Business Taxes, Management Delegation, and Growth*

Maurizio Iacopetta
SKEMA Business School and Sciences Po, Paris
and
Pietro F. Peretto
Duke University

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Abstract

We investigate the interplay between agency issues and business taxation within a model showcasing an endogenous market structure. Consistent with cross-country evidence, our analysis yields equilibria that vary in terms of shareholders' reliance on professional managers. We calibrate the model to the US economy. In the short run, a reduction in profit tax fosters growth to a greater extent in an economy with management delegation. However, in the long run, such a tax cut hampers growth. Conversely, an investor protection reform boosts growth both in the short and long terms. We also study the welfare effects of these reforms.

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E-mail address: maurizio.iacopetta@skema.edu.

1 Introduction

Several countries have lowered tax rates on the dividend and profit income in recent years.[1] Supporters argue that such reductions are "pro-growth" because they boost firm investment and stimulate business dynamism. Critics worry about their redistributive effects because different occupations earn income in different forms: wages and returns on savings for workers versus compensation tied to profits, dividends and capital gains for management-related positions. In pursuit of the same objective of reviving firm creation and increasing the productivity of existing firms, a number of middle and high-income countries have also passed legislation aimed at strengthening investor protection and promoting good governance (OECD 2022).[2] The macroeconomic debate on these issues is naturally very intense. However, it largely neglects the microeconomic details of how firms make decisions and of how industry evolves as the result of such decisions. This neglect can cause analysts to miss important forces and thus misdiagnose the main issues. Recent work argues that the response of investment to business taxation depends on the conflict between managers and shareholders within firms (Desai et al. 2007, Chetty and Saez 2010, Fulghieri and Suominen 2012). It has also been observed that the consequences of changes in the legal framework aimed at reducing agency issues are best understood when the analysis includes the dynamics of the industry (Jensen 1993; Holmtröm and Klapan 2001).

An economy that discourages delegation reflects unfavorable conditions. Figure 1 illustrates a strong correlation between reliance on professional management and the strength of property rights and intellectual property rights. This suggests that in countries with

[1] An OECD study found that 78 out of the 96 countries surveyed reduced the statutory corporate tax rates between 2000 and 2018, for an average reduction of 7.5 percentage points (OECD 2019). Similarly, Gechert and Heimberger (2022) document that the world average of statutory corporate tax rates declined about 15 percentage points from 1982 to 2019, going from 41% to 26% (see their Figure 1).

[2] Japan, for instance, has recently reformed its commercial law with an explicit objective of stimulating business dynamism and revive economic growth (Shankar, 2023). Mr. Kishida, the current Prime Minister of Japan, emphasized the importance of corporate governance reform in his speech at the New York Stock Exchange on September 22, 2022. He stated, "One very important policy is corporate governance reform. We will accelerate and further strengthen corporate governance reforms in Japan, such as establishing a forum in the near future to hear from investors from around the world." (See: https://www.fsa.go.jp/en/refer/councils/japan_corporate_governance_forum/jfsa_presentation.pdf)

low-quality institutions that hinder the establishment of robust and enforceable contractual ties, founding entrepreneurs are more inclined to retain full control of the firm. Delegation is profit-driven decision guided by specific costs and benefits. Insufficient legal protection prevent the delegation of tasks by firm owners, significantly limiting the firm's potential for expansion and innovative investments (Akcigit, Harun and Peters 2021). More generally, logic and evidence suggest that business taxation and firm governance interact, possibly in subtle ways. These considerations raise several questions. Do the macroeconomic effects of business taxation depend on management delegation and on the severity of agency issues? How different are the macroeconomic responses of a business reform compared to those of an investor protection reform?

In this paper, we address these questions in a Schumpeterian model of endogenous growth with endogenous market structure. Productivity growth is driven by entry of new firms that expands the variety of products and by investment of incumbent firms in the improvement of the quality of their products. We extend the model in two ways. First, we introduce a crucial insight from corporate governance theory: agency issues between owners and managers. In our set up, these issues result in dynamic inefficiency because they depress investments and hamper new firm entry into the market. Second, we endogenize the founder's decision about management delegation. While the founder of the firm can sidestep agency issues by retaining full managerial control of the firm, doing so penalizes the firm productivity and its growth. The way the delegation decision and the agency issues are addressed has aggregate consequences. Ultimately, consumer welfare depends on the internal organization of the firm and the severity of governance issues they face. In our analysis, the government can influences aggregate productivity through its power of taxation and in a more subtle way through the rule of law. The stimulus effect of a corporate tax cut materializes in the short run through the creation of new firms and the expansion of investments of existing firms. An economy with more qualified management responds more strongly in terms of both industry dynamics and investments of incumbent firms. Over time, however, firms motivation to invest weakens as a result of the profit tax cut, as the market share becomes smaller. This causes income growth to decline, especially in the economy with poor rule of law.[3] Calibrating the baseline delegation model on USA data, we find that a 10% cut in the profit tax rate boosts the entry rate and the rate of investment of incumbent firms in the near term by 0.47% and 0.65%, respectively, and increases the growth rate of wages by 0.77%. Conversely, in the long run, the growth rate of wages and income decreases by 0.54%. A similar tax reform implemented in an economy with a lower quality of governance, or in an economy with no delegation, generates smaller short run growth gains and larger long run growth losses.

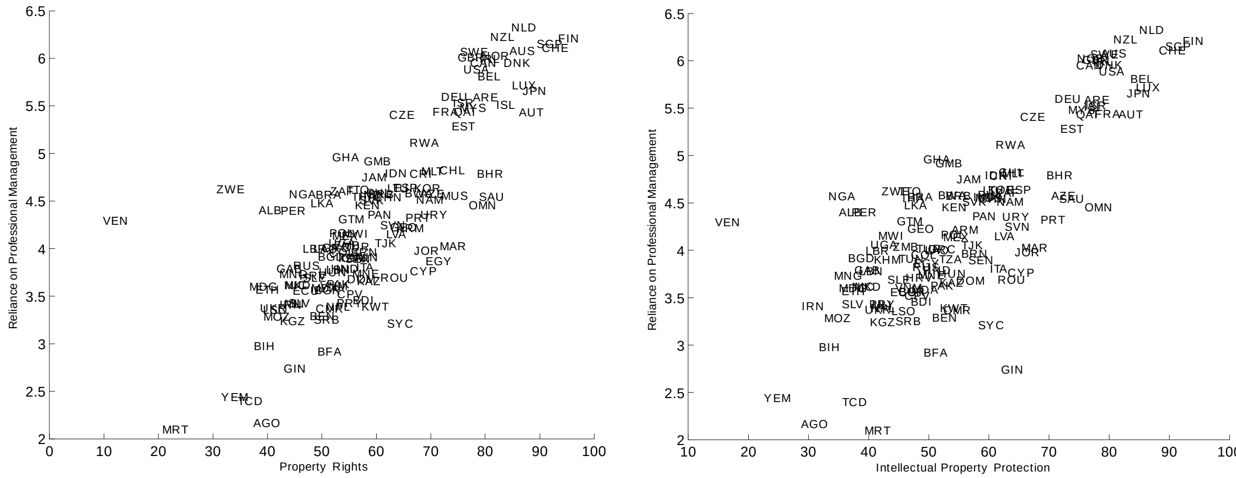
The effects of a reform that ameliorates the investor protection are quite different from those of a corporate tax cut. An investor reform has a relatively stronger effect on product quality growth, whereas a corporate tax reform is more powerful in boosting business dynamics. Consequently, the industry adjustment to the two reforms differs significantly. With a rule of law reform the average firm size expands, whereas with the corporate tax cut it shrinks. The long run income growth also moves in opposite directions: It goes down with a profit tax reduction and up in the case of the enhancement of the rule of law. Our welfare analysis indicates an investor protection reform is more beneficial at any time horizon than one that reduces the profit tax rate.

As mentioned, critics of tax cuts stress their redistributive consequences, highlighting that different groups in society earn different forms of income. Conversely, the amelioration of corporate governance is believed to level the playing field. To investigate these issues, we model managers as members of the representative households who are randomly selected by firms when they delegate. To keep things simple, we assume that managers remain in the workforce, earning wages, and perform their managerial duties as an additional activity. In this context, an improvement in governance lowers the ratio of the managers' surplus extracted from the firm and aggregate consumption. Similarly, and perhaps more surprisingly, we find that a profit tax cut in our calibrated economy reduces the inequality ratio. Indeed, when the profit tax rate is low, managers extract fewer resources because the firm size is relatively smaller.

[3]The model is scale-invariant, meaning that the size of the economy does not affect long-run growth because product proliferation fragments the economy into sub-markets in which firm size does not grow with the size of the economy. For a recent excellent review of the debate on scale effects in economic theory see Bond-Smith (2019).

Figure 1: Property Rights and Professional Management

Panel A: Property Rights Panel B: Intellectual Property Protection



–Note. Authors' elaboration based on data from worldbank.org. Variables: 41645 (property rights), 41646 (intellectual property protection), and 42700 (reliance on professional management). Correlation coefficients: 0.8 (panel A) and 0.79 (panel B).

This paper contributes to the rapidly expanding literature that considers the firm agency problem as an essential element for the microfoundation of macroeconomic models. Dessein and Prat (2022), study how the quality of governance affects the steady state of the economy. They argue that informational asymmetry about the quality of managers can lead shareholders to hire managers that follow short-term strategies and fail to develop the firm's organization capital. Within the framework of creative-destruction models, Terry (2023) and Celik and Tian (2022) show that managers are reluctant to invest in firm knowledge due to financial market pressure on CEOs to meet near-term earning targets. In an empirical study, Gutierrez and Philippon (2016) find that firms underinvest relative to the Tobin's Q partly because of poor governance. Similar to Dessein and Prat (2002), we introduce a standard agency problem, following the rent extraction approach of corporate finance (see Edmans and Gabaix 2016 for a literature review). In departure from these contributions, our work emphasizes the role of industry dynamics in explaining the macroeconomic adjustment that ensue a change in the firm's governance or corporate taxation. As Akcigit, Harun, and Peters (2021), Iacopetta and Peretto (2021) Grobovšek (2020), Iacopetta et al. (2019), Bandiera et al. (2018), and Bloom and Van Reenen (2007), this work is also motivated by cross-country evidence on productivity and professional management.

This paper also relates to the literature on taxation and growth. Peretto (2007) studies the long-run effects of business taxation in a Schumpeterian economy. More recently Ferraro, Ghazi and Peretto (2020, 2022) use that framework to investigate quantitatively the effects of tax policy and the special role of labor income taxes, respectively. In a growth model with labor-saving innovation Gersbach, Schetter and Schneider (2018) argue that the positive difference between the tax rate on labor income and the tax rate on profit income favors entrepreneurship and innovation but depresses wages. Sedlacek and Sterk (2019) find that corporate tax reforms, such as that of the 2017 Tax Cuts and Job Act, can generate productivity gains through industry restructuring. Akcigit and Stantcheva (2020), Gechert and Heimberger (2022) and Suzuki (2022) review recent theoretical and empirical insights on how taxation can affect the rate and direction of innovation.

Our work also relates to studies of interaction between governance and taxation. Schizer (2018) reviews the multiple channels through which they affect one another. Chetty and Saez (2010) argue that the agency issues that arises with the separation of ownership and control should change how we think about business taxation because it tempts managers to divert the firm's resources to unproductive uses. Desai, Dyck and Zingales (2007) note, however, that taxation can serve as a discipline device that mitigates the managers' diversion of resources. Our model sheds light on this debate. Finally, because some results are sensitive to the size of the R&D tax deductions, this paper adds to the ongoing debate on the growth effects of R&D subsidies (see, e.g., Chu and Cozzi 2018; Impullitti 2010).

The rest of the paper unfolds as follows. Section 2 lays out the basic model with business taxation. Section 3 presents the complete model with management delegation and analyzes the interaction of taxation with agency issues. Section 4 characterizes the general equilibrium of economies with different degrees of management delegation. Section 5 briefly discusses the analytical solution of the steady state equilibrium and the equilibrium dynamics. Section 6 calibrates the model to the USA economy. Section 7 compares, from a quantitative perspective, the effects of two policy experiments: a corporate tax reduction and an improvement of investor protection. The welfare analysis of these experiments is in Section 8. Section 9 concludes the paper. Technical proofs and details on analytical derivations are collected in the online Appendix.

2 The Basic Model

We begin with a brief description of the environment with business taxes but no management delegation. The next section expands it to allow for delegation in production and in R&D activities. The model has the following structure. Time is continuous and runs forever. All variables are functions of time, but we omit the time argument unless necessary to avoid confusion. There exists a homogeneous final good which serves as our numeraire. This good is consumed and used as input for the production of intermediate goods. It is also used for the accumulation of knowledge by incumbent intermediate firms and the foundation of new intermediate firms. A representative competitive firm produces the final good by employing labor and a variety of differentiated non-durable intermediate goods whose quality improves over time as intermediate firms accumulate knowledge in-house. In what follows, we will detail the technology of the final and intermediate goods sectors, the firms' decisions about in-house investments, and the households' consumption-saving decisions, as well as the decision to create new firms.

