta\left[(1-\theta)V^s(0,\theta) + \theta V^s(\bar{z},\theta)\right], \\[2ex] V^s(\bar{z},\theta) = p(\bar{z}) + \beta V^s(0,\theta). \end{cases} \tag{3}$$

Entrepreneurs who start and manage. $V^m(z,\theta)$ denotes the value function of the *start-and-manage* entrepreneur. The startup stage is identical to that of the start-and-sell entrepreneur. Conditional on success, the household continues to operate the business and earns operating profit.

Business output is linear in capital:

$$x = \bar{z}k,$$

where k is rented at rate r. A managed business survives into the next period with probability $\nu \in (0,1)$. The value functions satisfy

$$\begin{cases} V^m(0,\theta) = \beta\left[(1-\theta)V^m(0,\theta) + \theta V^m(\bar{z},\theta)\right], \\ V^m(\bar{z},\theta) = \max_{k\geq 0}\ \pi_m(k) + \beta\left[(1-\nu)V^m(0,\theta) + \nu V^m(\bar{z},\theta)\right], \end{cases} \tag{4}$$

where operating profit is

$$\pi_m(k) = \xi(x)\,x - rk \tag{5}$$

and $\xi(\cdot)$ denotes the inverse demand schedule for a differentiated intermediate input (derived below from final-good production). Let $\pi_m^* \equiv \max_{k\geq 0} \pi_m(k)$ denote optimal operating profit.

In the quantitative model, households are additionally heterogeneous in labor productivity, multiple business-quality states are allowed, and occupational choice is made each period rather than only once at the beginning of life.

Bank. The competitive bank sector has two divisions: final-good production and M&A. The final-good division produces the final good using labor L and a CES aggregate Q of differentiated intermediate inputs:

$$Y = AL^{1-\alpha}Q^{\alpha}, \qquad \alpha \in (0,1). \tag{6}$$

The intermediate input is

$$Q = \left(\int x_i^{\mu}\, di\right)^{1/\mu}, \qquad \mu \in (0,1), \tag{7}$$

where i indexes operating businesses/varieties. This aggregator implies an elasticity of substitution $1/(1-\mu) > 1$ across varieties.

The M&A division acquires businesses from entrepreneurs but operates them less efficiently. Let $\lambda \in (0,1)$ denote the efficiency wedge (equivalently, entrepreneurs may derive non-pecuniary private benefits from control), following Chari et al. (2005). If an acquired business is operated by

M&A, output is

$$x = \lambda \bar{z} k,$$

with capital rented at rate r.

Given the CES structure, the (price-taking) final-good division's demand for any variety i implies the inverse demand schedule

$$\xi(x_i) = \alpha A L^{1-\alpha} Q^{\alpha-\mu} x_i^{\mu-1}. \tag{8}$$

Accordingly, an entrepreneur-managed business chooses k to maximize (5), and an M&A-operated business chooses k to maximize

$$\pi_b(k) = \xi(x)\, x - rk, \qquad \text{with } x = \lambda \bar{z} k, \tag{9}$$

with optimal profit $\pi_b^* \equiv \max_{k \geq 0} \pi_b(k)$.

Because the M&A division is competitive, the purchase price $p(\bar{z})$ equals the present value of operating profits while the business survives

$$p(\bar{z}) \;=\; \pi_b^* \;+\; \beta\nu\, p(\bar{z}) \qquad \Longleftrightarrow \qquad p(\bar{z}) = \frac{\pi_b^*}{1-\beta\nu}. \tag{10}$$

2.2 Equilibrium without capital gains tax

This subsection characterizes occupational choice in the baseline economy, taking (w, r) and the induced objects $(p(\bar{z}), \pi_m^*)$ as given.

Occupational cutoffs. Cutoff values of θ are pinned down by comparing value functions evaluated at $z = 0$.

First, in a two-way comparison between worker and start-and-sell, the indifference cutoff is

$$\theta^{sw} = \frac{w}{\beta\big(p(\bar{z}) - w\big)}. \tag{11}$$

Second, in a two-way comparison between worker and start-and-manage, the indifference cutoff is

$$\theta^{mw} = \frac{(1-\beta\nu)\, w}{\beta\big(\pi_m^* - w\big)}. \tag{12}$$

Third, the cutoff between start-and-sell and start-and-manage is

$$\theta^{sm} = \frac{(1-\beta\nu)\, p(\bar{z}) - \pi_m^*}{\beta\big(\pi_m^* - p(\bar{z})\big)}. \tag{13}$$

When all three occupations are active, the equilibrium mapping is

$$\theta < \theta^{mw} \Rightarrow \text{worker}, \qquad \theta^{mw} \leq \theta < \theta^{sm} \Rightarrow \text{start-and-manage}, \qquad \theta^{sm} \leq \theta \Rightarrow \text{start-and-sell}.$$

Using (10) and the homogeneity of profits under (8), one can express θ^{sm} as a function of the efficiency wedge λ. In particular, $\pi_b^*/\pi_m^* = \lambda^{\frac{\mu}{1-\mu}}$, and substituting into (13) yields

$$\theta^{sm} = \frac{(1-\beta\nu)\left(\lambda^{\frac{\mu}{1-\mu}} - 1\right)}{\beta\left(1-\beta\nu - \lambda^{\frac{\mu}{1-\mu}}\right)}. \tag{14}$$

I focus on the empirically relevant case in which all three occupations are simultaneously active. A convenient set of sufficient conditions is as follows.

Proposition 1. If $\frac{(1+\beta)(1-\beta\nu)}{1-\beta\nu+\beta} \leq \lambda^{\frac{\mu}{1-\mu}} \leq 1 - \frac{\beta\nu\, w}{\pi_m^*}$, then all three occupations are active. Households with $\theta < \theta^{mw}$ become workers; those with $\theta^{mw} \leq \theta < \theta^{sm}$ become start-and-manage entrepreneurs; and those with $\theta \geq \theta^{sm}$ become start-and-sell entrepreneurs.

Figure 2 illustrates the value functions and the associated cutoff levels.

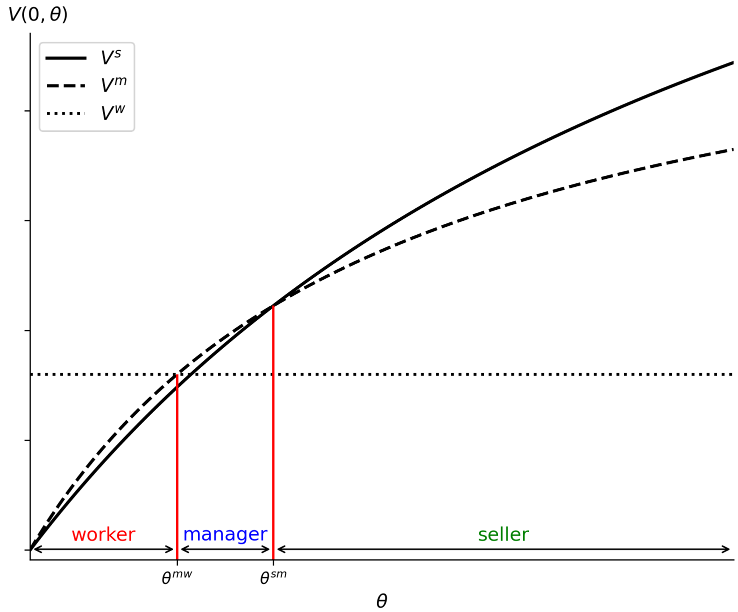


Figure 2: Occupational choice cutoff levels in the baseline economy

Stationary measures and labor supply. Let f_m denote the stationary measure of *operating* entrepreneur-managed businesses. For a type-θ start-and-manage entrepreneur, the stationary probability of being in the operating state is $\theta/(1-\nu+\theta)$. Hence

$$f_m = \int_{\theta^{mw}}^{\theta^{sm}} \frac{\theta}{1-\nu+\theta}\, h(\theta)\, d\theta. \tag{15}$$

Let f_b denote the stationary measure of businesses operated by the bank's M&A division. For a type-θ start-and-sell entrepreneur, the stationary probability of being in the (pre-sale) ownership state is $\theta/(1+\theta)$, so the flow of sales to the bank is $\theta/(1+\theta)$ per period. Since bank-operated businesses survive with probability ν, the stationary stock equals the flow divided by the exit rate $1-\nu$:

$$f_b = \frac{1}{1-\nu} \int_{\theta^{sm}}^{1} \frac{\theta}{1+\theta}\, h(\theta)\, d\theta. \tag{16}$$

Because only workers supply labor to final-good production, aggregate labor input is

$$L = H(\theta^{mw}). \tag{17}$$

2.3 Introduction of a realization-based capital-gains tax

Suppose realized capital gains are taxed at rate τ. Under realization-based taxation, only start-and-sell entrepreneurs pay the tax, upon sale. The start-and-sell value function becomes

$$\begin{cases} V^s(0,\theta) = \beta\left[(1-\theta)V^s(0,\theta) + \theta V^s(\bar{z},\theta)\right], \\ V^s(\bar{z},\theta) = (1-\tau)\, p(\bar{z}) + \beta V^s(0,\theta). \end{cases} \tag{18}$$

Thus the effective sale price is reduced to $(1-\tau)p(\bar{z})$, and the seller–manager cutoff shifts to

$$\theta^{sm}_{\text{real}} = \frac{(1-\beta\nu)\,(1-\tau)p(\bar{z}) - \pi^*_m}{\beta\big(\pi^*_m - (1-\tau)p(\bar{z})\big)}. \tag{19}$$

Proposition 2. If τ is sufficiently small so that all three occupations remain active, then

$$\theta^{sm}_{\text{real}} > \theta^{sm}.$$

A realization-based capital-gains tax therefore raises the threshold for selecting the start-and-sell entrepreneur: the measure of sellers falls while the measure of managers rises. Intuitively, some high-ability households (high θ) that would have sold their businesses in the no-tax economy instead choose to retain and operate them when realizations are taxed. Following Chari et al. (2005), I refer to this reallocation as a *capital lock-in* effect. Figure 3 illustrates this mechanism.

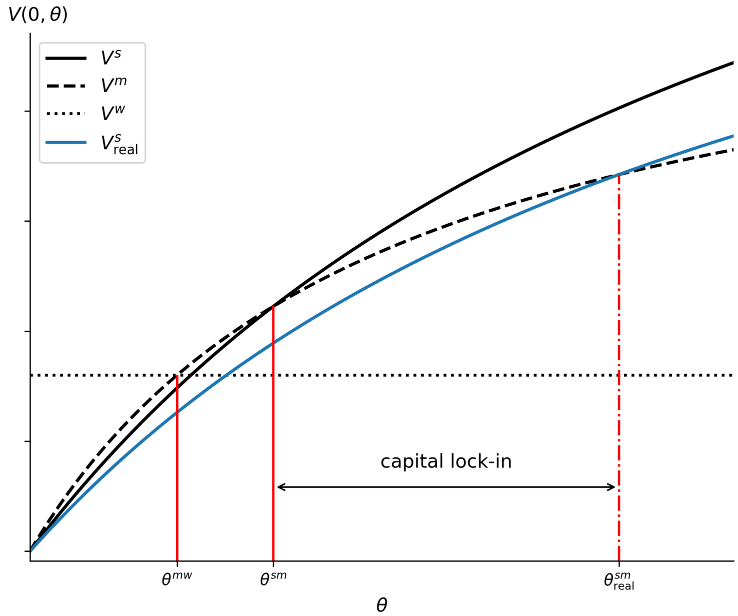


Figure 3: Occupational cutoffs under a realization-based capital-gains tax

2.4 Introduction of an accrual-based capital-gains tax

Suppose instead that capital gains are taxed upon accrual at rate τ. In this stylized environment, business quality is constant while operating, so accrual taxation is equivalent to taxing the business value $p(\bar{z})$ when the household successfully creates a business (i.e., when it transitions from $z = 0$ to $z = \bar{z}$). If the business subsequently exits (a capital-loss event), previously paid taxes are rebated. Many policy proposals implement loss offsets through carry-forward provisions; for tractability, I abstract from carry-forward constraints and assume that losses are fully rebated contemporaneously.

Under accrual taxation, both the seller's and manager's value functions are modified.

Seller.

$$\begin{cases} V^s(0,\theta) = \beta\left[(1-\theta)V^s(0,\theta) + \theta\Big(V^s(\bar{z},\theta) - \tau p(\bar{z})\Big)\right], \\ V^s(\bar{z},\theta) = p(\bar{z}) + \beta V^s(0,\theta). \end{cases} \tag{20}$$

Manager.

$$\begin{cases} V^m(0,\theta) = \beta\left[(1-\theta)V^m(0,\theta) + \theta\Big(V^m(\bar{z},\theta) - \tau p(\bar{z})\Big)\right], \\ V^m(\bar{z},\theta) = \pi_m^* + \beta\left[(1-\nu)\Big(V^m(0,\theta) + \tau p(\bar{z})\Big) + \nu V^m(\bar{z},\theta)\right]. \end{cases} \tag{21}$$

Because the tax is levied upon accrual, households pay $\tau p(\bar{z})$ upon successful business creation. If the business exits, the associated "capital loss" triggers a rebate of the same amount under the full-refund assumption.