2.1 Final Good Production

A competitive representative firm produces the final good with the technology

$$Y = \int_0^N X_i^\theta \left(\frac{Q_i L}{N^{1-\epsilon}} \right)^{1-\theta} di, \quad 0 < \theta, \ 0 \leq \epsilon < 1 \tag{1}$$

where N is the mass of non-durable intermediate goods, X_i is the quantity of good i, and L is the flow of labor services, which in equilibrium equals the mass of workers since labor supply is inelastic (see below). The parameter ϵ measures love of variety and θ represents the elasticity of output to intermediate use. The quality of intermediate good i, Q_i, is the good's ability to augment labor in Solovian fashion.

Let p_i be the price of good i and w be the wage. The final producer's profit maximization yields the input demand functions:

$$X_i = (\frac{\theta}{p_i})^{\frac{1}{1-\theta}} \frac{Q_i L}{N^{1-\epsilon}}; \tag{2}$$

$$L = (1-\theta)\frac{Y}{w}. \tag{3}$$

This demand system yields that a fraction θ of final output goes to intermediate good producers, i.e., $\int_0^N p_i X_i di = \theta Y$, and the remaining fraction, $1-\theta$, to workers.

2.2 Intermediate Firms

An intermediate firm i transforms one unit of final good into one unit of its intermediate good. The quality of the good is

$$Q_i = Z_i^{\alpha} Z^{1-\alpha}, \quad \alpha < 1 \tag{4}$$

where Z_i is the firm's stock of knowledge and $Z = \left(\int_0^N Z_i di\right)/N$ is average knowledge. Production also requires a fixed operating cost ϕQ_i in units of the final good. The firm accumulates knowledge according to the technology

$$\dot{Z}_i = I_i, \tag{5}$$

where I_i is investment in units of the final good. The creation of a new firm requires payment of a sunk entry cost χX in units of the final good, where $X = \left(\int_0^N X_i di\right)/N$ is the average firm output.

The model's core mechanism is that a firm can shift its demand curve to the right by raising the quality of the good it sells. This increases profitability since, anticipating one of the properties of the firm's value-maximizing plan, our demand system (2) yields that the firm charges a constant markup over the marginal cost of production. Therefore, profitability is proportional to the volume of sales. In Section (3) we add a new mechanism to this standard setup, where the firm's founder can improve the firm's use of resources in the factory and/or the lab by hiring agents with better managerial skills than her own. Such delegation, however, introduces agency issues. In this section the founder manages production and investment directly. We refer to her as founder-manager to highlight the difference with the founder of section (3), where she delegates activities to other agents. The firm's pre-tax profit is

$$\Pi_i = (p_i - 1) X_i - \phi Q_i. \tag{6}$$

The firm's distributed dividend, D_i, is the difference between after-tax profit and the firm's investment expenditure, I_i, net of tax credits:

$$D_i = \Pi_i (1 - \tau_\Pi) - (1 - \sigma_I \tau_\Pi) I_i, \tag{7}$$

where τ_Π is the flat tax rate on profit income, and σ_I is the share of investment expenditure that the tax law allows the firm to deduct from its taxable profit income. Dividend income is subject to a flat tax rate τ_D. Anticipating an equilibrium property (see section 4), $D_i > 0$, firms finance investment with retained earnings and therefore there is no issuing of new shares.[4] Without loss of generality, we normalize the number of equity per firm to one.

The founder-manager maximizes the value of the firm

$$V_i(t) = \int_t^\infty e^{-\int_t^v r(s) ds} (1 - \tau_D) D_i(v) dv, \tag{8}$$

subject to the demand schedule (2), the R&D technology (5), and the definitions of profit (6) and of dividend (7). Time derivative of (8) yields

$$r = (1 - \tau_D) \frac{D}{V} + \frac{\dot{V}}{V}. \tag{9}$$

The value-maximizing price is the monopolistic price $p_i = \frac{1}{\theta}$. The value-maximizing investment plan equates the return, net of taxes and of the R&D rebate, to the firm's internal asset, the firm's stock of knowledge, to the return to an outside asset (i.e., the market interest rate):

$$r = \frac{1 - \tau_\Pi}{1 - \sigma_I \tau_\Pi} \alpha \frac{\Pi_i}{Z_i}. \tag{10}$$

The dividend tax, τ_D, is notably absent from this expression because, as long as τ_D is constant over time, any amount of profit not distributed today to shareholders and reinvested in the firm generates a flow of profit and a corresponding stream of future tax liabilities that

[4] As it is well known from the debate between the Old and New views of corporate finance, if dividends are taxed, the cash-rich firm that wants to minimize the shareholders' tax bill does not finance investment with new equity.

are equivalent, in present value, to the dividend tax paid today. If $\sigma_I = 1$, the profit tax is equivalent to a dividend tax and the firm's marginal gross profit $\alpha \frac{\Pi_i}{Z_i}$ equals the interest rate, r. If $\sigma_I < 1$, however, τ_Π distorts the firm's investment decision: for given interest rate, r, the firm accumulates a smaller stock of knowledge ($\alpha \frac{\Pi_i}{Z_i}$ is decreasing in Z_i).

Entry. The new firm starts operations with a knowledge stock equal to the industry average, Z. The entry cost includes not only R&D expenditures that the founder has incurred for the development of a new product but also encompasses set-up costs, including incorporation expenses. That part of the entry cost accounted for by R&D expenditures can sometimes be used to lower the newly created firm's profit taxes. Thus, the tax-adjusted entry cost is $(1-\sigma_X \tau_\Pi)\chi X$. As intermediate firms operate under Bertrand competition, the entry sunk cost implies that the entrant introduces a new good rather than competing with an existing producer. Accordingly, only one firm operates in each product line (equivalently, industry).

2.3 Households

The representative household consists of L identical individuals whose mass grows at a constant rate $\lambda \geq 0$. The initial mass is $L(0) = 1$. The household has preferences

$$U(0) = \int_0^\infty e^{-(\rho-\lambda)t} \log\left(\frac{C(t)}{L(t)}\right) dt, \quad \rho > \lambda \tag{11}$$

where ρ is the intertemporal discount rate and C is the household's consumption. The household faces the flow budget constraint (to keep the notation simple we anticipate the property that the equilibrium of the intermediate sector is symmetric)

$$N\dot{V} = (1-\tau_D) D + wL + H - C \tag{12}$$

where N is the mass of firms, D is the dividend distributed by each firm, $\dot{V}$ is the appreciation of each firm's value, w is the wage and H is a lump-sum transfer from the government.[5]

[5] For simplicity we assume no taxation of capital gains, labor income and consumption. Allowing for such taxation does not change our qualitative results and distracts from our intended focus on business income taxation and its interaction with the agency frictions due to delegation of managerial control.

This setup with no disutility of work yields that the household supplies its entire labor endowment, L, and saves according to

$$r = \rho + \frac{\dot{C}}{C} - \lambda = (1 - \tau_D)\,\frac{D}{V} + \frac{\dot{V}}{V}. \tag{13}$$

This Euler equation defines the after-tax, reservation rate of return to saving that enters the evaluation of corporate equity in (8) discussed above. The household's consumption plan must also satisfy the usual boundary conditions.

3 The Environment with Delegation

A large literature views delegation as a strategy to achieve better outcomes by assigning decision rights to better informed or more able parties (Alonso and Matouschek 2008; Marin and Verdier 2008; Tirole 2010). We consider delegation of two managerial functions: production organization and in-house innovation. The agents in charge of these functions are the production manager and the R&D manager, respectively, and for clarity of exposition we consider them different individuals. In the environment with delegation the final good sector is the same as the previous section. The organization of the firm, however, is more articulated. As in our prior works (Iacopetta et al. 2019, Iacopetta and Peretto, 2021), we introduce governance frictions using the "rent extraction" approach of corporate finance that sees the misalignment of interests between managers and shareholders as diversion of the firm's resources (see Edmans and Gabaix 2016 for a literature review).

3.1 Agent-managers

For a given stock of knowledge Z_i and Z, the production manager delivers an intermediate good of higher quality than that obtained under the owner-manager by a factor $\gamma_X > 1$, namely,

$$Q_i = \gamma_X (Z_i)^{\alpha} (Z)^{1-\alpha}. \tag{14}$$

Similarly, the R&D manager delivers $\gamma_I > 1$ units of new knowledge per unit of final good actually invested in R&D – that is, net of diversion. While delegation improves the firm's use of resources in production and innovation, it introduces agency problems because the managers' objectives diverge from the founder's. Following a common approach in corporate finance, we model the resulting conflict as the managers' diversion of the firm's resources to private benefits. Diversion captures a vast range of actions that damage shareholders: from tunneling, to undersupply of effort, to spending on pet projects (Edmans and Gabaix 2016). The founder uses incentive contracts to mitigate diversion, and the overall agency cost of delegation is the sum of the contractual (compensation) and non-contractual (diversion) flow of the firm's resources that managers capture. Thus, as in Celik and Tian (2022), firms, by adopting incentivizing contracts, improve their corporate governance and their propensity to innovate.

3.1.1 The Production Manager

The demand curve and the profit functions are the same as those of the no delegation economy reported in (2) and (6). Because in our setup agency frictions do not distort the manager's price decision, the monopolistic price is still $p_i = \frac{1}{\theta}$ as in the no delegation economy.

The manager can divert a share d_{X_i} of the firm's profit, Π_i, incurring a utility cost of $f(d_{X_i})\Pi_i$, where $f'(d_{X_i}) > 0$, $f''(d_{X_i}) > 0$. The cost measures the monetary and non-monetary sanctions, legal or otherwise, that the manager faces. In an environment with a strong rule of law, the cost parameter β_X is relatively high. To mitigate diversion, the founder offers a contract that features a flat wage, that we normalize to zero, and a compensation, b_{X_i}, proportional to the post-diversion firm's profit, $(1-d_{X_i})\Pi_i$. Accordingly, the manager's utility is

$$u_{X_i} = [(1-\tau_b)(1-d_{X_i})b_{X_i} + d_{X_i} - f(d_{X_i})]\,\Pi_i, \tag{15}$$

where τ_b is the tax rate on executive compensation. The utility-maximizing diversion rate solves the marginal condition $1 = f'(d_{X_i}) + (1-\tau_b)b_{X_i}$. The last term in this expression aligns the manager's interest to the owner's. The marginal condition gives us an implicit function. We thus characterize the manager's behavior as

$$d_{X_i} = d_X\left(b_{X_i}; \tau_b, \beta_X\right) \equiv \underset{d_{X_i}}{\arg\text{solve}} \left\{1 = f'(d_{X_i}) + (1-\tau_b)b_{X_i}\right\}. \tag{16}$$

Since $f''(d_{X_i}) > 0$, the manager's diversion is decreasing in b_{X_i} and increasing in τ_b. The last effect is important in our context: for given compensation, the tax induces the manager to divert more.

As with the no delegation case, under delegation the founder sunks an entry cost $(1-\sigma_X\tau_\Pi)\tilde{\chi}X$ where X is the average firm output $X=\left(\int_0^N X_i di\right)/N$. The parameter $\tilde{\chi}$ is smaller by a factor γ_X relative to the no delegation case χ/γ_X. This captures the idea that the production manager's skills help also reduce the entry cost. As it will be clarified in section (4) the average X in an equilibrium with production delegation is larger than in economy where the founder is in charge of production by a factor of γ_X. Therefore, firms sunk the same amount of resources in the two environments when entering the market.

3.1.2 The R&D Manager

We leave the determination of the firm's investment plan in the hands of the founder, who earmarks a flow of funds, I_i, to knowledge accumulation. The R&D manager diverts a share d_{I_i} of it to private consumption at utility cost $\hat{f}(d_{I_i})I_i$, with $\hat{f}'(d_{I_i})>0$, and $\hat{f}''(d_{I_i})>0$. Therefore, knowledge accumulation is

$$\dot{Z}_i=\gamma_I\left(1-d_{I_i}\right)I_i. \tag{17}$$

In this case as well, the founder offers an incentive contract to mitigate diversion. In addition to a flat wage, normalized to zero, the contract features compensation proportional to the flow of new knowledge $b_{I_i}\dot{Z}_i$. With such a contract, the R&D manager's utility flow is

$$u_{I_i}=\left[(1-\tau_b)\gamma_I(1-d_{I_i})b_{I_i}+d_{I_i}-\hat{f}(d_{I_i})\right]I_i. \tag{18}$$

The utility-maximizing diversion rate satisfies the marginal condition $1=\hat{f}'(d_{I_i})+(1-\tau_b)\gamma_I b_{I_i}$, which says that the diversion cost is not only the effort but also the forgone fraction of the contractual compensation. We characterize the manager's behavior as

$$d_{I_i}=d_I\left(b_{I_i};\tau_b,\gamma_I\right)\equiv\underset{d_{I_i}}{\arg\text{solve}}\left\{1=\hat{f}'(d_{I_i})+(1-\tau_b)\gamma_I b_{I_i}\right\}. \tag{19}$$

Since $\hat{f}''(d_{I_i})>0$, diversion is decreasing in compensation b_{I_i} and in the efficiency parameter γ_I, and increasing in the tax rate τ_b.