These modifications shift the occupational cutoffs. The worker–manager cutoff becomes

$$\theta^{mw}_{\text{accrual}} = \frac{w(1-\beta\nu)}{\beta\left(\pi^*_m - w - (1-\beta)\tau p(\bar{z})\right)}, \tag{22}$$

and the seller–manager cutoff becomes

$$\theta^{sm}_{\text{accrual}} = \frac{(\pi^*_m + \beta\tau p(\bar{z})) - (1 - \beta\nu(1-\tau))\, p(\bar{z})}{\beta\left[p(\bar{z}) - (\pi^*_m + \beta\tau p(\bar{z}))\right]}. \tag{23}$$

Proposition 3. If τ is sufficiently small that all three occupations remain active, then

$$\theta^{sm}_{\text{real}} > \theta^{sm}_{\text{accrual}} > \theta^{sm} \qquad \text{and} \qquad \theta^{mw}_{\text{accrual}} > \theta^{mw} = \theta^{mw}_{\text{real}}.$$

Thus, relative to realization-based taxation, accrual taxation mitigates capital lock-in (by lowering the cutoff for selling relative to $\theta^{sm}_{\text{real}}$), but it discourages entrepreneurial entry by raising the worker–manager cutoff.

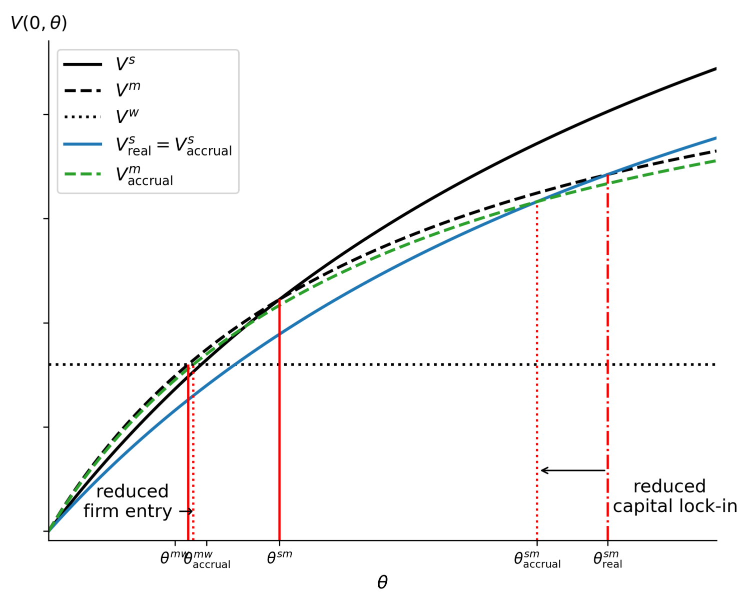


Figure 4: Occupational cutoffs under an accrual-based capital-gains tax

2.5 Social planner

This subsection studies a constrained social planner's problem to characterize distortions in the model and to assess whether capital lock-in is socially distortionary. To focus on allocative inefficiencies rather than redistribution, I assume the planner cannot use lump-sum taxes or transfers.[4]

With linear utility and a unit mass of households, the planner's objective is to maximize discounted aggregate consumption:

$$\max \sum_{t=0}^{\infty} \beta^t \int u(c_t)\, dH(\theta) \; = \; \sum_{t=0}^{\infty} \beta^t C_t, \tag{24}$$

The resource constraint is

$$Y_t - rK_t = C_t, \tag{25}$$

where K_t is aggregate capital rented for private-business production. Because capital is supplied by the global market, capital income rK_t accrues to foreigners and is subtracted from domestic resources.

Substituting the resource constraint into the objective yields the planner's problem

$$\max_{\theta^{mw}, \theta^{sm}, k_m, k_b} \sum_{t=0}^{\infty} \beta^t \left\{ AL^{1-\alpha} Q^{\alpha} - r \left[f_m k_m + f_b k_b \right] \right\}. \tag{26}$$

where (L, Q, f_m, f_b) are determined by the occupational cutoffs and the induced stationary measures.

The key wedges in this environment are (i) a monopolistic-competition distortion in intermediate-good production and (ii) an externality through the dependence of aggregate demand on the mass of varieties (which affects the private return to operating and to entry). To clarify their implications, I compare the planner's allocation to the baseline competitive equilibrium along both the intensive and extensive margins.

[4] Equivalently, the planner is restricted to implementable allocations without non-distortionary fiscal instruments.

Intensive margin. Let k_m denote capital used by an entrepreneur-managed operating business and k_b denote capital used by a bank-operated business. Under (8), the planner chooses

$$k_m^{SP} = \left[\frac{\alpha A L^{1-\alpha} Q^{\alpha-\mu} \bar{z}^{\mu}}{r}\right]^{\frac{1}{1-\mu}} > k_m = \left[\frac{\mu\, \alpha A L^{1-\alpha} Q^{\alpha-\mu} \bar{z}^{\mu}}{r}\right]^{\frac{1}{1-\mu}}, \tag{27}$$

$$k_b^{SP} = \left[\frac{\alpha A L^{1-\alpha} Q^{\alpha-\mu} (\lambda \bar{z})^{\mu}}{r}\right]^{\frac{1}{1-\mu}} > k_b = \left[\frac{\mu\, \alpha A L^{1-\alpha} Q^{\alpha-\mu} (\lambda \bar{z})^{\mu}}{r}\right]^{\frac{1}{1-\mu}}. \tag{28}$$

Thus, the competitive equilibrium underinvests in private business capital because individual producers internalize only a fraction μ of the marginal social return—a standard markup distortion under monopolistic competition.

Extensive margin. The extensive margin is summarized by the occupational cutoffs θ^{mw} and θ^{sm}, which govern entry into entrepreneurship and the choice between managing and selling. In the equilibrium,

$$\theta_{SP}^{mw} < \theta^{mw},$$

implying that entrepreneurial entry is inefficiently low in the competitive equilibrium. Intuitively, market power in intermediate-good production depresses the private return to entry relative to the social return.

Moreover, I obtain

$$\theta_{SP}^{sm} < \theta^{sm},$$

so that the planner assigns a larger measure of entrepreneurs to the start-and-sell occupation. This difference reflects a trade-off between (i) the turnover benefit of selling—which increases the rate at which entrepreneurs can initiate new businesses—and (ii) the production inefficiency after acquisition by the bank, captured by λ. Formally, the sign of $\frac{\partial Q}{\partial \theta^{sm}}$ depends on

$$\underbrace{\frac{1}{1-\nu+\theta^{sm}}}_{\text{marginal manager contribution}} - \underbrace{\frac{\lambda^{\frac{\mu}{1-\mu}}}{(1-\nu)(1+\theta^{sm})}}_{\text{marginal seller contribution}}. \tag{29}$$

This expression highlights the underlying trade-off: raising θ^{sm} increases the mass of managers and reduces the mass of sellers, and the net effect on Q depends on their relative contributions.

Managers and sellers differ along two dimensions. First, the turnover friction differs: the relevant denominator for managers is larger by $\nu\theta^{sm}$, reflecting that managers can start a new business only after exit, whereas sellers can restart immediately after selling. This makes the start-and-sell occupation relatively more effective at generating new businesses. Second, sellers' businesses are less productive after acquisition by the bank, reflected in the multiplicative penalty $\lambda^{\frac{\mu}{1-\mu}}$ in the seller term.

In the competitive equilibrium, individual households do not internalize the aggregate benefit of higher turnover from selling (an aggregate-demand externality), and they are discouraged from selling by the post-acquisition inefficiency in bank-operated production. Together, these forces raise θ^{sm} relative to the planner's choice, generating too few sellers. In the social planner's optimum, θ^{sm} is chosen to internalize these forces and to exactly balance this trade-off.

2.6 Comparison between the social planner and tax regimes

I now compare the allocations under capital-gains taxation to the constrained social planner's allocation. Along the intensive margin, the optimal capital choice under both tax regimes coincides with the baseline competitive equilibrium; hence, in both cases private business investment remains inefficiently low relative to the social planner. Capital-gains taxation, however, affects the extensive margin through occupational choice.

Corollary. If τ is sufficiently small that all three occupations remain active, then

$$\theta^{sm}_{\text{real}} > \theta^{sm}_{\text{accrual}} > \theta^{sm} > \theta^{sm}_{SP} \qquad \text{and} \qquad \theta^{mw}_{\text{accrual}} > \theta^{mw} = \theta^{mw}_{\text{real}} > \theta^{mw}_{SP}.$$

Under realization-based taxation, the capital lock-in mechanism in Proposition 2 reduces the measure of sellers. Comparing to the social planner makes clear that this reallocation is distortionary: the competitive equilibrium already features too few sellers relative to the planner. Switching from realization-based to accrual-based taxation mitigates this distortion, as implied by $\theta^{sm}_{\text{real}} > \theta^{sm}_{\text{accrual}}$. However, accrual-based taxation raises the entry cutoff θ^{mw}, discouraging entrepreneurial entry relative to realization-based taxation; relative to the planner, this entry deterrence is also distortionary. The key quantitative question is therefore whether the welfare gains from mitigating capital lock-in outweigh the welfare losses from reduced firm entry. The next section addresses this question quantitatively.

3 Quantitative model

The quantitative model extends the simple model to match key empirical moments for aggregate production, the occupational distribution, entrepreneurial firm dynamics, and the wealth distribution. Figure 5 provides an overview of the structure of the enriched model economy.

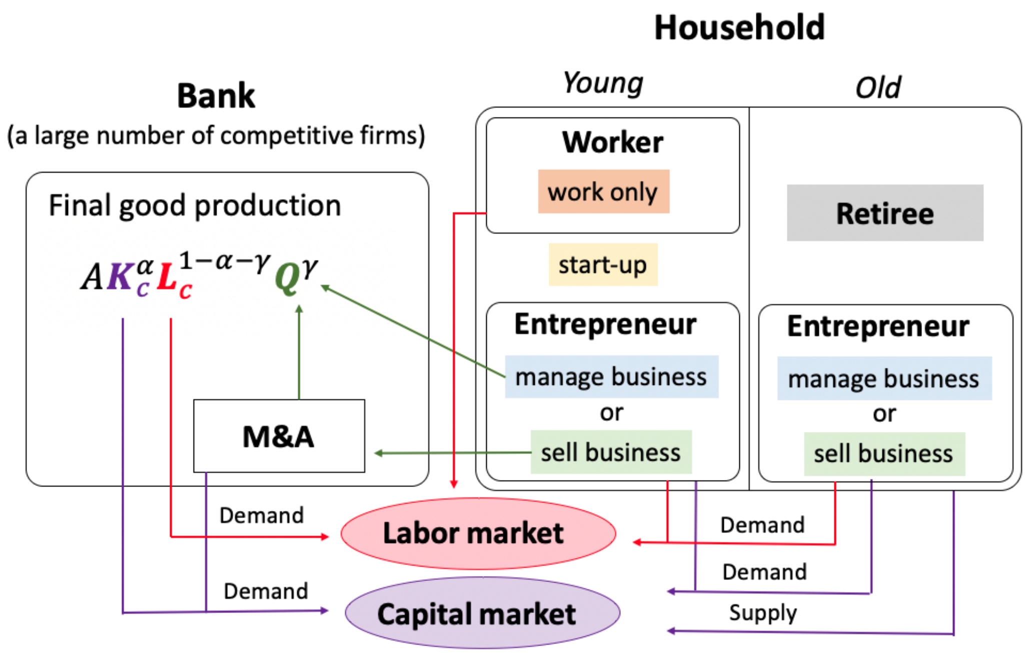


Figure 5: Quantitative model economy

3.1 Demographics and preferences

I adopt a life-cycle structure with intergenerational altruism, following Cagetti and De Nardi (2009), in which households pass through two stages of life: young and old. Each model period corresponds to one year. In each period, young households face a constant probability of aging, $(1 - \pi_y)$, while old households face a constant probability of dying, $(1 - \pi_o)$. Old households care about the utility of their offspring, who enter the economy upon the death of their parents and inherit the bequeathed assets and business. The probabilities of aging and death are calibrated so that the implied average lengths of working life and retirement are realistic. The population is normalized to one. Households derive utility from consumption according to a CRRA utility function,

$$u(c) = \frac{c^{1-\sigma}}{1-\sigma}.$$

3.2 Heterogeneity

Households are heterogeneous in labor productivity $y \in \mathcal{Y}$, entrepreneurial idea $\theta \in \Theta$, private-business ownership and productivity $z \in \mathcal{Z}$, asset holdings $a \in \mathcal{A}$, and life stage $\iota \in \mathcal{I} = \{young, old\}$. The individual state is therefore

$$s = (z, a, y, \theta, \iota) \in \mathcal{S} \equiv \mathcal{Z} \times \mathcal{A} \times \mathcal{Y} \times \Theta \times \mathcal{I},$$

and let Ψ denote the cross-sectional distribution over $\mathcal{S}$.

Labor productivity. Labor productivity follows an AR(1) process in logs:

$$\log y_{t+1} = \rho_y \log y_t + \varepsilon_{y,t+1}, \qquad \varepsilon_{y,t+1} \sim \mathcal{N}(0, \sigma_y^2), \tag{30}$$

with transition kernel $f(y' \mid y)$.

Entrepreneurial idea. Entrepreneurial idea θ follows an AR(1) process in logs:

$$\log \theta_{t+1} = \rho_\theta \log \theta_t + \varepsilon_{\theta,t+1}, \qquad \varepsilon_{\theta,t+1} \sim \mathcal{N}(0, \sigma_\theta^2), \tag{31}$$

with transition kernel $g(\theta' \mid \theta)$.

Business ownership and productivity. Business ownership and productivity are summarized by the state variable z:

$$z = \begin{cases} z_0, & \text{if no business is owned,} \\ z_b \in \mathcal{Z}_b = \{z_1, z_2, \ldots, z_N\}, & \text{if a business is owned, with productivity } z_b. \end{cases} \tag{32}$$

The state variable z evolves through both endogenous decisions, such as entry and sale, and exogenous shocks to business productivity. Figure 6 illustrates this evolution by showing the within-period timing of household decisions for young households.

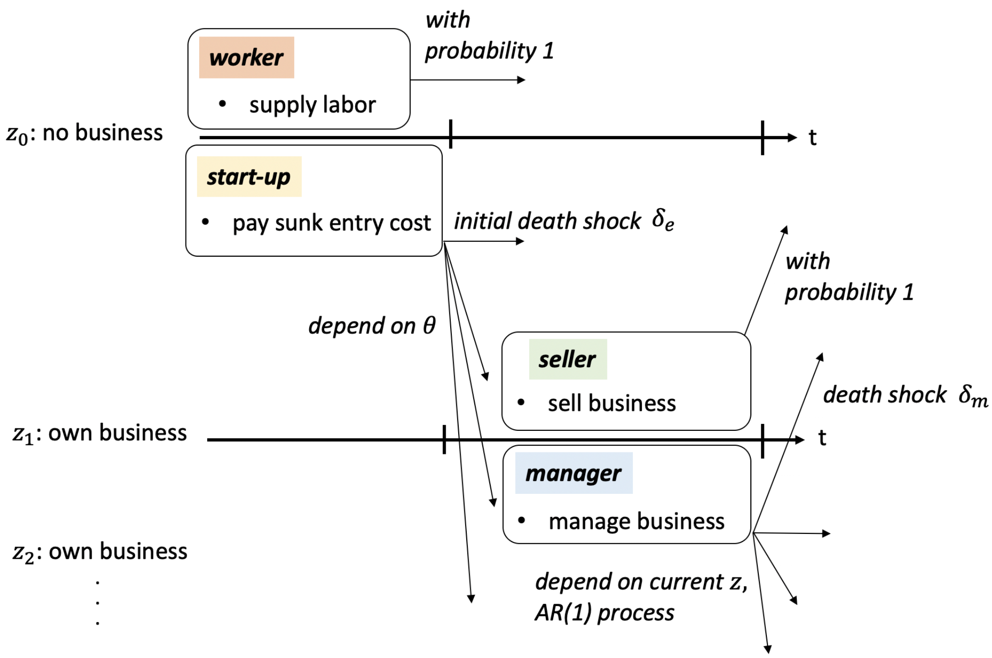


Figure 6: Timeline of household decisions within each period

Entry decision. In each period, households in the no-business state, $z = z_0$, choose whether to remain workers or to attempt to start a business. Households that remain workers stay in state z_0 in the next period. Prospective entrepreneurs pay a sunk entry cost and learn their initial business productivity at the beginning of the next period. Conditional on attempting entry, next-period productivity z' is drawn from the distribution $h_e(z' \mid \theta)$. I assume that the failure probability is constant across θ and that, conditional on successful entry, the probability of drawing business productivity is decreasing and convex in the productivity index. To capture this structure, I use an exponential specification and assume that a higher entrepreneurial idea θ shifts the startup-productivity distribution toward more productive outcomes:

$$h_e(z' \mid \theta) = \begin{cases} \delta_e, & \text{if } z' = z_0, \\ (1-\delta_e)\dfrac{\exp\left(-\frac{1}{\theta}j\right)}{\sum_{m=1}^{N_z}\exp\left(-\frac{1}{\theta}m\right)}, & \text{if } z' = z_j, \quad j = 1, \ldots, N_z. \end{cases} \tag{33}$$

Sell/continue decision. Households that already own a business, $z = z_b \in \mathcal{Z}_b$, choose either to sell the firm to the bank's M&A sector or to continue managing it. Those who sell transition to z_0 in the next period. If they continue operating the firm, they face a constant bankruptcy risk δ_c, and business productivity evolves according to an AR(1) process in logs:

$$\log z_{t+1} = \rho_z \log z_t + \varepsilon_{z,t+1}, \qquad \varepsilon_{z,t+1} \sim \mathcal{N}(0, \sigma_z^2), \tag{34}$$

with transition kernel $h(z_b' \mid z_b)$. Hence, the transition kernel for z for households that own a business is

$$h_c(z' \mid z_b) = \begin{cases} \delta_c, & \text{if } z' = z_0, \\ \big(1 - \delta_c\big) h(z' \mid z_b), & \text{if } z' = z_j, \quad j = 1, \ldots, N_z. \end{cases} \tag{35}$$

Assets. Asset holdings a are chosen endogenously in each period. I assume that $a' \in \mathcal{A}$, where $\mathcal{A}$ may incorporate a borrowing limit.

3.3 Technology

Intermediate-good production. Each entrepreneur who owns a business produces a differentiated intermediate good using capital k and labor ℓ,

$$x_i = z_i k_i^{\varphi} \ell_i^{1-\varphi}. \tag{36}$$

When the bank's M&A sector acquires a business and operates it, output is given by

$$x_i = \lambda z_i k_i^{\varphi} \ell_i^{1-\varphi}, \qquad 0 < \lambda \le 1, \tag{37}$$

where λ captures the efficiency loss under bank control, or equivalently the nonpecuniary benefit that entrepreneurs derive from control, following Chari et al. (2005). Thus,

$$x = \begin{cases} z k^{\varphi} \ell^{1-\varphi}, & \text{if owner-managed}, \\ \lambda z k^{\varphi} \ell^{1-\varphi}, & \text{if bank-managed (M\&A)}. \end{cases} \tag{38}$$

Final-good production. The bank's production sector produces the final good using capital K_c, labor L_c, and a CES aggregate of differentiated intermediate inputs, Q:

$$Y = AK_c^{\alpha} L_c^{1-\alpha-\gamma} Q^{\gamma}, \qquad \alpha \in (0,1),\ \gamma \in (0, 1-\alpha). \tag{39}$$

Let Φ_t denote the distribution of firms operated by the bank's M&A division at the beginning of period t, before new business sales occur. When households sell their businesses to the bank, these newly acquired firms enter the post-trade bank-operated distribution in period t. Firms enter this distribution when households sell their businesses to the bank. For any measurable set $B \subseteq \mathcal{Z}_b$, define the inflow of newly acquired firms as

$$M_t(B) = \int_{\mathcal{S}} \mathbb{1}_s(s)\, \mathbf{1}\{z(s) \in B\}\, d\Psi_t(s), \tag{40}$$

where $\mathbb{1}_s(s)$ is an indicator equal to one if a household in state s sells its business in the current period.

The post-trade distribution of bank-managed firms is therefore

$$\widetilde{\Phi}_t(B) = \Phi_t(B) + M_t(B). \tag{41}$$

After production in period t, all firms in the post-trade bank-operated distribution $\widetilde{\Phi}_t$ evolve according to the transition kernel $h_c(z' \mid z)$, so the law of motion for Φ_t is

$$\Phi_{t+1}(B) = \int_{\mathcal{Z}_b} h_c(B \mid z_b)\, d\widetilde{\Phi}_t(z_b), \qquad B \subseteq \mathcal{Z}_b. \tag{42}$$

Because Φ_t is defined only on $\mathcal{Z}_b$, any mass that transitions to z_0 exits the bank-managed distribution automatically.

Let $\mathbb{1}_m(s)$ be an indicator equal to one if a household in state s operates its business in the current period, that is, chooses to manage rather than sell, and zero otherwise. The CES aggregator is

$$Q_t = \left(\int_{\mathcal{S}} \mathbb{1}_m(s)\, x_m(s)^{\mu}\, d\Psi_t(s) + \int_{\mathcal{Z}_b} x_b(z)^{\mu}\, d\widetilde{\Phi}_t(z) \right)^{1/\mu}, \qquad \mu \in (0,1]. \tag{43}$$

Final-good firm's problem and factor prices. A representative competitive final-good firm chooses inputs taking prices as given. Let w denote the wage per efficiency unit and r the risk-free interest rate. The user cost of capital is $r+\delta$, where δ is the depreciation rate. Profit maximization implies

$$w = (1-\alpha-\gamma)\, AK_c^{\alpha} L_c^{-\alpha-\gamma} Q^{\gamma}, \tag{44}$$

and

$$r+\delta = \alpha\, AK_c^{\alpha-1} L_c^{1-\alpha-\gamma} Q^{\gamma}. \tag{45}$$

Moreover, the implied inverse demand schedule for any differentiated intermediate good of quantity x is

$$\xi(x) = \gamma\, AK_c^{\alpha} L_c^{1-\alpha-\gamma} Q^{\gamma-\mu} x^{\mu-1}, \tag{46}$$

where $\xi(x)$ is the price per unit of the intermediate good. Individual intermediate producers take (K_c, L_c, Q) as given and therefore face a downward-sloping demand schedule when $\mu < 1$.

3.4 Households

Households' decision problems depend on both their life stage and whether they currently own a business. Accordingly, I define separate value functions by life stage and business status: (i) households without a business, ($z = z_0$), and (ii) households with a business, ($z = z_b \in \mathcal{Z}_b$). During the young stage, households may attempt to start a business. Once they become old, however, they retire unless they are business owners, following Cagetti and De Nardi (2006). This assumption is intended to capture the fact that, whereas most workers retire before age 65, entrepreneurs often continue operating their businesses until much later.