3.2 The Founder

The founder establishes the firm and then decides whether to hire managers and what compensation to offer. As already observed, the monopolistic price is the same regardless of whether the founder or the production manager sets it. The founder's other main decision is to set the path of investment. Because employees bonuses are typically deductible from business profits, the before-tax dividend is

$$D_i = (1-\tau_\Pi)\left[(1-d_{X_i}(b_{X_i};\cdot))(1-b_{X_i})\right]\Pi_i - (1-\sigma_I\tau_\Pi)I_i - (1-\tau_\Pi)b_{I_i}\gamma_I\left[1-d_{I_i}(b_{I_i};\cdot)\right]I_i. \tag{20}$$

The founder maximizes the present discounted of after-tax dividends in (8), subject to the demand schedule (2), the R&D technology (17), the definitions of profit (6) and of dividend (20), and the managers' best response functions (16) and (19).

The interior solution for b_{X_i} must satisfy

$$1-d_{X_i} = -(1-b_{X_i})\frac{\partial d_X(b_{X_i};\tau_b)}{\partial b_{X_i}}. \tag{21}$$

This condition states that the founder's marginal cost of incentivizing the manager, $1-d_{X_i}$, is equal to the marginal gain generated by the reduction of diversion, $\partial d_X/\partial b_{X_i}$, of which the owner appropriates only the fraction $1-b_{X_i}$. The joint solution of equations (16) and (21) is the pair of firm-invariant and time-invariant values $b_{X_i} = b_X(\tau_b)$ and $d_{X_i} = d_X(\tau_b)$. Similarly, the interior solution for b_{I_i} must satisfy

$$\left[1-d_{I_i}(b_{I_i};\tau_b,\gamma_I)\right]^2 = -\frac{1-\sigma_I\tau_\Pi}{\gamma_I}\frac{\partial d_I(b_{I_i};\tau_b,\gamma_I)}{\partial b_{I_i}}. \tag{22}$$

This condition states that the founder's marginal cost of incentivizing the manager, $1-d_{I_i}$, is equal to the marginal gain generated by the reduction of diversion, $\partial d_{I_i}/\partial b_{I_i}$, multiplied by the difference between the tax-adjusted shadow value of knowledge and the contractual cost of innovation due to the compensation of the manager (see the online Appendix Section A.1). The joint solution of equations (19) and (22) is the pair of firm-invariant and time-invariant values $b_{I_i} = b_I(\gamma_I, \sigma_I\tau_\Pi, \tau_b)$ and $d_{I_i} = d_I(\gamma_I, \sigma_I\tau_\Pi, \tau_b)$.

Since contractual terms are the same across firms, from now on we drop the index i. Moreover, to simplify further the notation we write the endogenous governance terms b_X, d_X, b_I and d_I, unless necessary to remind the reader that they are functions of the parameters $(\gamma_X, \gamma_I, \sigma_I\tau_\Pi, \tau_b)$. The following proposition summarizes the main result.

Proposition 1 *(Governance) The founder offers compensation b_X and b_I, respectively, to the production manager and to the R&D manager. The resulting rates of diversion are d_X and d_I. Let*

$$s_X \equiv (1 - b_X)(1 - d_X)\gamma_X \tag{23}$$

and

$$s_I \equiv \frac{1 - \sigma_I \tau_\Pi}{\frac{1-\sigma_I\tau_\Pi}{(1-d_I)\gamma_I} + (1 - \tau_\Pi) b_I} \tag{24}$$

The governance structure produces the rates of return to in-house innovation and equity:

$$r = r_{Z_i} \equiv \frac{1 - \tau_\Pi}{1 - \sigma_I \tau_\Pi} s_X s_I \alpha \frac{\Pi_i}{Z_i}; \tag{25}$$

$$r = r_{N_i} \equiv \frac{(1 - \tau_D)\gamma_X}{(1 - \sigma_X \tau_\Pi)\chi X} \left[(1 - \tau_\Pi)(1 - b_X)(1 - d_X)\Pi_i - I_i(1 - \sigma_I \tau_\Pi) - (1 - \tau_\Pi) b_I \gamma_I (1 - d_I) I_i\right] + \frac{\dot{X}}{X}. \tag{26}$$

Proof. See online Appendix Section A.1 ■

We emphasize that the endogenous governance terms appearing in the aforementioned returns are time-invariant. This property significantly simplifies the dynamics of the model. The corresponding arbitrage conditions, when there is no production delegation, can be derived by setting $d_X = b_X = 0$ and $\gamma_X = 1$, which imply $s_X = 1$. Similarly, when there is no R&D delegation, the conditions can be obtained by setting $d_X = b_X = 0$ and $\gamma_I = 1$, which imply $s_I = 1$. The next section will explain that these properties can be used to obtain the general equilibrium of the economies with partial or no delegation as special case of that with production and R&D delegation.

3.3 Households and Managers

In the economy with delegation, managers are members of the representative household selected at random by the firms. To maintain simplicity, we assume that they remain part of the workforce and thus keep earning the wage while performing their managerial duties as an extra activity. To emphasize the distributional implications of our model, we further assume that these individuals do not contribute their managerial earnings to the household's budget but fully consume the resources they secure in their role as managers (see section

5.2). Because the household's budget constraint excludes the managers' income and the resources they appropriate through diversion, its budget constraint is given by (12) and the consumption-saving decision is that in (13). This representation of households has the advantage of differentiating between the earnings and consumption of managers from those of other household members. Managers do not receive transfers from the government. The online Appendix Section A.5 shows the correspondence between the economy's resource constraint, the budget in (12) and the managers' consumption.

4 General Equilibrium

In this section, we build the general equilibrium of the model. We first focus on a full delegation scenario, namely one in which the founder delegates both production and R&D activities to other agents. Next, we obtain the equilibria of economies with only production delegation, only R&D delegation, and with no delegation of either kind, treating them as nested scenarios of the full delegation equilibrium. Furthermore, we study the conditions under which each of these four equilibria arises. In any of the four configurations, the intermediate sector exhibits symmetry, implying that firms charge the same price, produce the same quantity, and grow at the same rate. Therefore, we will omit the subscript i unless it is useful to distinguish between a firm's variable and the corresponding average of the economy.

4.1 Structure of the Equilibrium with Delegation

The market clearing of final output follows from the budget constraint of the households and of the government. We have established in Section 2 that also the labor market clears. We now introduce the remaining three equilibrium conditions. The first condition requires the asset market to clear, meaning that the total wealth of the households is equal to the value of the equity issued by firms. Under free entry, this condition leads to $NV = \frac{\chi}{\gamma_X}(1-\sigma_X\tau_\Pi)NX$. The second condition is that the reservation rate of return on saving must be equal to the rate of return to equity of firms. The third condition follows from the no-arbitrage argument, which states that for both in-house innovation and entry to occur, their rates of return must be equal. If this condition is not met, one of the two types of investment is return-dominated and savers are not willing to finance it.

Given the significance of the rates of return in our analysis, we define the state variable

$$x \equiv \frac{X}{Q} = \theta^{\frac{2}{1-\theta}} \frac{L}{N^{1-\epsilon}}, \tag{27}$$

which is the quality-adjusted size of the intermediate firm. The last equality follows from using the demand (2) and illustrates the relationship between firm size and the primitive state variables of the model, namely the exogenous mass of workers and the endogenous mass of firms. We also introduce the following variables: the entry rate, $n \equiv N/N$; the firm growth rate, $z \equiv \dot{Z}/Z$; the growth rate of per capita output $\frac{(\dot{Y/L})}{Y/L} \equiv y$ (in view of 3 this is also the growth rate of wages $\frac{\dot{w}}{w}$); and the household's consumption ratio, $c \equiv C/Y$. In equilibrium these jumping variables become functions of the pre-determined state variable x.

Next, we use the result that expenditure on intermediates is $NpX = \theta Y$ and that the monopolistic price, $p = \frac{1}{\theta}$, to write $NX = \theta^2 Y$. This allow us to express the production function of the final good (1) in a reduced-form representation:

$$Y = \theta^{\frac{2\theta}{1-\theta}} N^{\epsilon} \gamma_X Z L. \tag{28}$$

Thus, output increases with the average knowledge stock, Z, the mass of firms, N, and employment, L. This equation also says in an economy where founders delegate production to managers, final output is greater by a factor γ_X compared to an economy with the same number of firms and the same average stock of knowledge, but without delegation. In our model, gross domestic product (GDP) differs from final output because resources are employed in the production of intermediate goods and to cover operating costs:

$$GDP = Y - N\left(X + \phi Q\right) = \left[1 - \theta^2 \left(1 + \frac{\phi}{x}\right)\right] Y.$$

This expression reveals that an economy with smaller firms uses a larger amount of resources for the fixed operating costs and therefore has smaller GDP, for a given final output, Y.

The no-arbitrage argument on returns equalization and the surplus factors in (34) and (35) allow us to rewrite the returns in Proposition 1 as:

$$r = s_X s_I \frac{1-\tau_\Pi}{1-\sigma_I \tau_\Pi} \alpha \left[\left(\frac{1}{\theta} - 1\right) x - \phi\right]; \tag{29}$$

$$r = \frac{(1-\tau_D)\gamma_X}{(1-\sigma_X\tau_\Pi)\chi}\left[(1-\tau_\Pi)s_X\left(\frac{1}{\theta}-1-\frac{\phi}{x}\right)-\frac{(1-\sigma_I\tau_\Pi)z}{s_I x}\right]+\frac{\dot{x}}{x}+z, \tag{30}$$

Government Budget. The government collects corporate taxes, net of R&D and entry tax deductions, personal dividend income, and executive income taxes. The total tax revenue intake is given by:

$$T = N\{\tau_D D + \tau_\Pi (1-d_X)(1-b_X)\Pi - [\sigma_I + b_I\gamma_I(1-d_I)]\tau_\Pi I - \sigma_X\tau_\Pi n\frac{\chi}{\gamma_X}X + \tau_b B\}. \tag{31}$$

The government allocates a fraction τ_H of tax revenues as lump-sum transfer, H, to households and the remaining amount to government consumption, G.

4.2 Structure of Equilibrium with Partial or No Delegation

As mentioned earlier in this section, the general equilibrium of economies with no R&D delegation or no production delegation, or with no delegation of any kind, is nested within the description of the general equilibrium of the production and R&D delegation economy. A convenient feature of our representation is that the measure of the firm size x (see 27), which is also the state variable of the dynamic system, does not depend on the delegation decision. This feature greatly facilitates comparisons of policies across economies that differ with respect to delegation.

The structure of the equilibrium of an economy with no production delegation is still characterized by the consumption-saving decision in (13) and by equations (28-31) provided that we set $b_X = d_X = 0$ and $\gamma_X = 1$, implying $s_X = 1$. Similarly, the equilibrium structure of an economy in which R&D delegation is characterized by (13) and (28-31) with $b_I = d_I = 0$, and $\gamma_I = 1$, implying $s_I = 1$. Finally, an economy where neither type of delegation is present has $b_I = b_X = d_I = d_X = 0$, and $\gamma_X = \gamma_I = s_X = s_I = 1$. For instance, in an economy with no delegation, the corresponding returns (29) and (30) of this economy would be:

$$r = \frac{1-\tau_\Pi}{1-\sigma_I\tau_\Pi}\alpha\left[\left(\frac{1}{\theta}-1\right)x-\phi\right]; \tag{32}$$

$$r = \frac{1-\tau_D}{(1-\sigma_X\tau_\Pi)\chi}\left[(1-\tau_\Pi)\left(\frac{1}{\theta}-1-\frac{\phi}{x}\right)-(1-\sigma_I\tau_\Pi)\frac{z}{x}\right]+\frac{\dot{x}}{x}+z. \tag{33}$$

The in-house investment return (32) and the return to equity (33) are the general equilibrium version of that of the no delegation economy in (10) and (9), respectively.

Next, we study the conditions regarding the rule of law, captured by the diversion cost functions $f(d_X)$ and $\hat{f}(d_I)$, that lead to the emergence of any the four types of equilibria just described.

4.2.1 Delegation Conditions

We verify the conditions to be satisfied for the emergence of a particular delegation equilibrium by studying the founder's delegation surplus to delegate production and R&D activities, and that of the outside agents hired as managers.

Production Delegation. For a given state of firm's and industry knowledge Z_i and Z, the quality of the product is higher by a factor γ_X in the economy with production delegation (see 4 and 14). Similarly, for comparable stock of knowledge, population L, and number of industry N, the demand of a firm's product (see 2) is larger in an economy with production delegation than in one without production delegation by a factor of γ_X . Thus, in absence of production delegation, following (2) and (4) the flow of profits (6) net of corporate tax is

$$(1-\tau_\Pi)\Pi = (1-\tau_\Pi)(p(\frac{\theta}{p})^{\frac{1}{1-\theta}}\frac{L}{N^{1-\epsilon}}Z_i^\alpha Z^{1-\alpha} - \phi Z_i^\alpha Z^{1-\alpha}).$$

In presence of production delegation the demand function (2) the technology for quality (14) and the flow of profits (6) imply that profits accruing the the founder, net of corporate tax, of manager's compensation and of manager diversion, is

$$(1-\tau_\Pi)(1-b_X)(1-d_X)\Pi = (1-\tau_\Pi)(1-b_X)(1-d_X)(p(\frac{\theta}{p})^{\frac{1}{1-\theta}}\frac{L}{N^{1-\epsilon}}\gamma_X Z_i^\alpha Z^{1-\alpha} - \phi\gamma_X Z_i^\alpha Z^{1-\alpha})$$

These two expressions combined state that the founder wants to delegate production if:

$$s_X \equiv (1-b_X)(1-d_X)\gamma_X > 1. \tag{34}$$

Here, s_X can be interpreted as a measure the founder's surplus in delegating production. This surplus increases with the manager's productivity γ_X and declines with the attendant production agency costs b_X and d_X. The surplus s_X does not depend on the profit tax τ_Π neither directly nor indirectly through the governance variables b_X and d_X. Also, observe also that the production delegation decision is independent of the R&D delegation decision.