3.4.1 Young households problem

Young households without a business. A household without a business chooses between working and attempting entry:

$$V(z_0, a, y, \theta) = \max\left\{V_w(z_0, a, y, \theta),\ V_e(z_0, a, y, \theta)\right\}. \tag{47}$$

Worker. Workers earn labor income wy and asset income ra. Let τ_w denote the labor-income tax rate, τ_k the capital-income tax rate, and τ_c the consumption tax rate. Regardless of whether they age in the next period, they remain in the no-business state z_0. Conditional on remaining young, the expected continuation value is taken over (y', θ') conditional on (y, θ) using $f(y' \mid y)$ and $g(\theta' \mid \theta)$. If the worker becomes old, the household retires, and the continuation value is $W_r(z_0, a')$. The worker's problem is

$$V_w(z_0, a, y, \theta) = \max_{c, a' \geq 0} \left\{ u(c) + \beta \pi_y \mathbb{E}\big[V(z_0, a', y', \theta')\big] + \beta(1 - \pi_y) W_r(z_0, a') \right\}, \tag{48}$$

subject to

$$a' = (1 + r(1 - \tau_k))\, a + (1 - \tau_w)\, wy - (1 + \tau_c)\, c. \tag{49}$$

Startup entrepreneur. If the household attempts to start a business, it pays a sunk entry cost κ. Next-period business productivity z' is drawn from $h_e(z' \mid \theta)$. Hence, conditional on remaining young, the expected continuation value is taken over (z', y', θ') conditional on (y, θ) using $h_e(z' \mid \theta)$, $f(y' \mid y)$, and $g(\theta' \mid \theta)$. If the household becomes old, the continuation value is $W(z', a')$, where the expectation is taken over z' conditional on θ using $h_e(z' \mid \theta)$. The startup entrepreneur's problem is

$$V_e(z_0, a, y, \theta) = \max_{c, a' \geq 0} \left\{ u(c) + \beta \pi_y \mathbb{E}\big[V(z', a', y', \theta')\big] + \beta(1 - \pi_y) \mathbb{E}\big[W(z', a')\big] \right\}, \tag{50}$$

subject to

$$a' = (1 + r(1 - \tau_k))\, a - (1 + \tau_c)\, c - \kappa. \tag{51}$$

Young households with a business. A young business owner chooses whether to continue managing the business or to sell it:

$$V(z_b, a, y, \theta) = \max \left\{ V_m(z_b, a, y, \theta),\ V_s(z_b, a, y, \theta) \right\}. \tag{52}$$

Manager. A managing entrepreneur chooses capital k, labor ℓ, consumption, and savings. The profits are given by

$$\pi(z, k, \ell) = \xi(x)\, x - (r + \delta)k - w\ell, \qquad x = z k^{\varphi} \ell^{1-\varphi}. \tag{53}$$

Capital investment is subject to a collateral constraint that depends on the entrepreneur's assets and business productivity:

$$k \leq \psi(z)\, a, \tag{54}$$

where $\psi(\cdot)$ governs the tightness of borrowing constraints. Conditional on remaining young, the expected continuation value is taken over (z', y', θ') conditional on (z_b, y, θ) using $h_c(z' \mid z_b)$, $f(y' \mid y)$, and $g(\theta' \mid \theta)$. If the entrepreneur becomes old, the expected continuation value is taken over z' conditional on z_b using $h_c(z' \mid z_b)$. The value function for a managing entrepreneur is

$$V_m(z_b, a, y, \theta) = \max_{c,k,\ell,a' \geq 0} \left\{ u(c) + \beta\pi_y \mathbb{E}\big[V(z', a', y', \theta')\big] + \beta(1-\pi_y)\mathbb{E}\big[W(z', a')\big] \right\}, \tag{55}$$

subject to (54) and

$$a' = (1 + r(1-\tau_k))\, a + (1-\tau_k)\, \pi(z_b, k, \ell) - (1+\tau_c)\, c. \tag{56}$$

Seller. If the entrepreneur sells the business, she pays a fixed cost ϕ, and the business is transferred to the bank's M&A sector at price $p(z_b)$. Under realization-based taxation, the seller pays a capital-gains tax at rate τ_g upon sale. Because the entrepreneur sells the business in the current period, she becomes a non-business owner in the next period. Conditional on remaining young, the expected continuation value is taken over (y', θ') conditional on (y, θ) using $f(y' \mid y)$ and $g(\theta' \mid \theta)$. If she becomes old, she retires. The seller's problem is

$$V_s(z_b, a, y, \theta) = \max_{c,a' \geq 0} \left\{ u(c) + \beta\pi_y \mathbb{E}\big[V(z_0, a', y', \theta')\big] + \beta(1-\pi_y) W_r(z_0, a') \right\}, \tag{57}$$

subject to

$$a' = (1 + r(1-\tau_k))\, a + (1-\tau_g)\, p(z_b) - \phi - (1+\tau_c)\, c. \tag{58}$$

3.4.2 Old households problem

Old households that own a business can choose either to continue managing it or to sell it and retire, whereas old households without a business are retirees.

Old households without a business (retirees). Retirees receive pension income T_p in every period and remain retirees for as long as they survive. Upon death, their offspring enter the economy with the bequeathed assets, and their labor productivity y and entrepreneurial idea θ are drawn from the invariant distribution. Old households value the utility of their offspring with weight η. The retiree's value function is

$$W_r(z_0, a) = \max_{c,a' \geq 0} \left\{ u(c) + \beta \pi_o W_r(z_0, a') + \eta \beta (1 - \pi_o) \mathbb{E} V(z_0, a', y', \theta') \right\} \tag{59}$$

subject to

$$a' = T_p + (1 + r(1 - \tau_k))a - (1 + \tau_c)c. \tag{60}$$

Old households with a business. An old business owner chooses whether to continue managing the business or to sell it:

$$W(z_b, a) = \max\{W_m(z_b, a), W_s(z_b, a)\}. \tag{61}$$

Manager. An old entrepreneur who continues to manage the business draws next-period business productivity conditional on z_b according to $h_c(z' \mid z_b)$. Upon death, the offspring enter the economy with bequeathed assets a' and inherit the business, whose productivity z' is drawn conditional on the parent's business productivity z_b using $h_c(z' \mid z_b)$. The offspring's labor productivity y' and entrepreneurial idea θ' are drawn from the invariant distribution. The value function is

$$W_m(z_b, a) = \max_{c,k,\ell,a' \geq 0} \left\{ u(c) + \beta \pi_o \mathbb{E} W(z', a') + \eta \beta (1 - \pi_o) \mathbb{E} V(z', a', y', \theta') \right\} \tag{62}$$

subject to (54) and (56).

Seller. An old entrepreneur who sells the business in the current period becomes a retiree in the next period. Upon death, the offspring enter the economy with the bequeathed assets, and their labor productivity y' and entrepreneurial idea θ' are drawn from the invariant distribution. The seller's problem is

$$W_s(z_b, a) = \max_{c,a' \geq 0} \left\{ u(c) + \beta \pi_o W_r(z_0, a') + \eta \beta (1 - \pi_o) \mathbb{E} V(z_0, a', y', \theta') \right\} \tag{63}$$

subject to (58).

3.5 Bank

The bank has two divisions: final-good production and M&A. Final-good production was described above. The M&A division acquires businesses and operates them with efficiency wedge λ.

M&A division and the purchase-price function. Let $\pi_b(z,k,\ell)$ denote the period profit earned when the bank operates an acquired firm with productivity z using capital k and labor ℓ:

$$\pi_{\text{bank}}(z,k,\ell) = \xi(x)\,x - (r+\delta)k - w\ell, \qquad x = \lambda z k^{\varphi}\ell^{1-\varphi}. \tag{64}$$

The M&A division purchases a business at price $p(z)$, defined as the present value of after-tax profits from operating the acquired firm. The price function satisfies

$$p(z_b) = \max_{k,\ell\geq 0}\left\{(1-\tau_k)\,\pi_{\text{bank}}(z_b,k,\ell) + \frac{1}{1+r}\int_{\mathcal{Z}} p(z')\,dh_c(z' \mid z_b)\right\}, \tag{65}$$

with boundary condition

$$p(z_0) = 0. \tag{66}$$

3.6 Government

The government collects taxes on consumption, labor income, capital income, and realized capital gains. Let $\mathbb{1}_w(s)$ and $\mathbb{1}_e(s)$ indicate whether a household without a business works or attempts entry in the current period, respectively. Let $\mathbb{1}_m(s)$ and $\mathbb{1}_s(s)$ indicate whether a business owner manages or sells in the current period, respectively. Let $\mathbb{1}_r(s)$ indicate whether a household is retired. In the baseline analysis, all tax revenue is used to finance government purchases G.

The government budget constraint is

$$\begin{aligned} G = &\int_{\mathcal{S}}\Big[\tau_c c(s) + \tau_k r a + \mathbb{1}_w(s)\tau_w w y + \mathbb{1}_s(s)\tau_g p(z_b) + \mathbb{1}_m(s)\tau_k \pi\big(z_b, k(s), \ell(s)\big)\Big]\,d\Psi(s) \\ &+ \int_{\mathcal{Z}_b} \tau_k\,\pi_{\text{bank}}\big(z_b, k(z_b), \ell(z_b)\big)\,d\Phi(z) - \int_{\mathcal{S}} \mathbb{1}_r(s) T_p. \end{aligned} \tag{67}$$

3.7 Market clearing

Capital demanded by the final-good producer and by intermediate producers must equal aggregate asset holdings. The capital-market clearing condition is

$$K_c + \int_{\mathcal{S}} \mathbb{1}_m(s)\, k_m(s)\, d\Psi(s) + \int_{\mathcal{Z}_b} k_b(z)\, d\widetilde{\Phi}(z) = \int_{\mathcal{S}} a\, d\Psi(s). \tag{68}$$

Labor demand by the final-good producer and by intermediate producers must equal the total efficiency units supplied by workers:

$$L_c + \int_{\mathcal{S}} \mathbb{1}_m(s)\, \ell(s)\, d\Psi(s) + \int_{\mathcal{Z}_b} \ell(z)\, d\widetilde{\Phi}(z) = \int_{\mathcal{S}} \mathbb{1}_w(s)\, y\, d\Psi(s). \tag{69}$$

3.8 Equilibrium

A stationary equilibrium consists of prices (r, w); aggregate inputs (K_c, L_c, Q); household policy functions for consumption and saving $\{c(s), a'(s)\}_{s\in\mathcal{S}}$; discrete occupational and sale choices encoded by $\{\mathbb{1}_w(s), \mathbb{1}_e(s), \mathbb{1}_m(s), \mathbb{1}_s(s), \mathbb{1}_r(s)\}_{s\in\mathcal{S}}$; entrepreneurial capital and labor choices $\{k(s), \ell(s)\}_{s\in\mathcal{S}}$; bank policies $\{k(z_b), \ell(z_b)\}_{z_b\in\mathcal{Z}_b}$; a purchase-price function $p(z_b)$; and invariant distributions Ψ^* on $\mathcal{S}$ and Φ^* on $\mathcal{Z}_b$ such that:

1. Given prices and the demand schedule (46), households solve the dynamic programming problems in (47)–(63).
2. The final-good firm optimally chooses inputs, and factor prices satisfy (44)–(45); intermediate-good prices satisfy (46).
3. The M&A purchase-price function satisfies (65)–(66).
4. The government budget constraint (67) holds.
5. Markets clear, so (68) and (69) hold.
6. The distributions Ψ^* and Φ^* are invariant under the induced policy rules and exogenous transition kernels.

4 Calibration

Table 1 reports the parameter values used in the quantitative model. Some parameters are calibrated externally taken from the literature or direct empirical counterparts, while the remaining parameters are calibrated internally to match targeted moments.

Parameter	Value	Source / Target
Externally assigned		
A	1.0	Normalized
α	0.07	NIPA data, average 2010–2019
γ	0.51	Giandrea and Sprague (2017)
φ	0.61	SOI data, average 2015-2019
μ	0.80	Edmond et al. (2023)
δ	0.06	Cagetti and De Nardi (2006)
$\tau_k,\ \tau_g$	23.4%	McDaniel (2007), average 2010–2019
τ_w	20.4%	McDaniel (2007), average 2010–2019
τ_c	7.5%	McDaniel (2007), average 2010–2019
T_p	40% of average yearly income	Cagetti and De Nardi (2006)
ρ_y	0.95	Storesletten et al. (2004)
σ_y	0.23	Cagetti and De Nardi (2006)
π_y	0.98	45 years of average young period
π_o	0.93	14 years of average old period
κ	25% of average yearly income	Campbell and De Nardi (2007)
δ_e	0.18	Fairlie (2022)
δ_c	0.08	BDS data, average 2010-2019
η	1.0	Cagetti and De Nardi (2006)
σ	1.5	Attanasio et al. (1999)
Internally calibrated		
β	0.94	Capital-to-GDP ratio
λ	0.81	Business-value held by entrepreneurs to total wealth
$\bar{\psi}$	0.85	Private-business debt-to-GDP ratio
ρ_z	0.23	Entrepreneur share at top 10% non-business wealth
σ_z	0.48	Gini coefficient of networth
ρ_θ	0.35	Entry rate of startup
σ_θ	0.35	Entrepreneur population share
ϕ	5.55	Seller share among entrepreneurs

Table 1: Externally and internally calibrated parameters (annual frequency).

4.1 Externally assigned parameters

Production related parameters. In the final goods production function, the capital share α is set at 7 percent—the observed ratio of corporate profits (non-financial domestic corporation) to GDP. The intermediate-goods share γ is calibrated so that the aggregate labor income share equals 58 percent, consistent with the estimate of Giandrea and Sprague (2017). The capital share φ in the private business production is set at 0.605, so that labor share $1-\varphi$ is equal to the average labor cost ratio to value added in S corporation statistics recorded in the Statistics of Income (SOI) Tax Stats during 2015-2019. The curvature parameter of the CES aggregator for intermediate goods production, μ is set to 0.8, which is the average cost-weighted markup measured in Edmond et al. (2023). As is standard in literature, capital depreciation rate δ is set to 0.06.

Tax rates and pension transfer. Each tax rates τ_k, τ_g, τ_w, and τ_c are set at 23.4 percent, 23.4 percent, 20.4 percent, and 7.5 percent respectively, which is estimated by McDaniel (2007). The pension transfer is 40% of average labor income following Cagetti and De Nardi (2006).

Labor productivity. Labor productivity follows AR(1) process. I set $\rho_y = 0.95$ following Storesletten et al. (2004). Following Cagetti and De Nardi (2006), σ_y is set to be 0.23 to match the average Gini coefficient of labor earning of 0.38.

Probability of aging and of death. The probability of aging and of death are set so that the average length of young period is 45 years (age 20-65) and the average length of old period is 14 years (age 65-79) where age of 79 is the average life expectancy in U.S.

Private firm dynamics. The entry sunk cost for start up entrepreneurs are set to 25% of average labor income as calculated by the average money investment for entry by new entrepreneurs reported in Campbell and De Nardi (2007) and average of wage and salary income using the Current Population Survey (CPS) data. The death shock by newly entered private business is set to 18% (Fairlie (2022)) and the death shock by incumbent private business is set to 8% from the average firm death rate from Business Dynamics Statistics (BDS) data during period of 2010-2019 .

Intergenerational altruism and preference. I assume perfect intergenrational altruism as in Cagetti and De Nardi (2006). The curvature of CRRA utility function is set to 1.5 following Attanasio et al. (1999).

4.2 Internally calibrated parameters

The following parameters are calibrated jointly within the model:

- the discount factor β;
- the bank's production-inefficiency parameter λ;

- the collateral schedule $\psi(z)$ in the constraint $k \leq \psi(z)a$. Following Rotberg and Steinberg (2024), in the discretized model I impose

$$\psi(z_n) = 1 + \bar{\psi}\,\frac{n-1}{N-1}, \qquad z_n \in \{z_1, \ldots, z_N\};$$

- the persistence coefficient and standard deviation (ρ_z, σ_z) in the process for z;

- the persistence coefficient and standard deviation $(\rho_\theta, \sigma_\theta)$ in the process for θ;

- the fixed cost for selling private business ϕ.

These parameters are chosen so that the model matches the targeted moments in Table 2: (i) the capital-to-GDP ratio; (ii) the business value held by entrepreneurs to total wealth in economy; (iii) the private-business debt-to-GDP ratio; (iv) the Gini coefficient of wealth; (v) the population share by self-employed business owners who actively manage their business at top 10% non-business wealth position; (vi) the entry rate of starting up business; (vii) the entrepreneur population share; (viii) the sellers share among entrepreneurs.

Target	**Data**	**Model**	**Source**
Aggregate capital to GDP	3.00	2.99	BEA, average 2010–2019
Business value to total wealth	0.19	0.19	SCF, average 2010-2019
Private-business debt-to-GDP	0.11	0.12	SOI, average 2015-2019
Entrepreneur share at top 10%	0.21	0.19	SCF, average 2010-2019
Gini coefficient of wealth	0.85	0.84	SCF, average 2010-2019
New-entrepreneur rate	0.02	0.01	Cagetti and De Nardi (2009)
Entrepreneur population share	0.07	0.05	SCF, average 2010–2019
Sellers share	0.03	0.03	Bhandari et al. (2024)

Notes: Private business debt is calculated using total liability by non-financial business taking pro rate for S-corporations.

Table 2: Targeted moments for internal calibration

4.3 Validation

In addition to the targeted moments, the model replicates several salient features of the wealth distribution, tax revenues, business transfers, and firm dynamics, as shown in Table 3.

Wealth distribution. Although the wealth Gini coefficient is targeted, the model also matches wealth shares for several groups reasonably well. It also reproduces the distribution of non-business assets across groups, as well as the Gini coefficient for non-business assets. In addition, the model generates plausible values for the non-business asset share of business-owning entrepreneurs, the ratio of business assets to their own non-business assets, and bequests. Figure 7 reports the fit of the population share of business owners across non-business asset groups. Although the population share at the top 10% is targeted, the model also performs reasonably well for other groups.

Tax revenue. Although tax rates are externally assigned, the model generates tax-revenue-to-GDP ratios that are broadly consistent with OECD data.

Business transfers and firm dynamics. For business transfers, the population share of sellers is targeted. The model also replicates the median relative size of the wage bill paid by the M&A sector after acquisition, compared with the wage bill paid by the seller before the sale. Since the model assumes that the M&A sector does not face collateral constraints, the empirical counterpart is based on cases in which the buyer is a C corporation rather than a small firm. In addition, Figure 8 shows that the age distribution of entrepreneurial firms in the model is broadly consistent with that observed in the BDS data.

Statistic	**Data**	**Model**	**Source**
Wealth share ($a + p(z)$)			
by top 1%	0.36	0.21	SCF, average 2010–2019
by top 10%	0.76	0.68	SCF, average 2010–2019
by top 20%	0.87	0.83	SCF, average 2010–2019
by bottom 50%	0.01	0.01	SCF, average 2010–2019
Non-business asset share (a)			
by top 1%	0.34	0.22	SCF, average 2010–2019
by top 10%	0.73	0.65	SCF, average 2010–2019
by top 20%	0.86	0.80	SCF, average 2010–2019
by bottom 50%	0.01	0.01	SCF, average 2010–2019
Gini coefficient of non-business asset (a)	0.84	0.79	SCF, average 2010-2019
Non-business asset share by business owned entrepreneurs	0.24	0.24	SCF, average 2010–2019
Entrepreneur's business asset to non-business asset ratio	0.81	0.79	SCF, average 2010–2019
Bequests (% wealth)	0.01	0.01	Nishiyama (2000)
Tax revenue to GDP	0.26	0.24	OECD, average 2015-2019
Consumption	0.04	0.05	OECD, average 2015-2019
Labor income	0.13	0.12	OECD, average 2015-2019
Capital income	0.08	0.06	OECD, average 2015-2019
Capital gains	0.01	0.01	OECD, average 2015-2019
Relative size of wage bill by buyer to seller			
25th percentile	2.2	7.7	Bhandari et al. (2024)
50th percentile	14.9	15.1	Bhandari et al. (2024)
75th percentile	130.7	34.8	Bhandari et al. (2024)

Notes: Capital income tax revenue is calculated as the sum of (1) taxes on individual income and profits, multiplied by a pro-rated capital share of 0.3, and (2) taxes on corporate income, profits, and capital gains. When property taxes are also included, the capital-income-tax-revenue-to-GDP ratio increases to 7.7%.

Table 3: Non-targeted moments for internal calibration

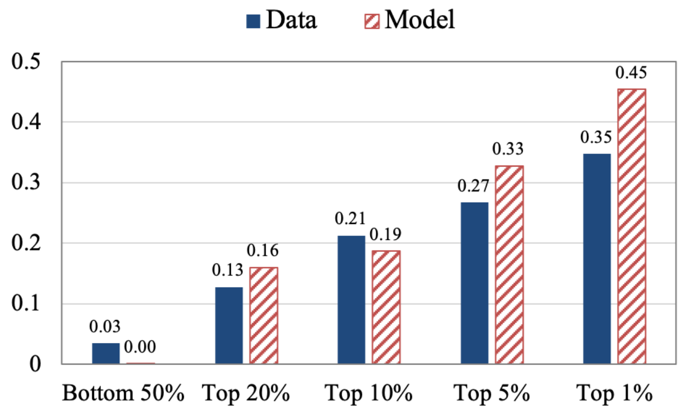


Figure 7: Business-owner population share by non-business asset group

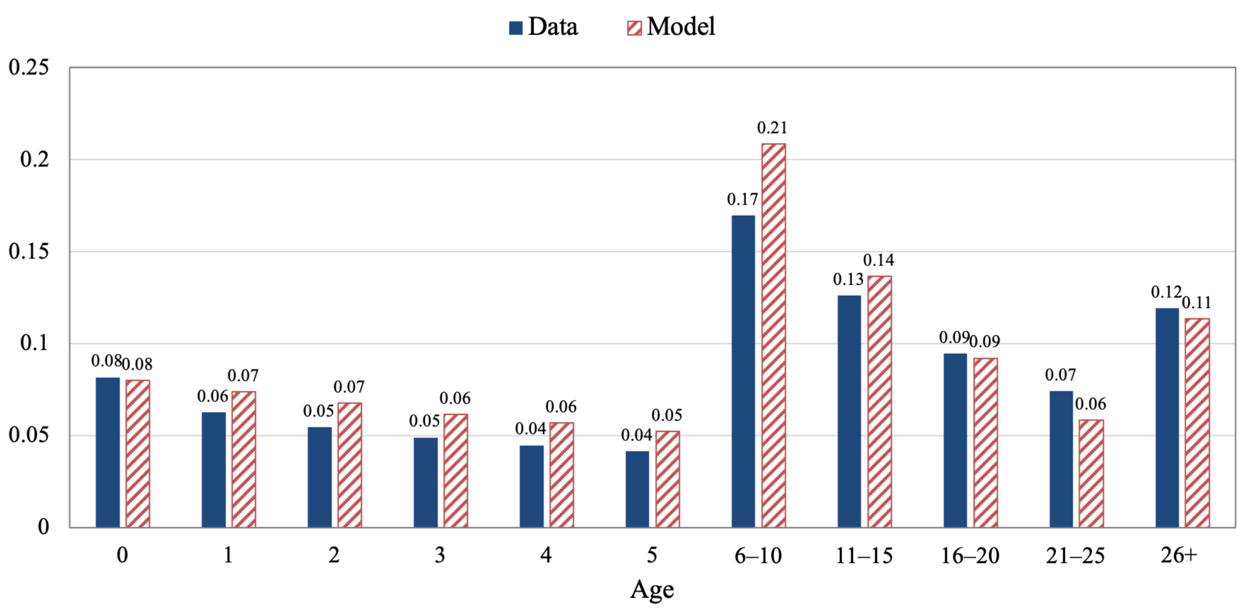


Figure 8: Firm age distribution

5 Model with an accrual-based capital-gains tax

This section modifies the model to incorporate an accrual-based (mark-to-market) capital-gains tax. Under accrual taxation, an entrepreneur pays taxes on changes in the market value of the business while it is held. If the business value falls, the entrepreneur receives a refund (or an offset). For tractability, I assume full loss offset with contemporaneous rebates.

5.1 State augmentation and accrual tax liability

To implement accrual taxation, I augment the household state with a lagged business-productivity index $z^- \in \mathcal{Z}$, which records the previous period's business productivity if the household held a business then, and equals z_0 otherwise. The household state becomes

$$\tilde{s} = (z, a, y, \theta, z^-) \in \tilde{\mathcal{S}} \equiv \mathcal{Z} \times \mathcal{A} \times \mathcal{Y} \times \Theta \times \mathcal{Z}.$$

Let $p(z)$ denote the assessed market value of a business with productivity z, with normalization $p(z_0) = 0$. The accrual-based capital-gains tax liability is

$$T_g(z, z^-) \equiv \tau_g\big(p(z) - p(z^-)\big), \tag{70}$$

which can be negative (a rebate) when $p(z) < p(z^-)$. In budget constraints below, this enters as a payment $-T_g(z, z^-)$.

The transition matrix of z^- is

$$F(z^{-'}|z^-) = \begin{cases} z^{-'} = z \text{ for all occupation except seller} \\ z^{-'} = z_0 \text{ for seller} \end{cases} \tag{71}$$

5.2 Discussion: practical implementation

Policy proposals for accrual-based taxation (mark-to-market taxation) recognize that annual valuation of privately held businesses is difficult. In practice, such reforms would likely allow infrequent appraisals and impute interim appreciation using an interest-rate benchmark, and they may permit installment payment of tax liabilities to mitigate liquidity constraints. Loss offsets are also typically implemented via carry-forward rules. For tractability, I abstract from these institutional details and model annual accrual taxation with full contemporaneous loss refunds as in (70).

6 Results

This section conducts counterfactual experiments comparing three alternative capital-gains tax regimes: (i) *no* capital gains tax; (ii) a *realization-based* capital-gains tax (status quo); (iii) an *accrual-based* capital-gains tax; and (iv) a *hybrid* regime that combines the two. In the hybrid regime, accrual-based taxation applies only to wealthy households, while the rest of the population faces realization-based taxation. This hybrid design follows recent policy proposals, including the proposal advanced by the Biden administration.

6.1 No Capital Gains Tax, Realization-Based Taxation, and Accrual-Based Taxation

I first examine the two main mechanisms emphasized by the stylized model: firm-entry deterrence and capital lock-in. I then discuss how these mechanisms affect aggregate production, inequality, and welfare.

Firm entry. The stylized model implies that accrual-based taxation discourages firm entry. The mechanism is that, upon successful business creation, a startup entrepreneur must pay taxes on accrued gains, which reduces the net payoff from entering entrepreneurship. As a result, the population of entrepreneurs falls. This mechanism is also present in the quantitative model. Table 4 shows that switching from realization-based taxation to accrual-based taxation reduces the population of startup entrepreneurs.