R&D delegation. The founder gains in delegating the R&D tasks if by doing so reduces the cost of knowledge accumulation. Under no R&D delegation this is $1/(1-\sigma_I\tau_\Pi)$ (see 10) whereas under R&D delegation is $1/(\frac{1-\sigma_I\tau_\Pi}{(1-d_I)\gamma_I}+(1-\tau_\Pi)b_I)$. Therefore, the founder wants to delegate if:

$$s_I \equiv \frac{1-\sigma_I\tau_\Pi}{\frac{1-\sigma_I\tau_\Pi}{(1-d_I)\gamma_I}+(1-\tau_\Pi)b_I} > 1, \tag{35}$$

The term s_I captures both the efficiency of the R&D manager and the severity of the agency costs. Unlike s_X, the R&D surplus factor s_I is influenced by the profit tax rate, τ_Π, both directly and through b_I and d_I. Specifically, the above expression implies that if $b_I > 0$ and $\sigma_I > 0$, the direct effect of τ_Π on s_I is negative because τ_Π reduces the gap between the price of capital with and without delegation. For the same reason, σ_I tends to reduce the surplus s_I.

Managers' Participation Constraints. Using Proposition 1 and the utility of the production manager in (15) and of the R&D manager in (18), we can determine that the production manager agrees to contract if:

$$(1-\tau_b)b_X\,(1-d_X)+d_X \geq f(d_X), \tag{36}$$

and the R&D manager will agree to the contract if:

$$b_I(1-\tau_b)\gamma_I\,(1-d_I) \geq \hat{f}(d_I). \tag{37}$$

In brief, depending on the strength of the rule of law, reflected in the cost functions $f(.)$ and $\hat{f}(d.)$, the delegation conditions of the founder (34-35), and those of the two managers (36) and (37) result into four kinds of equilibria, summarized in the following proposition.

Proposition 2 *(Delegation) The model yields four distinct equilibria based on the satisfaction of delegation conditions:*
(i) Only production delegation: This equilibrium emerges when both (34) and (36) are satisfied, but either (37), or (35), or both, are not met.
(ii) Only R&D delegation: This equilibrium arises when both (35) and (37) are satisfied, but either (34), or (36), or both, are not fulfilled.
(iii) Both production and R&D delegation: This equilibrium occurs when all four constraints (34, (35), (36), and (37) are met.

(iv) No delegation: This equilibrium is observed in all other circumstances where delegation conditions are not satisfied.

Proof. The claim follows from the discussion in the text. ■

As already noted, the emergence of a particular equilibrium does not depend on our measure of firm size x.[6] When studying the effects of a tax reform (section 7.1.1), our primary focus will be on the equilibria (iii) and (iv).

4.2.2 Taking Stock: Rule of law and delegation

Figure 1 exhibits a strong correlation between the reliance on professional management and the World Bank indices of the rule of law. To illustrate the connection between our analysis and this evidence, consider the diversion cost functions $f(d_X) = \beta_X d_X + \frac{1}{2}d_X^2$ and $\hat{f}(d_I) = \beta_I d_I + \frac{1}{2}d_I^2$. We will use the same functional forms to calibrate the model to the USA economy in section (6). The reaction functions of the production and R&D managers (16) and (19) become

$$1 = \beta_X + d_X + (1 - \tau_b)b_X, \tag{38}$$

and

$$1 = \beta_I + d_I + (1 - \tau_b)\gamma_I b_I, \tag{39}$$

respectively.

Because the parameters β_X and β_I measures the managers' utility cost in diverting profits and knowledge investments, they can be interpreted as the strength of investor protection. These parameters map into the two indices of the rule of law shown in Figure 1 (see Grobovšek 2020 for a similar analytical insight). The reaction function (38) states that, for a given contract b_X, the intensity of diversion d_X decreases in the cost β_X. Similarly, d_I is negatively related to β_I . The conditions (21) and (22) determine the contracts that maximize the founder's surplus. With our diversion cost functions, these conditions yield, respectively,

$$1 - d_X = (1 - b_X)(1 - \tau_b) \tag{40}$$

[6] In this paper, our focus is on examining the impact of taxation and the rule of law on delegation decisions. In a related study (Ferraro, Iacopetta and Peretto 2022) we analyze how the incentives to delegate vary with the size of the firm.

and

$$(1-d_I)^2 = (1-\sigma_I \tau_\Pi)(1-\tau_b). \tag{41}$$

After some derivations, the two conditions (38) and (40) give the following expression for founder's surplus in case of delegating production (34):

$$s_X = \frac{\gamma_X}{4}(1+\frac{\beta_X}{1-\tau_b})^2(1-\tau_b). \tag{42}$$

The founder's surplus is increasing in the strength of the rule of law β_X. In particular, the founder wants to delegate production if $\beta_X > 2\sqrt{\frac{(1-\tau_b)}{\gamma_X}} - (1-\tau_b)$. This threshold is harder to reach in an economy with a low managerial productivity γ_X. It is also harder to reach if τ_b is high because the founder would need to compensate the manager more to prevent the same amount of diversion.

Likewise, the two conditions (39) and (41) lead to the founder's surplus for delegating R&D (35)

$$s_I = \frac{(1-\tau_\Pi\sigma_I)\gamma_I}{\sqrt{\frac{(1-\tau_\Pi\sigma_I)}{1-\tau_b}} + \frac{1-\tau_\Pi}{1-\tau_b}(\sqrt{(1-\tau_\Pi\sigma_I)(1-\tau_b)} - \beta_I)}, \tag{43}$$

which also depends positively on γ_I and β_I. The founder wants to delegate R&D when s_I exceeds 1, which occurs when:

$$\beta_I > \sqrt{(1-\sigma_I\tau_\Pi)(1-\tau_b)}[1 - \frac{\gamma_I}{1-\tau_\Pi}(\sqrt{(1-\tau_b)}\sqrt{(1-\sigma_I\tau_\Pi)} - 1)].$$

These results imply that the size of the R&D delegation region expands when institutions effectively mitigate the manager's moral hazard. In the language of the cross-country comparisons for Figure 1B, our model predicts a positive correlation between intellectual property rights protection and indices of the prevalence of R&D delegation.

4.3 Delegation and taxation: an analytical insight

In section (7) we will study, from a quantitative perspective, how taxation affects firm entry and the incentives of incumbent firms to invest in product quality, taking into account the role of delegation. Here, we emphasize a key qualitative result regarding the distortion of taxation on in-house investment. The return on in-house investment in an economy with delegation can be found in (29). While the production agency cost b_X, d_X are not sensitive to τ_Π (as discussed in Section 4.2.1), the R&D agency costs, b_I and d_I, might respond to it (see online Appendix Section A.2).

The reaction of the return to in-house investment to τ_Π in a delegation economy is given by

$$\frac{\partial r_Z}{\partial \tau_\Pi} = -\frac{\gamma_I (1-d_I)(1-\sigma_I)}{[1-\sigma_I\tau_\Pi + (1-\tau_\Pi)\gamma_I b_I (1-d_I)]^2} s_X \alpha \left[\left(\frac{1}{\theta}-1\right)x - \phi\right]; \tag{44}$$

The corresponding expression for an economy with partial or no delegation can be obtained as a special case. For instance, in an economy with no delegation (configuration (iv) of 2), characterized by $s_X = s_I = 1$, $b_I = d_I = 0$, the previous expression simplifies to

$$\frac{\partial r_Z}{\partial \tau_\Pi} = -\frac{1-\sigma_I}{(1-\sigma_I\tau_\Pi)^2} \alpha \left[\left(\frac{1}{\theta}-1\right)x - \phi\right]. \tag{45}$$

The following proposition states that r_Z is more sensitive to τ_Π in an economy with full or partial delegation than in a no delegation economy.

Proposition 3 *For a given x, the $\frac{\partial r_Z}{\partial \tau_\Pi}$ is larger, in absolute term, in any of three configurations (i)-(iii) with delegation than in that with no delegation (iv) described in proposition 2.*

Proof. See online Appendix Section A.2 ■

The profit tax rate τ_Π affects also differently the return to entry (equity) depending on the presence of delegation. The online Appendix Section A.3 uses the expression (30) to derive $\frac{\partial r_N}{\partial \tau_\Pi}$. It turns out that if $\sigma_X > 0$, τ_Π tends to have a positive effect on the return on entry as it increases the tax rebate. If $\sigma_X = 0$, entry responds negatively in both economies to τ_Π as it reduces the firm's net profit – if $\sigma_I > 0$ such reduction is partly offset by the higher R&D deduction. In general, the effect of τ_Π on r_N in either economy depends on the particular set of parameters.

To summarize, in the short run, that is before market structure adjustments, a cut of the profit tax rate τ_Π boosts the return to in-house innovation more robustly in the delegation economy than in the no-delegation economy. The sign and sensitivity of the return to entry, $\frac{\partial r_N}{\partial \tau_\Pi}$, depend on specific parameter values in both economies.

Finally, observe that while the dividend tax rate τ_D does not alter the return to in-house innovation in either economy, it does have a negative effect on the return to entry in both kinds of economies. We conclude with the reminder that in this section we have considered only the direct effects of tax cuts holding (b_I, d_I) and the firm size x constant. We study the full effects quantitatively in Section 7.

5 Steady State and Dynamics

In this section, we study analytically the model's general equilibrium, with a focus on the scenario of full delegation. We will show that this nests the representation of the other three kinds of equilibria of proposition (2). We also explore the distributional implications of our framework.

5.1 Steady state

In the steady state, firm size x, consumption ratio c, entry rate, n, firm growth rate z, interest rate r, and growth rate of final output y, are all constant. Time differentiation of the definition of x yields

$$\frac{\dot{x}}{x} = \lambda - (1-\epsilon)\, n \Rightarrow n^* = \frac{\lambda}{1-\epsilon},$$

where an asterisk denotes a steady-state value. Differentiating the reduced-form production function (28) with respect to time gives:

$$y = \epsilon n + z + \lambda \Rightarrow y = \frac{\lambda}{1-\epsilon} + z, \tag{46}$$

which, combined with the Euler equation (13), yields:

$$r = \rho + \epsilon n + z \Rightarrow r = \rho + \frac{\epsilon\lambda}{1-\epsilon} + z. \tag{47}$$

Replacing the interest rate in the returns to in-house investment and entry, (29)-(30), with the expression for r, we obtain:

$$z = \frac{1-\tau_\Pi}{1-\sigma_I\tau_\Pi} s_X s_I \alpha \left[\left(\frac{1}{\theta}-1\right)x - \phi\right] - (\rho + \frac{\epsilon\lambda}{1-\epsilon}); \tag{CI}$$

$$z = \frac{s_I}{1-\sigma_I\tau_\Pi}\left\{(1-\tau_\Pi)s_X\left[\left(\frac{1}{\theta}-1\right)x-\phi\right] - \left(\rho+\frac{\epsilon\lambda}{1-\epsilon}\right)\frac{\chi(1-\tau_\Pi\sigma_X)}{1-\tau_D}x\right\}. \tag{EI}$$

These two loci describe the combinations of (x, z) that satisfy the condition that each form of investment, in-house innovation and entry, delivers a rate of return that meets the reservation rate of return of savers. We label them the corporate investment locus (CI) and the entrepreneurial investment locus (EI), respectively. Since they are linear, we obtain the closed-form solution:

$$x^* = \frac{(1-\alpha)(\frac{1-\tau_\Pi}{1-\sigma_I\tau_\Pi})s_X s_I \phi + \left(\rho + \frac{\epsilon\lambda}{1-\epsilon}\right)}{(1-\alpha)(\frac{1-\tau_\Pi}{1-\sigma_I\tau_\Pi})s_X s_I \left(\frac{1}{\theta} - 1\right) - \left(\rho + \frac{\epsilon\lambda}{1-\epsilon}\right)\frac{\chi}{\gamma_X}\frac{(1-\tau_\Pi\sigma_X)}{1-\tau_D}}; \tag{48}$$

$$z^* = \frac{1-\tau_\Pi}{1-\sigma_I\tau_\Pi} s_I s_X \alpha \left[\left(\frac{1}{\theta} - 1\right) x^* - \phi\right] - (\rho + \frac{\epsilon\lambda}{1-\epsilon}). \tag{49}$$

The steady state (x^*, z^*) is saddle stable if the EI intersects the CI from below. This condition reduces to

$$\left(\rho + \frac{\epsilon\lambda}{1-\epsilon}\right)\frac{\chi}{\gamma_X}\frac{(1-\tau_\Pi\sigma_X)}{1-\tau_D} < \frac{(1-\tau_\Pi)s_I s_X}{1-\sigma_I\tau_\Pi}\left(\frac{1}{\theta} - 1\right)(1-\alpha). \tag{50}$$

This same condition ensures saddle-path stability in the (x, c) space discussed in the next section. The interest rate is $r^* = \rho + \frac{\epsilon\lambda}{1-\epsilon} + z^*$and the per capita final output growth rate is $y^* = \frac{\epsilon\lambda}{1-\epsilon} + z^*$. This is also the per capita GDP growth rate because in steady state the ratio $\frac{GDP}{Y}$ is constant.