Capital lock-in. The stylized model also shows that a realization-based capital-gains tax induces a lock-in effect: entrepreneurs who would otherwise sell their businesses instead retain and manage them in order to defer capital-gains taxation. This mechanism is confirmed by the quantitative results in Table 4. Relative to the no-capital-gains-tax case, the population of managers is higher, while the numbers of sellers and M&A-operated firms are lower under the realization-based tax regime.

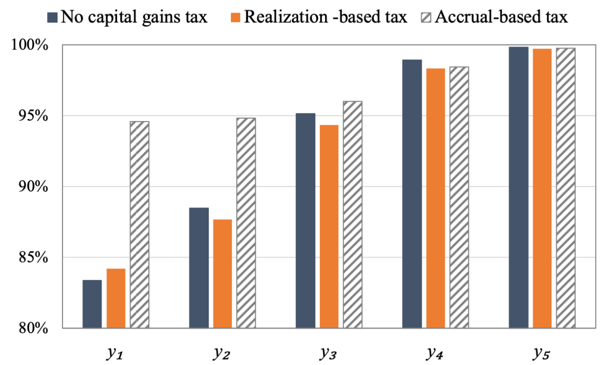
By contrast, switching to accrual-based taxation reduces the lock-in distortion because tax liability no longer depends on whether the business is sold. As a result, accrual-based taxation induces some business owners who were locked in under realization-based taxation to sell their businesses. This implication of the stylized model is also confirmed by the quantitative results. Table 4 shows that, after switching from realization-based taxation to accrual-based taxation, the number of sellers and M&A-operated firms rises, while the population of managers falls.

	Firm entry	Capital lock-in		
Policy	Startups	Managers	Sellers	M&A firms
No capital gains tax	0.70	4.11	0.25	3.11
Realization-based tax	0.63	4.89	0.13	1.60
Accrual-based tax	0.43	2.39	0.16	1.97

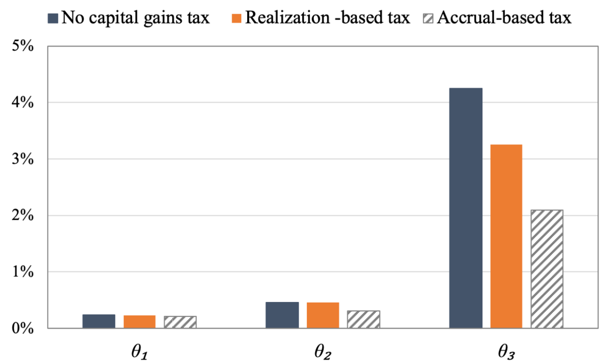
Notes: Total population in the economy is 100.

Table 4: Population by entrepreneurs and number of firms operated by M&A sector

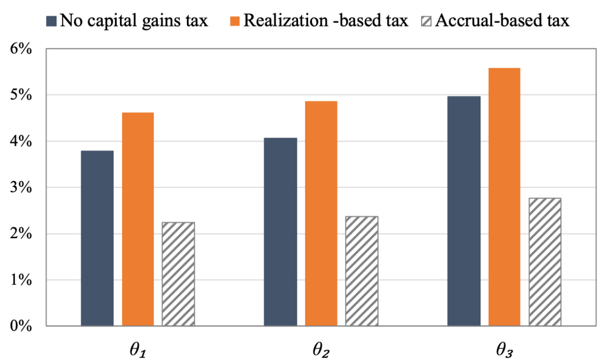
Misallocation. This section clarifies how firm entry and capital lock-in affect the allocation of labor and entrepreneurial talent. In the model, individual labor productivity y matters only for labor supply as a worker, while individual business-idea ability θ matters only for starting an entrepreneurial business. Therefore, the economy is more efficient when households with higher labor productivity are allocated to work and households with higher business-idea ability are allocated to entrepreneurship. Figure 9 reports the worker rate by labor productivity and the occupation rates for each type of entrepreneur by business-idea ability under the three tax regimes. Since these ability types evolve exogenously, their distributions are the same across tax regimes.



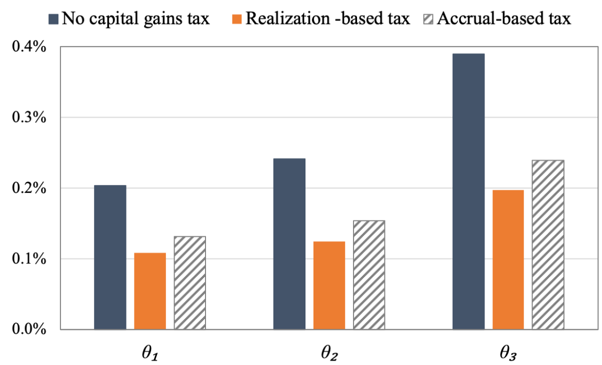
(a) Worker rate by labor productivity y



(b) Startup rate by business idea ability θ



(c) Manager rate by business idea ability θ



(d) Seller rate by business idea ability θ

Figure 9: Occupation rates by ability type

The first two panels relate to firm entry. In the no-capital-gains-tax case, the worker rate is higher for the two highest labor-productivity types than under the other tax regimes. In addition, individuals with the highest business-idea ability have a higher startup rate than under the other tax regimes. These patterns indicate that both labor productivity and entrepreneurial ability are relatively well allocated in the no-capital-gains-tax case.

By contrast, under accrual-based taxation, firm entry is discouraged because the policy lowers the after-tax payoff from successful entrepreneurship. In particular, individuals with high business-idea ability θ are less likely to start a business. This effect is especially important for households with lower levels of labor productivity y, who accumulate assets more slowly and therefore face tighter effective entry constraints. As a result, many of these households remain workers, and the worker rates for the lowest and second-lowest y types are substantially higher than under the other tax regimes. Thus, the entry-deterrence effect generates misallocation along both dimensions: entrepreneurial ability is less likely to be used for business creation, and lower-productivity workers remain in the labor market rather than entering entrepreneurship.

The last two panels, which report manager and seller rates, relate to capital lock-in. Since business-idea ability θ matters only for starting a business, it is more efficient for households with high θ to sell their existing businesses and potentially start new ones, rather than continue managing businesses whose productivity z evolves exogenously after entry. Consistent with this mechanism, the seller rate for the highest-θ type is higher in the no-capital-gains-tax case than under the other tax regimes.

Comparing the no-capital-gains-tax case with the realization-based tax case, the capital lock-in effect under realization-based taxation leads to higher manager rates for all business-idea-ability types. This indicates that entrepreneurial talent is locked into managing existing firms rather than being reallocated toward new firm creation. At the same time, the seller rate is lower for all θ types under realization-based taxation.

Switching to accrual-based taxation reduces this capital lock-in distortion. Relative to the realization-based tax case, the manager rate falls and the seller rate rises. Thus, accrual-based taxation mitigates the misallocation caused by capital lock-in.

Aggregate outcomes. This section examines which force dominates in the aggregate: the efficiency gain from reducing capital lock-in or the efficiency loss from discouraging firm entry. Table 5 summarizes the macroeconomic outcomes under accrual-based taxation relative to the realization-based regime. It also reports the no-capital-gains-tax case as a benchmark.

The results show that switching to accrual-based taxation reduces entrepreneurial production by 11 percent. This decline indicates that the entry-deterrence effect dominates the efficiency gain from reducing capital lock-in. Because the discouragement of firm entry leads more individuals to remain workers, labor supply increases by 1.3 percent. However, this increase in labor supply is not large enough to offset the decline in entrepreneurial production. Moreover, the decline in entrepreneurial production reduces capital demand, causing the equilibrium capital stock to fall. Together, the decline in entrepreneurial production and the fall in capital more than offset the increase in labor supply. Consequently, aggregate final-good production falls by 5.9 percent.

Policy	Y	Q	K_c	L_c	C
No capital gains tax	5.57	9.86	5.70	0.57	4.10
Accrual-based taxation	−5.94	−11.03	−9.32	1.25	−5.76

Table 5: Aggregate production outcomes relative to the realization-based tax regime (%)

Inequality and welfare. Table 6 reports the implications for inequality and welfare. The Gini coefficients for net worth, non-business assets, and consumption are highest under accrual-based taxation. This is because entry into high-earning entrepreneurial occupations becomes more difficult, so fewer individuals become entrepreneurs and accumulate capital. By contrast, under realization-based taxation, the Gini coefficients are lower because the lock-in effect keeps more entrepreneurs managing their businesses, leading more individuals to remain in the middle of the wealth distribution.

Overall, accrual-based taxation generates a consumption-equivalent welfare loss of 6.4 percent relative to realization-based taxation, reflecting both higher inequality and lower aggregate efficiency. In contrast, the no-capital-gains-tax case generates a welfare gain of 3.8 percent relative to realization-based taxation. Although inequality is higher than under the realization-based regime, more efficient production dominates this inequality effect and leads to higher welfare.

	Gini coefficient			Consumption-equivalent
Policy	Net worth	Non-business assets	Consumption	welfare
No capital gains tax	0.847	0.798	0.394	3.8%
Realization-based taxation	0.842	0.794	0.392	—
Accrual-based taxation	0.952	0.805	0.396	−6.4%

Notes: Consumption-equivalent welfare is measured relative to the realization-based regime.

Table 6: Inequality and Welfare

Table 7 reports consumption-equivalent welfare changes relative to the realization-based tax, separately by exogenous household characteristics: age, labor productivity, and business-idea ability. Switching to accrual-based taxation reduces welfare more for young households than for old households. This is because young households are more exposed to the firm-entry margin. Some young households who would have chosen high-earning entrepreneurial occupations under realization-based taxation no longer enter entrepreneurship when accrual-based taxation lowers the after-tax payoff from successful entry.

In terms of labor productivity, welfare losses are larger for low-productivity households than for high-productivity households. Low-productivity households have a lower comparative advantage in working and are therefore more likely to enter entrepreneurship. As a result, they are more exposed to the entry-deterrence effect of accrual-based taxation and experience larger welfare losses.

In terms of business-idea ability, households with high business-idea ability experience slightly larger welfare losses than those with low or medium ability. These households are more likely to become entrepreneurs and therefore bear a larger tax burden when business values are taxed on an accrual basis.

	Age		Working ability y			Business idea ability θ		
Policy	Young	Old	Low	Medium	High	Low	Medium	High
No capital gains tax	4.3	2.2	3.8	4.5	5.2	4.3	4.3	4.4
Accrual-based taxation	−7.2	−4.1	−10.8	−6.3	−5.1	−7.2	−7.2	−7.3

Notes: Consumption-equivalent welfare is measured relative to the realization-based regime.

Table 7: Consumption-equivalent welfare by exogenous state (%)

Tax revenue. Table 8 reports tax revenue and government spending relative to GDP under the three tax regimes. Because accrual-based and realization-based taxation mainly differ in the timing of capital-gains tax payments, tax revenue relative to GDP changes only modestly, especially when capital losses are fully reimbursed. However, under accrual-based taxation, a larger share of households choose retirement rather than entrepreneurship, which increases pension expenditures. As a result, residual government spending that balances the government budget falls. Thus, accrual-based taxation does not generate a government budget surplus in this economy.

	Tax revenue						
Policy	τ_c	τ_w	τ_k	τ_g	all	pension	G
No capital gains tax	4.72	11.84	5.48	0.00	22.04	6.94	15.10
Realization-based taxation	4.78	11.86	5.60	1.26	23.50	7.29	16.21
Accrual-based taxation	4.79	11.84	5.71	1.17	23.51	7.86	15.65

Table 8: Tax revenue and government spending (%GDP)

6.2 Hybrid regime of accrual-based taxation for the wealthy

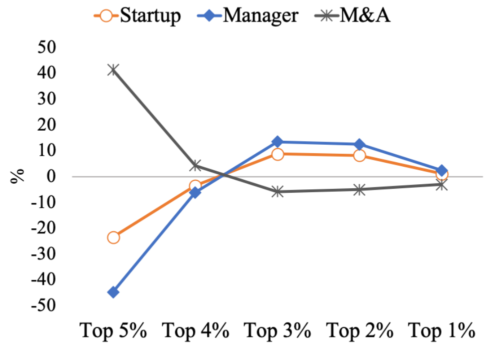
This subsection examines a hybrid tax regime in which accrual-based taxation applies only to wealthy households, while the rest of the population remains subject to realization-based taxation. Under this hybrid regime, once a household's net worth reaches the cutoff, its previously accumulated unrealized business gains become subject to accrual-based taxation. I consider several wealth cutoffs above which households are subject to accrual-based taxation.

The cutoff level is important because wealthy households differ from the rest of the population in two ways. First, they are more likely to be incumbent business-owning entrepreneurs. Therefore, applying accrual-based taxation only to wealthy households may generate a smaller firm-entry deterrence effect than applying it to the entire population. Second, because wealthy households are less financially constrained, they may be less likely to remain locked in solely to defer capital-gains taxes. As a result, the effect on reducing capital lock-in may also be limited. Hence, the production effects of hybrid accrual-based taxation depend on where the wealth cutoff is set.