The steady state consumption output ratio c^* can be found by solving

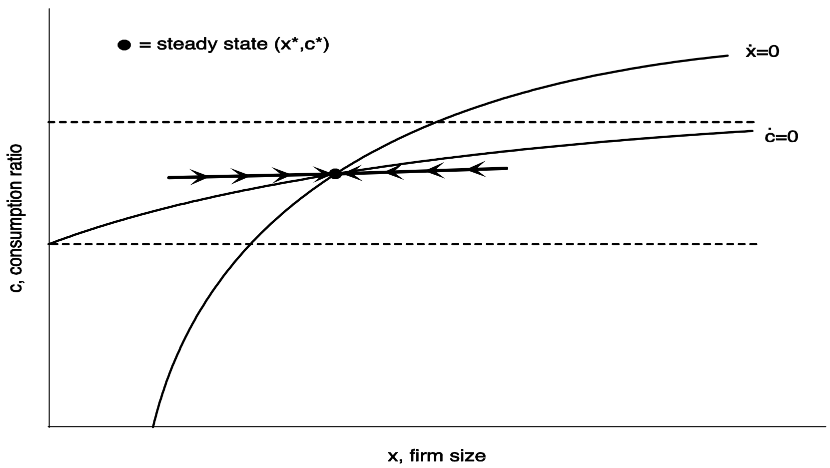
$$c^* = (1-\theta) + h(x^*, c^*) + (1-\tau_\Pi\sigma_X)\chi\theta^2(\rho - \lambda)/\gamma_X. \tag{51}$$

Nested Equilibria. The steady states of (i) the production delegation economy, (ii) the R&D economy, and (iv) the no delegation economy as presented in Proposition 2, can be derived using equations (48)-(51) by setting $s_X = \gamma_X = 1$ in (i), $s_I = 1$ in (ii), and $s_X = \gamma_X = s_I = 1$ in (iv). Furthermore, the saddle-path stability condition (50) is applicable to these three equilibria, subject to the appropriate restrictions for s_X, s_I, and γ_X.

5.2 Dynamics

To study dynamics, we use the two functions $n(x, c)$ and $z(x, c)$ that describe the equilibrium entry rate and in-house innovation rate, respectively, and the transfer ratio, $h(x, c) \equiv \frac{H}{Y} = \tau_H \frac{T}{Y}$. Figure 2 illustrates the dynamics, and the following proposition provides the formal

Figure 2: Phase diagram for the delegation economy



result. The online Appendix Section A.4 describes the details of the dynamics which here we summarize as follows:

Proposition 4 *(Dynamics with delegation) The general-equilibrium dynamic system of the delegation economy (iii), presented in Proposition 2, in* (x, c) *space is:*

$$\frac{\dot{c}}{c} = \frac{c - (1-\theta) - h(x,c)}{(1-\sigma_X \tau_\Pi)\theta^2 \chi / \gamma_X} + (\lambda - \rho); \tag{52}$$

$$\frac{\dot{x}}{x} = \lambda - (1-\epsilon)\, n(x,c). \tag{53}$$

There is a unique equilibrium trajectory: given the initial condition x_0*, the economy jumps on the saddle path and converges to the steady state* (x^*, c^*)*, where* x^* *and* c^* *are defined by (48) and (51).*

Proof. See online Appendix Section A.4 ■

Equations (52)-(53) also represent the dynamics of the economies with partial or no delegation as described in Proposition 2, under the same configuration of restrictions on s_X, s_I, and γ_X as discussed for the steady state equilibria.

Figure 2 shows the saddle-path of the economy. In the special case in where the government uses all collected taxes for its own consumption, that is, there are no household tranfers ($\tau_H = h(.) = 0$), the dynamics simplify considerably: the consumption-output ratio jumps immediately to the long run constant level of $c^{*} = 1 - \theta + (1 - \tau_{\Pi}\sigma_X)\chi\theta^2 (\rho - \lambda) / \gamma_X$. The state variable still evolves according to (53). In essence, when $\tau_H = 0$, the saddle path depicted in Figure 2 becomes flat.

In our experiments described in Section 7 the government tranfers all its receipts to households, meaning $\tau_H = 1$. Interestingly, even in our environment with $\tau_H = 1$, the locus $\dot{c} = 0$ is relatively flat, implying that the saddle path is also almost flat. Thus, the differences in dynamics across the four types of economies mainly depend on the behavior of firm size x, with the behavior of the consumption ratio c playing only a marginal role, if any.

Managers' Consumption. We expressed the dynamics of the economy with delegation in terms of the households' consumption-output ratio, $c = C/Y$, where C *does not* include the consumption of managers. Managers earn a total pre-tax income

$$NB = N\left[b_X(1 - d_X)\Pi + \gamma_I(1 - d_I)b_I I\right].$$

Dividing the resulting after-tax income by Y, gives their fraction total income relative to output:

$$(1 - \tau_b)\frac{NB}{Y} = (1 - \tau_b)\frac{N}{Y}\left[b_X(1 - d_X)\Pi + \gamma_I(1 - d_I)b_I I\right].$$

Managers fully consume their income as well as the extra resources diverted. Hence, the managers' overall consumption as a ratio of final output is

$$\frac{C^m}{Y} = (1 - \tau_b)\frac{NB}{Y} + \underbrace{\frac{N(d_X\Pi + d_I I)}{Y}}_{\text{aggregate diversion}}. \tag{54}$$

This is this *additional* consumption of managers relative to the standard households. It increases as the agency issues become more severe, a dimension often neglected in the current debate of inequality. Observe that executive income taxation reduces the extra consumption of managers directly through τ_b and possibly through redistribution if $\tau_H > 0$. Nevertheless, some of the inequality reduction can be undone as τ_b tends to favor diversion through the decision rules, (16) and (19).

6 Calibration

This section explains how we calibrate the baseline delegation model to the US economy. The other economies we consider have similar preferences and technological specifications as the baseline delegation economy, but differ in their laws concerning investor protection.Tables 1-2 report the values of the 17 parameters of the model and our targets. Table 3 summarizes the steady state of the economy. Although in general equilibrium most parameters influence most variables, for clarity, we organize the discussion around groups of parameters that are more directly connected to specific variables.

Taxes $(\tau_{\Pi}, \tau_D, \tau_b, \sigma_I)$. The profit income tax rate is $\tau_{\Pi} = 0.38$. This is the rate calculated by Barro and Furman (2018) combining the federal and state statutory profit tax rates before the adoption of the Tax Cuts and Jobs Act of 2017. Ordinary dividends are taxed at the federal level as regular income; some categories of dividends (qualified dividends) have a more favorable tax treatment. Hence, we set $\tau_D = \tau_b = 0.25$, a value falling in between the average tax rate for a single worker (29.9%) and a one-earner married couple with two children (18.8%) in 2019 (OECD 2020). The degree of expansibility of investment in R&D changes frequently. Currently, in most countries it is only a fraction of the actual spending. A recent study (OECD 2021) estimates that the implied R&D subsidy rate for profit making firms in the USA is 5%. Hence, we present results for the baseline delegation case with $\sigma_I = 0.05$. Due to the lack of established evidence on the tax rebate for firm's formation, we set $\sigma_X = \sigma_I$.

Agency Parameters $(\beta_X, \gamma_X, \beta_I, \gamma_I)$. We refer to the analytical expressions of the founder surpluses s_X and s_I obtained in Section 4.2.2 under the managerial diversion cost functions $f(d_X) = \beta_X d_X + \frac{1}{2} d_X^2$, and $\hat{f}(d_X) = \beta_I d_I + \frac{1}{2} d_I^2$. Several studies have suggested that when the owner delegates tasks to professional managers firm productivity can increase significantly. Bennedsen et al. (2007) have documented that family-run firms underperform relative to firms with outside managers, especially in knowledge intensive industries. Akcigit, Harun, and Peters (2021) find that the managerial productivity in the USA, a country with high degree of delegation, is twice as large that of India, a country with a low degree of delegation. An earlier cross-country study estimated that professional managers work about 10% more and are 20% more efficient than owner-managers (Bandiera et al. 2020). Therefore, we set, in a conservative way, $\gamma_X = \gamma_X = 1.5$. Given the set of taxes and subsidies, and the managers' productivities, the above expressions yield the values of the parameters β_X and β_I, for a given surplus pair (s_X, s_I). Recall that in our framework, the parameters β_X and β_I capture the strength of the legal system in protecting shareholders interests. In setting β_X and β_I, we also consider a case with a lower institutional quality than the baseline delegation economy. Specifically, we set these two parameters $\beta_X = \beta_X^T$ and $\beta_I = \beta_I^T$, so that the surplus factors s_X and s_I is marginally above one $s_X(\beta_X^T) = s_I(\beta_I^T) = 1.001$ – from now on we report this value rounded at 1. In this economy, which we will refer to as threshold delegation economy, the firm's value, from the founder's perspective, is about the same as that in a no delegation economy. We obtain $\beta_I^T = 0.665$ and $\beta_I^T = 0.5316$. For the baseline delegation economy we target in a conservative way $s_X = s_I = 1.1$ and obtain $\beta_X = 0.733$ and $\beta_I = 0.667$. We also verify the economy's response to a profit tax shock an environment with a stronger governance (larger β_X and β_I) so that $s_X = s_I = 1.2$.

Population and Technology $(\lambda, \epsilon, \theta, \rho, \alpha, \chi, \phi)$. We set $\lambda = 1.2\%$, which is the average annual population growth rate in the USA from 1910 to 2010 (Maddison data). We determine the social return to variety via (53) with $\dot{x} = 0$, which gives $\epsilon = 1 - \lambda/n$. We target an entry rate of 1.6% and obtain $\epsilon = 0.25$. The value of the entry rate is in the middle of the range spanned by the net entry rates in the U.S. manufacturing sector calculated by Lee and Mukoyama (2018) and those obtained from the U.S. Census Bureau database for the overall economy in the period 1982-2008. We target a monopolistic markup $\frac{1}{\theta} = 1.3$, which gives us $\theta = 0.769$. The markup target is inside the range of markups for the manufacturing sector in advanced countries (see, e.g., Meier and Reinelt 2020; Vermeulen 2012). We target the standard value of 2% for the growth rate of GDP per capita and the value 5% for the interest rate. These two targets give us $\rho = 0.03$. The resulting firm growth rate is $z = y - \lambda - \epsilon n = 1.6\%$. For the social return to knowledge, $1 - \alpha$, we note that in their extensive review of the literature Jones and Williams (1998) report estimates in the interval $[27\%, 100\%]$. We use the value $1 - \alpha = 0.7$. Finally, for a given χ the operating cost parameter ϕ pins down the growth rate of the economy. We choose the value of χ such as to generate a 3% R&D over GDP ratio, which is around what has been observed in the USA in recent years. In our model we have the R&D expenses and entry costs, gross of subsidies, that amount to NI and $\frac{\chi}{\gamma_X} NX$.

7 Policy experiments

Recent work argues that the response of investment to business taxation depends on the conflict between managers and shareholders within firms (Desai et al. 2007; Chetty and Saez 2010). Scholars have also documented the profound effects that corporate governance reforms have had on the market structure of various countries in recent decades, that influence the ease with which new firms enter into markets (Hyytinen, Kuosa, and Takalo 2003; Fulghieri and Suominen 2012). In this section, we compare these two views in our Schumpeterian framework and quantify the response of the entry rate, the firm growth rate, the wage and per capita GDP, of two types of policy reforms: (a) reducing of business taxes; (b) improving of the legal, regulatory and institutional framework aimed at enhancing the efficiency of corporate governance.[7]

7.1 Tax Cuts

Although we focus on the effects of a reduction in the profit tax rate, τ_{Π}, we also review the consequences of cuts in the dividend tax rate, τ_D, and of the executive income tax rate, τ_b. These policy interventions have distinct effects on managers' diversion, firm entry, and in-house innovation.

7.1.1 Profit Tax

As mentioned in Introduction section, several countries have reduced substantially their taxation of corporate profits in recent years. According to an OECD study (OECD 2019), 78 out of 96 countries surveyed reduced their statutory corporate tax rates between 2000 and 2018, with an average decrease of 7.5%. Gechert and Heimberger (2022) have documented that the world average of statutory corporate tax rates declined by about 15 percentage points from 1982 to 2019, dropping from 41% to 26% (see Figure 1 in their study). We consider a 10pp reduction in the profit tax rate, which falls somewhat in the middle range of the two studies above. The main question we want to address is whether the economy's

[7] The codes to generate the figures and quantitative results are written in Matlab. They are available upon request.

Table 1: Macroeconomy

Panel A: Externally Calibrated Parameters

α	Return Elasticity to Knowledge	0.300
η	Inverse Price Markup	0.769
λ	Population Growth	0.012
τ_{Π}	Profit Income Tax Rate	0.380
τ_D	Dividend Income Tax Rate	0.250
τ_b	Personal Income Tax Rate	0.250
σ_I, σ_X	Investment Expensing	0.050

Panel B: Internally Calibrated Parameters

Parameters			Targeted Variables (Baseline Economy)		
ϵ	Variety Externality	0.250	n	Rate of Entry	0.016
ϕ	Operating Cost	0.404	y	Output Growth Rate	0.020
ρ	Discount Rate	0.030	r	Real Interest Rate	0.050
χ	Entry Cost	1.213		R&D/GDP	0.030

Table 2: Agency Relationships

Parameters					*Targeted Delegation Surpluses*			
		Type of Economy				Type of Economy		
		No Del.	Thresh.	Baseline		No Del.	Thr.	Baseline
β_X	Diversion Cost in Production	< 0.665	0.665	0.73327	s_X Production	< 1	1.001	1.1
β_I	Diversion Cost in R&D	< 0.5316	0.5316	0.6637	s_I R&D	< 1	1.001	1.1
$\gamma_X = \gamma_I$	Managers' efficiency (ext.)	1	1.5	1.5				

Table 3: Steady State

		Type of Economy		
		No Del.	Thresh.	Baseline
r	Interest Rate	0.047	0.047	0.050
n	Entry Rate	0.016	0.016	0.016
z	Firm Growth Rate	0.013	0.013	0.016
x	Firm Size	2.608	2.608	2.490
y	Wage Rate Growth, per capita Income Growth, per capita GDP Growth	0.017	0.017	0.020
c	Consumption/Output	0.2451	0.2457	0.2455
d_X	Prod. Manager Diversion	n.a.	0.293	0.258
b_X	Prod. Manager Compensation	n.a.	0.057	0.011
d_I	R&D Manager Diversion	n.a.	0.142	0.142
b_I	R&D Manager Compensation	n.a.	0.290	0.173

Table 4: 10% Cut of the Profit Tax Rate

	Impact			Long Run		
	Type of Economy			Type of Economy		
	No Del.	*Delegation*		*No Del.*	*Delegation*	
		Threshold	Baseline		Threshold	Baseline
x	0	0	0	-0.2428	-0.2414	-0.1996
c	-0.0054	-0.0053	-0.0055	-0.0088	-0.0089	-0.0088
n	0.0046	0.0046	0.0047	0	0	0
z	0.0061	0.0062	0.0065	-0.006	-0.0059	-0.0054
y	0.0072	0.0073	0.0077	-0.006	-0.0059	-0.0054
gdp	0.0059	0.006	0.0063	-0.006	-0.0059	-0.0054
d_X	n.a.	0	0	n.a.	0	0
b_X	n.a.	0	0	n.a.	0	0
d_I	n.a.	-0.0022	-0.0022	n.a.	-0.0022	-0.0022
b_I	n.a.	0.0019	0.0019	n.a.	0.0019	0.0019
s_X	n.a.	0	0	n.a.	0	0
s_I	n.a.	0.0016	0.0014	n.a.	0.0016	0.0014

Table 5: Investor Protection Reform

	Impact			Long Run		
	Type of Economy			Type of Economy		
	No Del.	*Delegation*		*No Del.*	*Delegation*	
		Threshold	Baseline		Threshold	Baseline
x	0	0	0	-0.1179	-0.1179	-0.0922
c	0.0026	0.0026	0.0019	0	0	-0.0001
n	0.002	0.002	0.0019	0	0	0
z	0.0094	0.0094	0.0091	0.0031	0.0031	0.0033
y	0.0099	0.0099	0.0096	0.0031	0.0031	0.0033
gdp	0.0093	0.0093	0.009	0.0031	0.0031	0.0033
d_X	0.2584	-0.0341	-0.0334	0.2584	-0.0341	-0.0334
b_X	0.0112	-0.0455	-0.0445	0.0112	-0.0455	-0.0445
d_I	0.1422	0	0	0.1422	0	0
b_I	0.1725	-0.1174	-0.0991	0.1725	-0.1174	-0.0991
s_X	n.a.	0.1	0.1	n.a.	0.1	0.1
s_I	n.a.	0.1	0.1	n.a.	0.1	0.1

Note: The investor protection reform: (i) transforms both the No Delegation Economy and the Threshold Delegation Economy into the Baseline Delegation Economy; (ii) rises the surpluses s_X and s_I of the Baseline economy by 0.1. The gdp row reports the per capita GDP growth rate; the y row shows the growth rate of per capita output, Y/L, and of the wage rate.

response to such a reform is sensitive to the presence of professional managers, and, in the case of management delegation, to the severity of the agency issues. We answer this question by comparing the consequences of the tax cuts on three economies that differ only with respect to the values of the cost diversion parameters (β_X, β_I).

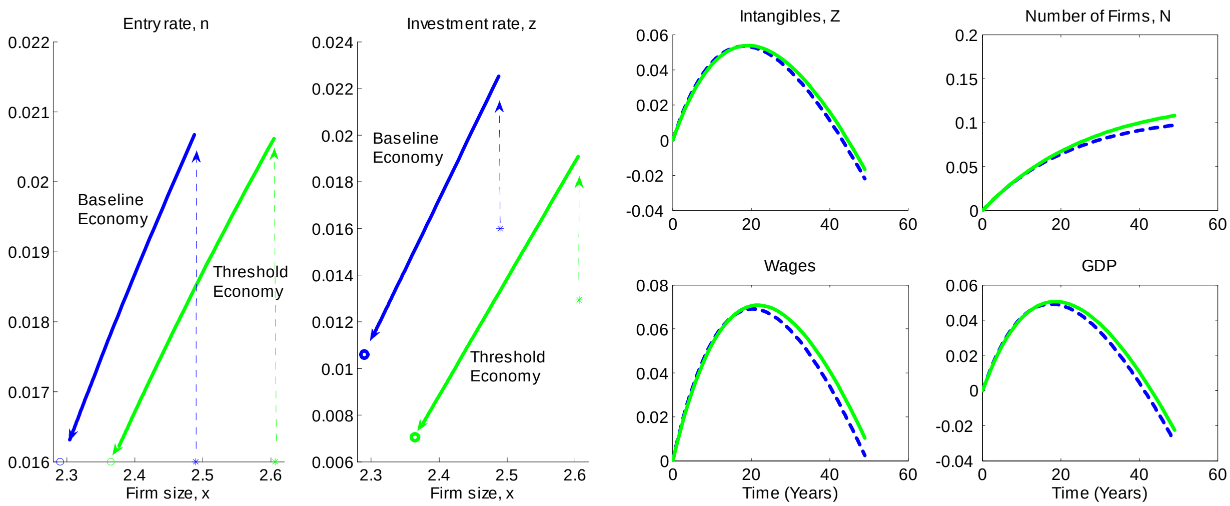
One economy, to which we will refer as the threshold economy, has a strength in the rule of law that is enough to induce management delegation, meaning $\beta_X = \beta_X^T$ and $\beta_I = \beta_I^T$ where β_X^T and β_I^T are such that $s_X(\beta_X^T) = s_I(\beta_I^T) = 1$. In another economy, characterized by a poorer rule of law with $\beta_X < \beta_X^T$ and $\beta_I < \beta_I^T$, there is no management delegation. Finally, we have the baseline economy whose rule of law yields the owner a 10% delegation surplus, namely $s_X = s_I = 1.1$. Additional results for an economy with a stronger rule of law that yields $s_X = s_I = 1.2$ are also discussed. We postulate the tax cut to be unanticipated and permanent. As noted earlier, the no-delegation economy is nested in the delegation one. In each exercise, the starting position of the economy is a steady state. Table 1 reports the set of parameter values of the baseline economy, which is also that of the other two economies, except for the investor protection parameters β_X, and β_I. Table 2 summarizes the steady state of the three economies. The no delegation and the threshold economies grow at a steady state of 1.7%, that is 0.3% less than the baseline economy. The difference in growth relative to the threshold economy is due to the higher quality of governance, captured by the surpluses factors $s_X = s_I = 1.1$. As mentioned in Section 5.1 the steady state of the no delegation economy can be obtained as a nested case of that with delegation provided that s_X and s_I are both fixed to one. Therefore, the growth rate of the no delegation economy is the same as that of the threshold economy.

We denote values for that steady state with the subscript 0, e.g., the initial firm size is x_0, and denote values for the new steady state with an asterisk, e.g., the new steady-state firm size is x^*. Panel A of Figure 3 represents the two key relationships driving the dynamics: the "policy" functions $n(x)$ and $z(x)$. They are calculated on the saddle path of the dynamic system of the economy illustrated in Figure 2. To construct $n(x)$ and $z(x)$, we compute the function $c(x)$ that describes the saddle path and use it to reduce the model's intratemporal expressions describing equilibrium behavior to functions of x only.

Panel B of Figure 3 displays the effects of a 10% profit tax cut on key economic indicators:

Figure 3: Profit Tax Cut

Panel A: Policy Functions | Panel B: Time Responses



Note. Panel B plots the log differences of the stocks of knowledge, the number of firms, wage rates, and per capita GDP due to a 10% reduction of τ_{Π} for the baseline delegation economy (dashed lines) and the threshold delegation economy (continuous lines).

the stock of knowledge (Z), the number of firms (N), the wage rate (w), and per capita GDP. The plots depict time series of log differences in levels, illustrating two cases: the baseline delegation economy and the threshold delegation economy. It will be clear later on that the response of the no delegation economy is similar to that of the threshold economy, and as a result, its graphical representation is omitted. Table 4 summarizes the short and long run changes induced by the tax cut for a broader range of variables across these three economies. The online Appendix Section A.6 discusses the sensitivity of the results to the initial level of taxation, τ_{Π}, and to the the tax rebate parameters σ_I and σ_X.

The baseline delegation economy. A 10% reduction of τ_{Π} immediately boostes the profitability of in-house investments (32) and the return on equity (33). It leads to a 0.47% increase in the rate of entry, n, and a 0.65% increase in the rate of firm growth, z, resulting in a 0.63% rise in GDP per capita growth. Besides the direct effect of the tax reduction, there is an indirect effect through agency costs. The lower tax level prompts the owner to rise the R&D bonus, b_I, aiming to lower diversion d_I. Overall, this adjustment causes the R&D delegation surplus to increase by 0.14%. However, in the long run, the tax reform results in a 0.54% drop in per capita GDP growth. Lower taxes incentivize firm entry, which leads to a decrease in firm size,x, and a decline in the rate of investment, z. This eventually converges to a permanently lower steady-state value $z^* < z_0$. Panel B of Figure 3 indicates that, during the first four decades after the reform, the economy exhibits higher per capita income and higher wages compared to a scenario of no tax reform.

The threshold delegation economy. The surplus factors s_X and s_I are both equal to 1 in the threshold economy, and 1.1 in the baseline economy. Therefore, in the threshold economy the short run responses to the profit tax cut are weaker than the those of the baseline economy. In particular, it experiences a 0.46% increase in the entry rate, n, and a 0.62% increase in the firm growth rate, z, compared to the 0.47% and 0.65% increase respectively in the baseline economy. The long run drop in the per capita income growth rate is larger in the threshold economy compared to the baseline economy (0.59% vs. 0.54%). Indeed, the firm's size adjustment is relatively more important in the threshold economy due to the more severe agency issues.

The no delegation economy. The reaction of the no delegation economy to the tax reform is qualitatively similar to that of the threshold economy, but with some quantitative differences. In the short run, the entry and investment rates (n and z) increase by 0.46% and 0.61%, respectively. These increases are smaller compared to the threshold economy and the baseline economy. Specifically, the rise in z is 0.01% and 0.04% smaller than that recorded in the threshold and baseline delegation economies, respectively. Differently from the two delegation economies, the no delegation economy cannot benefit from the governance improvement induced by the tax reform. In the long run, the no delegation economy performs worse than the two delegation economies. Its per capita income growth rate declines by 0.6%, compared to 0.59% and 0.54% in the threshold and baseline delegation economies, respectively. This means that the 0.06% difference with respect to the baseline economy (0.6% minus 0.54%) can be attributed to adjustments in agency costs (0.01%) and to the larger initial firm size resulting from the absence of delegation (0.05%).

7.1.2 Dividend Tax

The dividend tax rate, τ_D, generates similar effects in the three economies because it does not directly affect the in-house investment condition (32) or the agency costs. However, compared to the profit tax, a reduction in the dividend tax has stronger short run effects on entry. For instance, in the baseline economy, a 10% drop in τ_D immediately increases the entry rate n by 0.51%, compared to 0.47% in the case of an equivalent profit tax cut. This indicates that agents tend to allocate their savings more towards creating new firms after the shock. Unlike the profit tax reform, the reduction in τ_D does not alter the internal cost of capital. Nevertheless, the entry effect is sufficiently strong to cause a decline in z. While in the short run, the growth rate of per capita income increases by a modest 0.03%, in the long run, it declines by 0.13%. This long run decline is about twice as large as that resulting from an equivalent profit tax reduction.