In addition, the hybrid regime can affect entrepreneurship through general-equilibrium price effects. By reducing capital accumulation among wealthy households, the policy can lower the equilibrium wage. A lower wage reduces the opportunity cost of entrepreneurship for low-income households, making entry into entrepreneurship more attractive, as discussed in Brüggemann (2021). To examine these mechanisms, I first present the results for entrepreneurial production and then discuss the aggregate outcomes.

Intermediate goods production. Figure 10 shows how the populations of startups and managers, as well as the stock of firms operated by the M&A sector, change relative to the realization-based tax regime under different wealth cutoffs. The cutoffs correspond to the net-worth thresholds for the top 1 to 5 percent of households under the realization-based tax regime.

When the cutoff is above the top 4 percent wealth threshold, accrual-based taxation applies only to a small group of very wealthy households. These households are more likely to be incumbent entrepreneurs and are less financially constrained, so both the firm-entry deterrence effect and the reduction in capital lock-in are limited. Indeed, the populations of startups and managers do not fall below their levels under the realization-based tax, and the stock of M&A-operated firms does not rise.



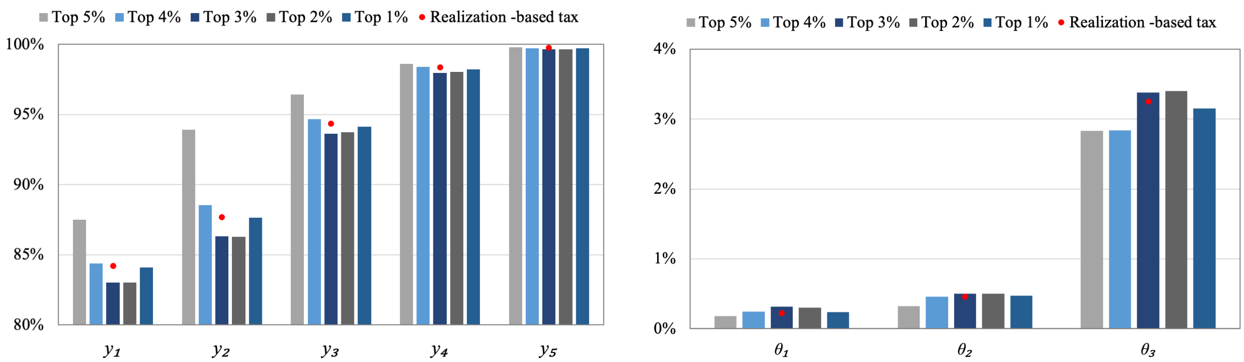
Notes: Entries are percentage changes relative to the realization-based tax regime.

Figure 10: Population by entrepreneurs and number of firms operated by M&A sector

By contrast, when the cutoff is below the top 4 percent wealth threshold and accrual-based taxation applies to a broader set of households, the main trade-off becomes more pronounced. The populations of startups and managers decline, and the stock of M&A-operated firms rises relative to the realization-based tax regime. The decline in startups reflects the firm-entry deterrence effect, while the decline in managers and the increase in M&A-operated firms indicate a reduction in capital lock-in. Thus, the cutoff level determines the relative strength of the entry-deterrence and lock-in-reduction channels.

Figure 11 reports the worker rate by labor productivity and the startup rate by business-idea ability under different wealth cutoffs. When the cutoff is below the top 4 percent wealth threshold, the pattern is similar to the economy-wide accrual-based tax case discussed in Figure 9: firm-entry deterrence reduces startup rates, especially among households with high business-idea ability.

By contrast, when the cutoff is above the top 4 percent wealth threshold, the firm-entry deterrence effect is limited. In this case, households with high business-idea ability start businesses at a higher rate than under the realization-based tax. This result reflects a general-equilibrium price effect. By reducing capital accumulation among wealthy households, the policy can lower the equilibrium wage. A lower wage reduces the opportunity cost of entrepreneurship for low-income households with high business-idea ability, making entry into entrepreneurship more attractive. As a result, households with low labor productivity who would otherwise remain workers under the realization-based tax enter entrepreneurship, and the worker rate for low-productivity households falls under these hybrid regimes.



(a) Worker rate by labor productivity y (b) Startup rate by business idea ability θ

Figure 11: Occupation rates by ability type

Figure 12 shows aggregate intermediate-goods production under hybrid accrual-based taxation relative to the realization-based tax regime. When the cutoff is below the top 4 percent wealth threshold, the efficiency loss from reduced firm entry outweighs the gain from reduced capital lock-in. As in the economy-wide accrual-based tax case, aggregate intermediate-goods production is therefore lower than under realization-based taxation.

By contrast, when the cutoff is above the top 4 percent wealth threshold, the general-equilibrium price effect becomes important. In this range, aggregate intermediate-goods production can be slightly higher than under realization-based taxation, with the largest increase of about 0.2 percent occurring at the top 2 percent cutoff.

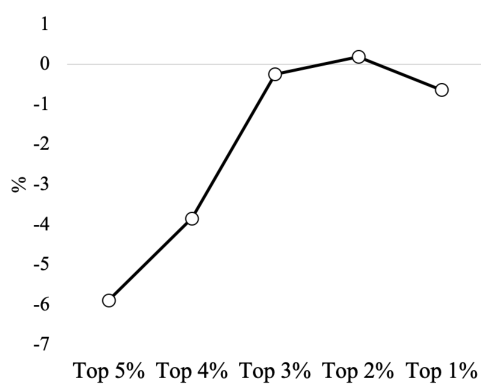
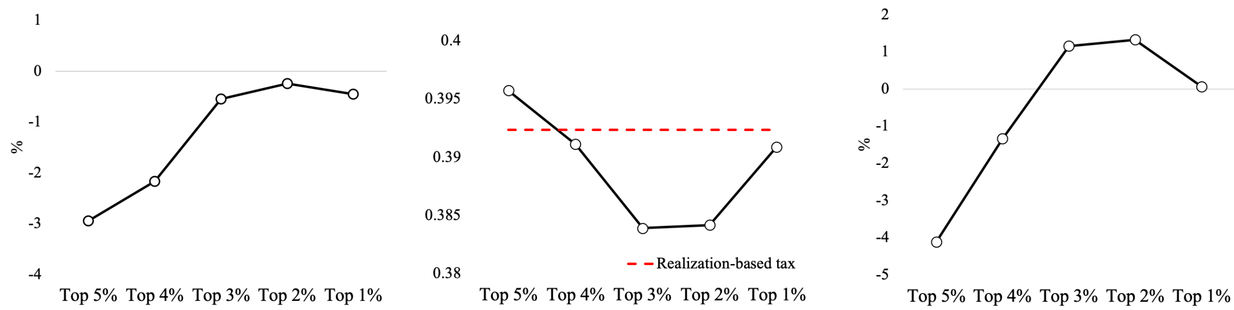


Figure 12: Intermediate good production under hybrid accrual-based taxation relative to realization-based tax

Final-good production and aggregate welfare. Figure 13 shows final-good production, the consumption Gini coefficient, and consumption-equivalent welfare under hybrid accrual-based taxation relative to the realization-based tax regime. Final-good production displays a hump-shaped pattern similar to that of aggregate intermediate-goods production. However, final-good production remains below its level under realization-based taxation for all cutoff levels.

By contrast, consumption inequality is lower than under realization-based taxation for most cutoff levels. This decline reflects the general-equilibrium price effect discussed above. The resulting reduction in inequality leads to a consumption-equivalent welfare gain, which reaches 1.3 percent at the top 2 percent cutoff.



(a) Final good production Y (b) Consumption Gini coeffcient (c) Consumption-equivalent welfare

Figure 13: Final good production and welfare under hybrid accrual-based taxation

Tax revenue. Finally, Table 9 reports tax revenue and government spending relative to GDP under the hybrid regimes, together with the realization-based tax regime as a benchmark. As in the economy-wide accrual-based tax case, accrual-based and realization-based taxation mainly differ in the timing of capital-gains tax payments. Therefore, tax revenue relative to GDP changes only modestly, especially because the model assumes that capital losses are fully reimbursed.

This result implies that, although very wealthy households hold a large amount of unrealized capital gains, taxing these gains on an accrual basis does not necessarily generate large additional tax revenue relative to GDP in the long run. If, as in some policy proposals, capital losses are instead carried forward to offset future tax liabilities, an important fiscal question is how much of the current tax revenue the government can use, given the risk that it may need to reimburse the tax if taxpayers do not have sufficient future gains against which to offset their capital losses.

Policy	Tax revenue τ_c	τ_w	τ_k	τ_g	all	pension	G
Realization-based taxation	4.78	11.86	5.60	1.26	23.50	7.29	16.21
Hybrid taxation with the wealth cutoff at							
Top 5 percent	4.75	11.83	5.68	1.18	23.45	7.60	15.85
Top 4 percent	4.81	11.87	5.70	1.23	23.62	7.46	16.15
Top 3 percent	4.80	11.43	5.68	1.26	23.57	7.29	16.27
Top 2 percent	4.80	11.83	5.66	1.26	23.56	7.28	16.28
Top 1 percent	4.80	11.86	5.62	1.25	23.53	7.32	16.21

Table 9: Tax revenue and government spending (%GDP)

7 Conclusion

This paper studies the macroeconomic and distributional consequences of replacing realization-based capital-gains taxation with an accrual-based alternative, focusing on capital gains from privately held businesses. The quantitative analysis shows that an economy-wide shift to accrual-based taxation can reduce aggregate production because the efficiency loss from firm-entry deterrence dominates the efficiency gain from reducing capital lock-in. However, a targeted reform that applies accrual-based taxation only to very wealthy households can dampen the entry-deterrence margin while reducing inequality, thereby generating welfare gains. These gains, however, are highly sensitive to the choice of the wealth cutoff.

References

Orazio P Attanasio, James Banks, Costas Meghir, and Guglielmo Weber. Humps and bumps in lifetime consumption. *Journal of Business & Economic Statistics*, 17(1):22–35, 1999.

Alan J. Auerbach. Retrospective capital gains taxation. *The American Economic Review*, 81(1): 167–178, March 1991.

Eduardo M Azevedo, Florian Scheuer, Kent Smetters, and Min Yang. Dilution vs. risk taking: Capital gains taxes and entrepreneurship. Technical report, National Bureau of Economic Research, 2025.

Laurent Bach, Laurent E Calvet, and Paolo Sodini. Rich pickings? risk, return, and skill in household wealth. *American Economic Review*, 110(9):2703–2747, 2020.

Jess Benhabib, Alberto Bisin, and Shenghao Zhu. The distribution of wealth and fiscal policy in economies with finitely lived agents. *Econometrica*, 79(1):123–157, 2011.

Anmol Bhandari, Paolo Martellini, and Ellen McGrattan. Capital reallocation and private firm dynamics. 2024.

Corina Boar and Virgiliu Midrigan. Should we tax capital income or wealth? *American Economic Review: Insights*, 5(2):259–274, 2023.

Bettina Brüggemann. Higher taxes at the top: The role of entrepreneurs. *American Economic Journal: Macroeconomics*, 13(3):1–36, 2021.

Bettina Brüggemann and Zachary L Mahone. Entrepreneurial rates of return and wealth inequality. *Review of Economic Dynamics*, 58:101298, 2025.

Marco Cagetti and Mariacristina De Nardi. Entrepreneurship, frictions, and wealth. *Journal of political Economy*, 114(5):835–870, 2006.

Marco Cagetti and Mariacristina De Nardi. Estate taxation, entrepreneurship, and wealth. *American Economic Review*, 99(1):85–111, 2009.

Jeffrey R Campbell and Mariacristina De Nardi. A conversation with 590 nascent entrepreneurs, working paper 2007-20. 2007.

VV Chari, Mikhail Golosov, and Aleh Tsyvinski. Business start-ups, the lock-in effect, and capital gains taxation. *Unpublished manuscript, Harvard University*, 2005.

Chris Edmond, Virgiliu Midrigan, and Daniel Yi Xu. How costly are markups? *Journal of Political Economy*, 131(7):1619–1675, 2023.

Andreas Fagereng, Martin Blomhoff Holm, Benjamin Moll, and Gisle Natvik. Saving behavior across the wealth distribution: The importance of capital gains. Technical report, National Bureau of Economic Research, 2019.

Andreas Fagereng, Luigi Guiso, Davide Malacrino, and Luigi Pistaferri. Heterogeneity and persistence in returns to wealth. *Econometrica*, 88(1):115–170, 2020.

Andreas Fagereng, Matthieu Gomez, Emilien Gouin-Bonenfant, Martin Holm, Benjamin Moll, and Gisle Natvik. Asset-price redistribution. 2024.