In short, agency frictions and management delegation do not alter the main tenet of the corporate view of finance, which states that dividend taxation does not affect the investment plan of the firm. This conclusion aligns with Yagan (2015), who found that the 2003 dividend tax cut in the USA did not have significant near-term consequences on firm investment. In our framework, however, a dividend tax cut stimulates entrepreneurship and thereby reduces the motivation of incumbents to invest. Therefore, in the long run, it lowers the growth rate in economies with or without management delegation.

7.1.3 Executive Income Tax

Although τ_b does not appear explicitly in the steady state expressions for steady-state for firm size and firm growth (see equations 48 and 49), it still affects the economy through agency costs. A cut of the tax rate τ_b lowers agency costs by reducing diversion and the compensation to managers. Consequently, firm growth accelerates while firm size slightly declines. In the short run, the fall in agency costs causes firm growth to overshoot its steady-state value, resulting in an acceleration of wage growth. For instance, a 10% reduction of τ_b causes the growth rate of wages to rise from 2% to 2.09%, in the short run, before declining to the steady state value of 2.06%.

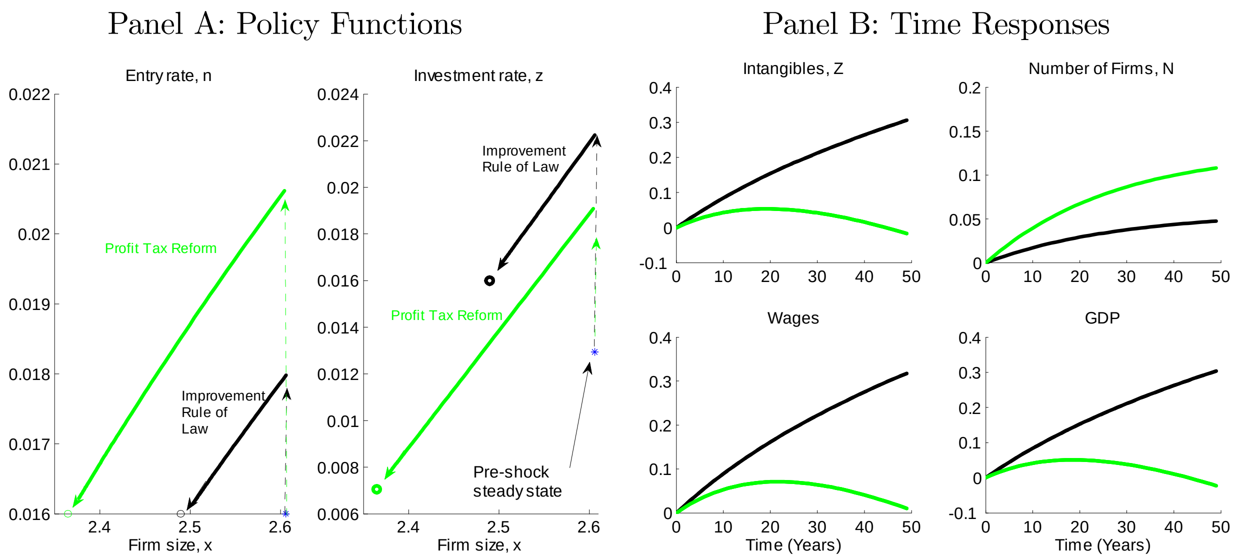
7.2 Improving Investor Protection

A corporate governance framework comprises elements of legislation, regulation, listing rules, contractual undertakings, and business practices. These elements can be modified through various means, including legislative intervention, initiatives of industry associations, or in response to social pressure from different company stakeholders, including customers. Recent reforms affecting corporate governance have focused on aspects ranging from public enforcement to internal governance and disclosure (Enriques and Volpin 2007). The underlying principle behind these reforms is to curb the extraction of private benefits of control by dominant shareholders or other insiders to the detriment of investors (OECD 2022). In short, they aim at reducing agency costs. Several studies have suggested that governance rules concerning the distribution of control power within a firm influence investment decisions, and, eventually, its growth (see Demirgüç-Kunt and Maksimovic 1998; Claessens and Leaven 2003; and Boyd and Solarino 2016 for a survey).

To capture the effect of changes in rules and regulations leading to more effective corporate governance, we increase the values of the diversion cost parameters β_X and β_I . Suppose that the values of these parameters in a threshold economy move up to match those of the baseline economy. Thus, β_X rises from 0.665 to 0.73327 and that of β_I from 0.5316 to 0.6637. The delegation surplus factors s_X and s_I move from 1 to 1.1. These institutional developments boost the economy's long run growth rate by 0.3%, from 1.7% to 2%. In the short run, the improvement in investor protection favors the entry of new firms and encourages incumbent firms to invest more in the stock of knowledge, Z. Specifically, the immediate effect of the changes in β_X and β_I is a 0.2% increase in the entry rate, n, and a 0.94% increase in the incumbents' investment rate, z. Over time, the higher intensity of firm entry tends to reduce firm size, x, and weakens incumbents' incentive to invest. Although the rate of investment, z, declines as it converges to the new steady state, it remains higher than its pre-shock value. Panel A of Figure 4 presents these dynamics and compares them with those triggered by a 10% cut of profit tax rate described in Section 7.1.1.

One major difference between the two policies is the *direction* of change in the long run economic growth: it is positive in the case of an investor protection reform and negative in the case of the profit tax reform. Although both policies lead to a reduction of the firm size

Figure 4: Comparing Reforms Threshold Economy



Note. The darker lines represent a governance reform (higher β_X and β_I); the lighter-colored lines represent a corporate tax reduction of τ_Π by 10%. Panel B plots the log differences of variable between a threshold delegation economy that implements the reform and one that does not.

(x), which tends to weaken the incentives to accumulate knowledge, they act differently on the internal cost of knowledge formation. In the case of the investor protection reform, this cost drops by approximately 10% (equivalent to the increase of s_I); conversely, the cost of capital formation goes up in the case of the profit tax cut, because the R&D tax deduction $\sigma_I \tau_\Pi$ becomes smaller.

A second major difference in the effects of the two policy interventions is the relative strength of the responses of n and z, both in the short run and along the transition. In the profit tax reform, the initial increase in z is approximately 50% larger than that of n, with both moving up by 0.72% and 0.43%, respectively. In contrast, with the governance reform, the increase of z is around 5 times bigger than that of n, amounting to 0.2% vs. 0.94%. In other words, incumbents' investment decisions are significantly more sensitive to an investor protection than to a profit tax reform. This asymmetry stems from the differential effects of the two policies on the internal cost of knowledge formation. Similar differences emerge when the two policies are implemented in the baseline delegation economy (see Tables 4 and 5). In comparison, a 10% expansion of the two surpluses, results in a rise of these two rates by 0.99% and 0.93%. A sensitivity analysis, included in the online Appendix Section A.6, reveals that the economy's responses are approximately proportional to the size of the reform. For instance, a rule of law reform that increases the surplus factors s_I and s_X from 1 to 1.2 causes short an long term consequences about twice as strong as a reform that induces such surplus factors to go from 1 to 1.1. An advantage of choosing on an investor protection reforms that improves the founder's surpluses s_X and s_I by 10% is that the outcome of the experiments is of the same order of magnitude of those resulting from a 10% decline in the profit tax rate. This, for instance, leads to a 0.72% increase in the wage growth rate and a 0.59% increase in the per capita GDP growth rate.

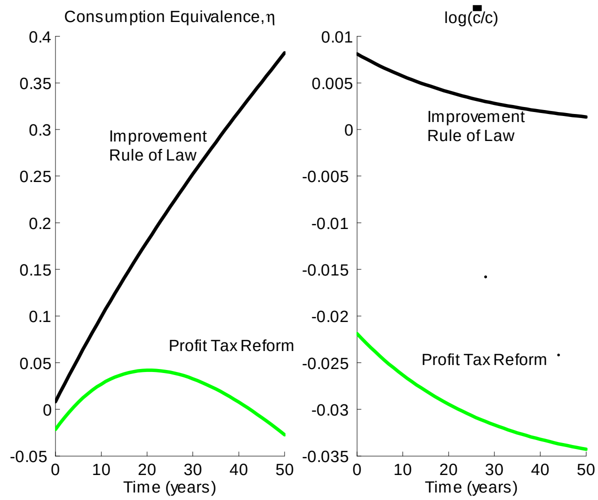
Similar considerations apply to the no delegation economy when comparing a rule of law reform that raises its cost diversion parameters to match the value of those of the threshold economy ($\beta_X = 0.665$ and $\beta_I = 0.5316$) and 10% profit tax cut.

The main takeaway of this section is that although both an investor protection and a profit tax reforms promote short-term growth, only the investor protection reform generates long run growth gains. This is because the profit tax cut is particularly effective in enhancing industry competitiveness, and thus reduce the average firm size, x, whereas the investor protection reform is more effective in incentivizing investments by existing firms. The next section will elaborate on the welfare consequences of these findings.

8 Welfare

In this section, we compare the welfare effects of the tax the rule of law reform and the profit tax reform across the three types of economies. We begin by focusing on the household consumption, C, net of managers' consumption, C^m. Therefore, the analysis starts with the household utility in (11), which, in the delegation economy, does not include the additional consumption of managers. In the previous section, we concluded that the rule of law reform tends to boost aggregate productivity, especially by favoring the innovative investments of existing firms. Conversely, the profit tax reform is relatively more powerful in attracting new firms to the industry. Although this also favors aggregate productivity through horizontal expansion, over time it weakens the motivation of existing firm to invest in R&D. Further-

Figure 5: Welfare Changes



Note. Comparison of a 10% reduction of τ_Π and of a investor protection enhancement of 10% in a delegation threshold economy.

more, the tax reform reduces the fraction of output rebated to households. The analysis of this section will elaborate on these mechanisms to draw conclusions regarding household welfare.

A useful starting point is the reduced-form production function (28) to express the household flow utility in the delegation economy as

$$\log\left(\frac{C}{L}\right) = \varphi + \log c + \log \gamma_X + \epsilon \log N + \log Z, \tag{55}$$

where $\varphi \equiv \frac{2\theta}{1-\theta}\log\theta$. The household cumulated discounted utility is the $\int_0^\infty e^{-(\rho-\lambda)t}\log\left(\frac{C}{L}\right)dt$. This expression remains valid for the no delegation economy provided γ_X is set to one. Such a decomposition of the utility flow separates the contribution to productivity of product quality, Z, from that of product variety, N, and takes into account the possible redistributive effects of a policy intervention through the consumption ratio, c.

To measure the welfare effects in terms of consumption equivalence, we define η as the fraction of consumption to be given to (or taken from) the representative household of the economy that does not implement the reform so that flow of utility of the representative households of two economies are equilized. Hence, denoting with $(\sim)$ the consumption in the treated economy, η solves: $u(\frac{C}{L})(1+\eta) = u(\frac{\tilde{C}}{L})$. Using (55) and assuming that the policy does not alter the founder's delegation decision we have

$$\log(1+\eta) = \log\frac{\tilde{c}}{c} + \epsilon\log\frac{\tilde{N}}{N} + \log\frac{\tilde{Z}}{Z}. \tag{56}$$

Table 6 shows the values of the three terms on the right hand side of (56) and that of η for the three types of economies (no delegation, threshold, and baseline economy) in response to after the 10% reduction of τ_Π at immeditaly after the tax cut and 10 years later. Figure 5 plots the time series of η and of $\log\frac{\tilde{c}}{c}$ over a 50-year period for the baseline delegation economy. In this economy, capital output ratio declines immediately after the tax shock, and then continues to decrease as the economy converges to the long run equilibrium. The decline of the consumption-output ratio is due to shrinking of government transfers to households, H. Nevertheless, the expansion of product variety and of the stock of knowledge provoked by the reform both contribute to an increase in output and income in the medium run. Panel C of Table 6 reports that after 10 years $\epsilon\log\frac{\tilde{N}}{N}$ and $\log\frac{\tilde{Z}}{Z}$ are 0.01 and 0.0443 whereas the term $\log\frac{\tilde{c}}{c} = -0.0274$. These effects combined yield a welfare improvement, measured by an increase of the consumption equivalent variable η, of 0.027. Over a 50-year horizon η exhibits an hampshaped behavior: It is negative in the short run, becomes positive in the medium run, and turns negative again as the economy converges to the new steady state (see Figure 5). While the rise of the stock of knolwedge and the entry of new firms tends to push up the value of η in the first two decades that follow the tax cut, the pattern of $\log\frac{\tilde{Z}}{Z}$ pulls it down afterwards, as incumbent firms invest relatively less in the long run (see Figure 4).

We observe similar qualitative welfare responses in the no delegation and threshold delegation economies. There are, however, small quantitative differences. A notecible one is the larger decline of c in the baseline delegation economy relative to the other two economies, suggesting a relatively larger adjustment of household transfers. Despite the more pronounced initial drop in c, ten years after the shock the the value of its η 10 years is the same as that of the threshold delegation economy and is higher than the no delegation economy. In general, along the adjustment there is some switching in the patterns of η across the three economies; after about four decades η is negative in the three types of economies, with the baseline delegation economy doing relatively better.