R Fairlie. National report on early-stage entrepreneurship in the united states: 2021 [kauffman indicators of entrepreneurship report]. kauffman foundation, 2022.

Michael D Giandrea and Shawn A Sprague. Estimating the us labor share. *Monthly Labor Review*, 2017.

Matthieu Gomez and Émilien Gouin-Bonenfant. Wealth inequality in a low rate environment. *Econometrica*, 92(1):201–246, 2024.

Fatih Guvenen, Gueorgui Kambourov, Burhan Kuruscu, Sergio Ocampo, and Daphne Chen. Use it or lose it: Efficiency and redistributional effects of wealth taxation. *The Quarterly Journal of Economics*, 138(2):835–894, 2023.

Sagiri Kitao. Entrepreneurship, taxation and capital investment. *Review of Economic Dynamics*, 11(1):44–69, 2008.

Cara McDaniel. Average tax rates on consumption, investment, labor and capital in the oecd 1950-2003. *Manuscript, Arizona State University*, 19602004, 2007.

Shinichi Nishiyama. *Measuring time preference and parental altruism*. Congressional Budget Office, 2000.

Vincenzo Quadrini. Entrepreneurship, saving, and social mobility. *Review of economic dynamics*, 3(1):1–40, 2000.

Jacob Robbins. Capital gains and the distribution of income in the united states. *cit. on*, page 54, 2018.

Shahar Rotberg and Joseph B Steinberg. Tax evasion and capital taxation. *Journal of Political Economy*, 132(7):2488–2529, 2024.

Emmanuel Saez, Danny Yagan, and Gabriel Zucman. Capital gains withholding. *University of California Berkeley*, 2021.

Florian Scheuer. Entrepreneurial taxation with endogenous entry. *American Economic Journal: Economic Policy*, 6(2):126–163, 2014.

Matthew Smith, Owen Zidar, and Eric Zwick. Top wealth in america: New estimates under heterogeneous returns. *The Quarterly Journal of Economics*, 138(1):515–573, 2023.

Kjetil Storesletten, Chris I Telmer, and Amir Yaron. Cyclical dynamics in idiosyncratic labor market risk. *Journal of political Economy*, 112(3):695–717, 2004.

Inês Xavier. Wealth inequality in the us: the role of heterogeneous returns. *Available at SSRN*, 3915439, 2021.

8 Appendix

A. Proof of Proposition 1.

Proof. Fix (w, r) and let $\beta \equiv (1+r)^{-1}$. In the baseline (no capital-gains tax) economy, the relevant value functions at $z = 0$ admit closed-form expressions.

Step 1: Closed-form value functions. The worker value is

$$V^w = \frac{w}{1-\beta}.$$

For a *start-and-sell* entrepreneur, the Bellman system implies

$$V^s(0,\theta) = \frac{\beta\theta\, p(\bar{z})}{(1-\beta)(1+\beta\theta)}.$$

For a *start-and-manage* entrepreneur, letting π_m^* denote optimal per-period operating profit, the Bellman system implies

$$V^m(0,\theta) = \frac{\beta\theta\, \pi_m^*}{(1-\beta)\big(1-\beta\nu+\beta\theta\big)}.$$

Both $V^s(0,\theta)$ and $V^m(0,\theta)$ are strictly increasing in θ, so the relevant cutoffs are uniquely pinned down by pairwise indifference conditions.

Step 2: Occupational cutoffs. Comparing $V^s(0,\theta)$ and V^w yields the worker–seller cutoff:

$$\begin{aligned} V^s(0,\theta) > V^w \iff \frac{\beta\theta\, p(\bar{z})}{(1-\beta)(1+\beta\theta)} > \frac{w}{1-\beta} \iff \frac{\beta\theta\, p(\bar{z})}{1+\beta\theta} > w \\ \iff \beta\theta\big(p(\bar{z}) - w\big) > w \iff \theta > \theta^{sw} \equiv \frac{w}{\beta\big(p(\bar{z}) - w\big)}. \end{aligned}$$

Comparing $V^m(0,\theta)$ and V^w yields the worker–manager cutoff:

$$\begin{aligned} V^m(0,\theta) > V^w \iff \frac{\beta\theta\, \pi_m^*}{(1-\beta)(1-\beta\nu+\beta\theta)} > \frac{w}{1-\beta} \iff \frac{\beta\theta\, \pi_m^*}{1-\beta\nu+\beta\theta} > w \\ \iff \beta\theta\big(\pi_m^* - w\big) > (1-\beta\nu)w \iff \theta > \theta^{mw} \equiv \frac{(1-\beta\nu)\, w}{\beta\big(\pi_m^* - w\big)}. \end{aligned}$$

Finally, comparing $V^s(0,\theta)$ and $V^m(0,\theta)$ yields the seller–manager cutoff:

$$\begin{aligned} V^s(0,\theta) > V^m(0,\theta) &\iff \frac{p(\bar{z})}{1+\beta\theta} > \frac{\pi_m^*}{1-\beta\nu+\beta\theta} \\ &\iff \beta\theta\big(p(\bar{z}) - \pi_m^*\big) > \pi_m^* - (1-\beta\nu)p(\bar{z}) \\ &\iff \theta > \theta^{sm} \equiv \frac{(1-\beta\nu)\, p(\bar{z}) - \pi_m^*}{\beta\big(\pi_m^* - p(\bar{z})\big)}. \end{aligned}$$

Step 3: Sufficient conditions for all three occupations to be active. To obtain the ordering

$$\theta < \theta^{mw} \;\Rightarrow\; \text{worker}, \qquad \theta^{mw} \le \theta < \theta^{sm} \;\Rightarrow\; \text{manager}, \qquad \theta \ge \theta^{sm} \;\Rightarrow\; \text{seller},$$

it suffices that (i) $\theta^{mw}, \theta^{sm} \in (0,1)$ and (ii) $\theta^{mw} < \theta^{sm}$.

First, $\theta^{mw} \leq 1$ is equivalent to

$$\frac{(1-\beta\nu)\, w}{\beta(\pi_m^* - w)} \leq 1 \quad \Longleftrightarrow \quad w \leq \frac{\beta}{1-\beta\nu+\beta}\,\pi_m^*,$$

and we also require $\pi_m^* > w$ so that the denominator is positive.

Second, to express θ^{sm} in terms of primitives, note that the bank's purchase price satisfies

$$p(\bar{z}) = \frac{\pi_b^*}{1-\beta\nu}, \qquad \pi_b^* = \lambda^{\frac{\mu}{1-\mu}}\pi_m^*,$$

so that $(1-\beta\nu)p(\bar{z}) = \lambda^{\frac{\mu}{1-\mu}}\pi_m^*$. Substituting into θ^{sm} yields

$$\theta^{sm} = \frac{(1-\beta\nu)\left(\lambda^{\frac{\mu}{1-\mu}} - 1\right)}{\beta\left(1-\beta\nu-\lambda^{\frac{\mu}{1-\mu}}\right)}.$$

Imposing $\theta^{sm} \leq 1$ is equivalent to the lower bound

$$\lambda^{\frac{\mu}{1-\mu}} \;\geq\; \frac{(1+\beta)(1-\beta\nu)}{1-\beta\nu+\beta}.$$

Third, the existence of a nonempty manager region requires $\theta^{mw} < \theta^{sm}$, which is equivalent to

$$\theta^{mw} < \theta^{sm} \quad \Longleftrightarrow \quad \beta\nu\, w < \pi_m^*\left(1-\lambda^{\frac{\mu}{1-\mu}}\right) \quad \Longleftrightarrow \quad \lambda^{\frac{\mu}{1-\mu}} \;<\; 1-\frac{\beta\nu\, w}{\pi_m^*}.$$

(Under the same condition one can also verify $\theta^{mw} < \theta^{sw}$, so sellers do not appear below the worker–manager cutoff.)

Combining these inequalities delivers the sufficient conditions stated in Proposition 1. □

B. Proof of Proposition 2.

Proof. Under a realization-based capital-gains tax at rate τ, the seller receives the after-tax sale price $(1-\tau)p(\bar{z})$, so the seller–manager cutoff becomes

$$\theta^{sm}_{\text{real}} = \frac{(1-\beta\nu)(1-\tau)p(\bar{z}) - \pi_m^*}{\beta\big(\pi_m^* - (1-\tau)p(\bar{z})\big)}.$$

Using $(1-\beta\nu)p(\bar{z}) = \lambda^{\frac{\mu}{1-\mu}}\pi_m^*$, define $\kappa \equiv \lambda^{\frac{\mu}{1-\mu}}$ and rewrite

$$\theta^{sm}_{\text{real}} = \frac{(1-\beta\nu)\big((1-\tau)\kappa - 1\big)}{\beta\big((1-\beta\nu) - (1-\tau)\kappa\big)}, \qquad \theta^{sm} = \frac{(1-\beta\nu)(\kappa - 1)}{\beta\big((1-\beta\nu) - \kappa\big)}.$$

A direct comparison yields

$$\theta^{sm}_{\text{real}} - \theta^{sm} = \frac{(1-\beta\nu)\,\kappa\,\nu\,\tau}{\big((1-\beta\nu) - (1-\tau)\kappa\big)\big((1-\beta\nu) - \kappa\big)}.$$

Under the maintained assumption that τ is small enough that all three occupations remain active, we have $\kappa > 1-\beta\nu$ and $(1-\tau)\kappa > 1-\beta\nu$, implying

$$(1-\beta\nu) - \kappa < 0 \quad \text{and} \quad (1-\beta\nu) - (1-\tau)\kappa < 0.$$

Hence the denominator is positive, while the numerator is strictly positive for $\tau > 0$. Therefore,

$$\theta^{sm}_{\text{real}} - \theta^{sm} > 0,$$

which proves Proposition 2. □

C. Proof of Proposition 3.

Proof. As in the main text, let $\kappa \equiv \lambda^{\frac{\mu}{1-\mu}}$ and use $(1-\beta\nu)p(\bar{z}) = \kappa\,\pi_m^*$. Under accrual taxation at rate τ, the seller–manager cutoff can be written as

$$\theta^{sm}_{\text{accrual}} = \frac{\kappa\big((1-\beta\nu) - \beta\tau(1-\nu)\big) - (1-\beta\nu)}{\beta\big((1-\beta\nu) - (1-\beta\tau)\kappa\big)}.$$

Step 1: $\theta^{sm}_{\text{accrual}} > \theta^{sm}$. A direct comparison yields

$$\theta^{sm}_{\text{accrual}} - \theta^{sm} = \frac{\nu\,\tau\,\kappa\Big[(1-\beta\nu) - (1-\beta)\kappa\Big]}{\big((1-\beta\nu) - (1-\beta\tau)\kappa\big)\big((1-\beta\nu) - \kappa\big)}.$$

Under the parameter restrictions for the three-occupation case, $\kappa > 1-\beta\nu$, so both denominator terms are negative for sufficiently small τ, and their product is positive. The numerator is positive for $\tau > 0$ under the same restrictions. Hence

$$\theta^{sm}_{\text{accrual}} - \theta^{sm} > 0.$$

Step 2: $\theta^{sm}_{\text{accrual}} < \theta^{sm}_{\text{real}}$. Comparing the accrual and realization cutoffs yields

$$\theta^{sm}_{\text{accrual}} - \theta^{sm}_{\text{real}} = -\frac{\nu\,\tau\,(1-\tau)\,(1-\beta)\,\kappa^2}{\big((1-\beta\nu)-(1-\beta\tau)\kappa\big)\big((1-\beta\nu)-(1-\tau)\kappa\big)} \;<\; 0,$$

again using that the denominator is positive for sufficiently small τ in the region where all three occupations remain active.

Combining Steps 1 and 2 delivers

$$\theta^{sm}_{\text{real}} > \theta^{sm}_{\text{accrual}} > \theta^{sm}.$$

Step 3: $\theta^{mw}_{\text{accrual}} > \theta^{mw}$. In the main text,

$$\theta^{mw} = \frac{(1-\beta\nu)\,w}{\beta(\pi^*_m - w)}, \qquad \theta^{mw}_{\text{accrual}} = \frac{(1-\beta\nu)\,w}{\beta\big(\pi^*_m - w - (1-\beta)\tau p(\bar{z})\big)}.$$

Since $(1-\beta)\tau p(\bar{z}) > 0$, the denominator of $\theta^{mw}_{\text{accrual}}$ is strictly smaller than that of θ^{mw} (and is positive for sufficiently small τ), implying

$$\theta^{mw}_{\text{accrual}} > \theta^{mw}.$$

Finally, under realization-based taxation the worker–manager cutoff is unchanged, so $\theta^{mw}_{\text{real}} = \theta^{mw}$, completing the proof. □