Figure 5 contrasts the welfare changes caused by the tax cut with those resulting from

Table 6: Welfare, 10% Cut Profit Tax Rate

		Panel A: No Delegation Economy		
	η	$\log(\tilde{c}/c)$	$\varepsilon\log(\tilde{N}/N)$	$\log(\tilde{Z}/Z)$
Impact	-0.0219	-0.0221	0	0
10 years	0.0261	-0.0264	0.0099	0.0423
		Panel B: Threshold Economy		
	η	$\log(\tilde{c}/c)$	$\varepsilon\log(\tilde{N}/N)$	$\log(\tilde{Z}/Z)$
Impact	-0.0217	-0.0219	0	0
10 years	0.027	-0.0263	0.0099	0.0431
		Panel C: Baseline Economy		
	η	$\log(\tilde{c}/c)$	$\varepsilon\log(\tilde{N}/N)$	$\log(\tilde{Z}/Z)$
Impact	-0.0224	-0.0226	0	0
10 years	0.027	-0.0274	0.0097	0.0443

Table 7: Welfare, Investor Protection Reform

		Panel A: No Delegation Economy		
	η	$\log(\tilde{c}/c)$	$\varepsilon\log(\tilde{N}/N)$	$\log(\tilde{Z}/Z)$
Impact	0.5155	0.0103	0	0
10 years	0.7631	0.0063	0.007	0.1482
		Panel B: Threshold Economy		
	η	$\log(\tilde{c}/c)$	$\varepsilon\log(\tilde{N}/N)$	$\log(\tilde{Z}/Z)$
Impact	0.0081	0.0081	0	0
10 years	0.1721	0.0042	0.007	0.1476
		Panel C: Baseline Economy		
	η	$\log(\tilde{c}/c)$	$\varepsilon\log(\tilde{N}/N)$	$\log(\tilde{Z}/Z)$
Impact	0.0076	0.0075	0	0
10 years	0.1647	0.0035	0.0064	0.1425

Table 8: Consumption Inequality

		Panel A: Threshold Delegation Economy	
Before the Shock	0.246	0.020	0.076
After the Shock:			
Profit Tax	0.236	0.017	0.066
Investor Protection	0.246	0.016	0.059
		Panel B: Baseline Delegation Economy	
	c	C^m/Y	Γ
Before the Shock	0.246	0.016	0.059
After the Shock:			
Profit Tax	0.236	0.013	0.052
Investor Protection	0.246	0.011	0.044

an improvement of the strength in the rule of law. Table 7 summarizes the immediate and 10-year welfare responses of the three economies following the rule of law reform. This is designed as follows: It raises the parameters β_X and β_I of the no delegation economy and of the threshold economy to match the values those parameters in the baseline delegation economy; it raises β_X and β_I in the baseline economy so as to causes an improvement of the founder surpluses s_X and s_I from 1.1 to 1.2. Three main differences are apparent compared to the profit tax reduction. First, upon the implementation of the investor protection reform, the consumption-output ratio jumps up, rather than down. This indicates that households step up their consumption pattern in response to the increased value of their assets. Second, the contribution of product variety to welfare gains is lower compared to the tax policy shock. The third and most significant difference is that the pattern of $\log \frac{\tilde{Z}}{Z}$ and consequently that of η continues to rise. Hence, unlike the profit tax intervention, welfare changes are positive at all time-horizons. For instance, in the baseline economy after 10 years η is up 0.1647 as opposed to 0.027 in the case of the profit tax reform. The contrast between the welfare consequences of the two policies is even more pronounced for the no delegation economy. In addition to the mechanisms described, in a no delegation economy, η accounts for the productivity jump, γ_X. Indeed, in this economy η is calculated as follows:

$$\log(1+\eta) = \log \frac{\tilde{c}}{c} + \log \gamma_X + \epsilon \log \frac{\tilde{N}}{N} + \log \frac{\tilde{Z}}{Z}.$$

This means that upon the implementation of the reform, η jumps up by an additional 50%, corresponding to the $\log(\gamma_X)$.

Inequality. Executive managers can consume more resources than standard representative household, as they extract resources from firms. This is the source of inequality that we focus on – our framework abstracts from other sources of inequality. In Section 5.2 we derived the expression of the consumption of managers relative to final output, C^m/Y (see equation 54). By combining this with the households consumption output-ratio, C/Y, described in equation 52, we can measure consumption inequality as the fraction of managers' consumption, C^m, over the total consumption of the economy, $C^m + C$, denoted as Γ:

$$\Gamma = \frac{C^m}{C^m + C}.$$

Since both C/Y and C^m/Y exhibit relatively flat patterns along the transition (the pattern of C/Y is represented in Figure 2), we focus on their changes in the steady state. We observe that a legislative reform strengthening the rule of law of a delegation economy does not alter its steady state values of c^*(see equation 51). Such a reform, however, reduces the funds managers can appropriate for consumption, C^m/Y, resulting in a decrease of Γ. For instance, implementing a reform in the threshold economy that improves the delegation surpluses s_X and s_I from 1 to 1.1, causes C^m/Y to decrease from 2% to 1.6% and Γ to decline from 7.6% to 5.93%. Interestingly, also a profit tax cut yields a reduction of consumption inequality, albeit to a lesser extent. A 10% reduction in τ_Π in the threshold economy brings C^m/Y down to 1.7% and Γ to 6.6%. This inequality reduction is driven by the improvement of agency frictions – the diversion of R&D managers drops with the tax reduction. Although this induces the government to transfers to households, the decrease in C/Y only slightly mitigates the decline of Γ (see Table 8). In summary, both an improvement in governance and a profit tax cut contribute to reducing the consumption gap between executive managers and representative households.

9 Conclusion

Our primary objective was to investigate the dynamic interplay between agency frictions and business taxation. The worldwide decline of corporate taxes in recent years has sparked debates over its effectiveness in spurring business dynamics and innovative investments. Furthermore, scholars have raised concerns that such tax reform might entail adverse redistributive consequences. More recently, policymakers have shifted their attention towards more fundamental changes aimed at increasing transparency in corporate governance. We employed a Schumpeterian model of endogenous growth with an endogenous market structure to assess the broader macroeconomic implications of these two distinct types of policy interventions. Our framework presented several desirable attributes to evaluate these policies. First, the nature of a firm's governance arises endogenously, contingent upon the vigor of the rule of law and the tax environment. The model generated equilibria featuring varying degrees of management delegation or a complete absence thereof. In our analysis, a weak application of the rule of law and inadequate contract enforcement may deter delegation, resulting in the firm founders to retain control despite their limited managerial prowess. Conversely, founders lean towards delegation when robust governance practices and stringent enforcement curtail managerial opportunism. Thus, delegation becomes viable when the gains from superior managerial skills for owners tip the balance against the costs associated with agency relationships. Our analytical result finds support in cross-country evidence that substantiate a robust link between investor protection to reliance on professional management. Second, the Schumpeterian growth framework puts the firm entry and incumbent investments in innovation at the core of the analysis. Understanding the relative importance of these mechanisms, which are often emphasized by proponents of either reform approach, was the main objective of our quantitative experiments. We contrasted the macroeconomic and welfare effects of a 10% profit tax reduction with those arising from a 10% strengthening in shareholders protection. While in the near term, both types of reforms tend to invigorate firm entry and R&D investments, there are considerable long run differences in terms of income growth. The tax cut tends to curtail incumbent investments in the long run as it attracts new firms and therefore reduces the market size of incumbent firms. The investor protection reform also encourages new entrants to the market, culminating in a gradual decrease in the average size of firms. Nevertheless, the competitive influence stemming from this reform is comparatively less pronounced than that of the profit tax reform. Conversely, incumbent firms exhibits a relatively stronger response to the investor protection reform, owing to its efficacy in reducing the costs associated with knowledge creation. As a result, this reform tends to yield a positive growth effect, both in the short and long terms. The calibrated model also indicated that the investor protection reform reduces manager-household consumption inequality significantly more than the profit tax reform.

We have also shown the observed welfare gains are more pronounced (or the losses less substantial) in economies characterized by management delegation than in those without it. Nevertheless, the quantitative differences are relatively small, because the higher efficiency of the professional managers is partly offset by the agency costs.

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Online Appendix

A.1 Founder's problem and Proposition 1

The Current Value Hamiltonian for the founder's problem is

$$\begin{aligned} CVH_i &= (1-\tau_D)\{(1-\tau_\Pi)[(1-d_X(.))(1-b_{X_i})]\Pi_i - (1-\sigma_I\tau_\Pi)I_i + \\ &\quad -(1-\tau_\Pi)b_{I_i}\gamma_I[1-d_{I_i}(.)]I_i\} + \mu_i\gamma_I(1-d_I(.))I_i \end{aligned}$$

where μ_i is the shadow value of knowledge and $d_X(.)$ and $d_I(.)$ are managers' reaction functions in (16) and (19), that the managers take as given. The first order conditions for compensation, repeated here with self-contained numbering for convenience, are:

$$1-d_{X_i} = -(1-b_{X_i})\frac{\partial d_X(.)}{\partial b_{X_i}} \tag{A1}$$

and

$$1-d_{I_i} = -\left(\frac{\mu_i}{1-\tau_D} - b_{I_i}(1-\tau_\Pi)\right)\frac{\partial d_I(.)}{\partial b_{I_i}}. \tag{A2}$$

The first order condition for investment is

$$(1-\tau_D)\left[\frac{1-\sigma_I\tau_\Pi}{\gamma_I(1-d_{I_i})} + b_{I_i}(1-\tau_\Pi)\right] = \mu_i. \tag{A3}$$

The combination of (A2) and (A3) gives

$$[1-d_{I_i}(.)]^2 = -\frac{1-\sigma_I\tau_\Pi}{\gamma_I}\frac{\partial d_I(.)}{\partial b_{I_i}}.$$

The two reaction functions, (16)-(19), and the founder's optimality conditions, (A1)-(A3) give the interior governance solution $(b_{X_i}, b_{I_i}, d_{X_i}, d_{I_i})$. This solution is time-invariant and firm-invariant. Therefore, we drop the index i from the governance variables and from the shadow value μ_i. The condition for the state variable Z_i is

$$r\mu = (1-\tau_D)(1-\tau_\Pi)(1-b_X)(1-d_X)\frac{\partial \Pi_i}{\partial Z_i} + \dot{\mu}.$$

Using (A3) and the result that $\dot{\mu}=0$, this equation reduces to

$$r = \frac{(1-\tau_\Pi)(1-b_X)(1-d_X)\gamma_X}{\frac{1-\sigma_I\tau_\Pi}{(1-d_I)\gamma_I} + (1-\tau_\Pi)b_I}\alpha\frac{\Pi_i}{Z_i}.$$

Using the definitions $s_X \equiv (1-b_X)(1-d_X)\gamma_X$ and $s_I \equiv \frac{1-\sigma_I\tau_\Pi}{\frac{1-\sigma_I\tau_\Pi}{(1-d_I)\gamma_I}+(1-\tau_b)b_I}$ in (23) and (24), the above expression simplifies to

$$r = \frac{1-\tau_\Pi}{1-\sigma_I\tau_\Pi}s_X s_I \alpha\frac{\Pi_i}{Z_i}, \tag{A4}$$

as reported in equation (25) in Proposition 1. Turning to the entry arbitrage condition, time-differentiation of the firm's value (8) yields

$$r = (1-\tau_D)\frac{D}{V} + \frac{\dot{V}}{V}.$$

Using the free-entry condition $(1-\sigma_X\tau_\Pi)X\chi/\gamma_X = V$ and the definition of dividends in (20) we obtain

$$r = \frac{(1-\tau_D)\gamma_X}{(1-\sigma_X\tau_\Pi)\chi X}\left[(1-\tau_\Pi)\left[(1-d_X)(1-b_X)\right]\Pi - (1-\sigma_I\tau_\Pi)I - (1-\tau_\Pi)b_I\gamma_I(1-d_I)I\right] + \frac{\dot{X}}{X}$$

which is the same as equation (26) in Proposition 1.

A.2 Profit taxes and in-house innovation

Proof of Proposition 3. Consider first the production delegation economy (configuration (i) in Proposition 2) and set $\gamma_I = s_I = 1$, and $b_I = 0$. Hence, the ratio the multiplies the expression in the brackets in (44) reduces to

$$-\frac{(1-\sigma_I)}{(1-\sigma_I\tau_\Pi)^2}s_X\alpha.$$

Because in such an economy the founder's production delegation surplus $s_X > 1$, this ratio is necessarely larger, in absolute value, than the corresponding one in (45). Turning to the R&D delegation economy (configuration (ii) in Proposition 2) we set $\gamma_X = s_X = 1$ and $b_X = 0$. The ratio before the expression of the brackets in (44) now is

$$-\frac{\gamma_I(1-d_I)(1-\sigma_I)}{[1-\sigma_I\tau_\Pi + (1-\tau_\Pi)\gamma_I b_I(1-d_I)]^2}\alpha.$$

This is larger, in absolute value, to the corresponding one in (45) if

$$\frac{\gamma_I(1-d_I)(1-\sigma_I)}{[1-\sigma_I\tau_\Pi + (1-\tau_\Pi)\gamma_I b_I(1-d_I)]^2} > \frac{(1-\sigma_I)}{(1-\sigma_I\tau_\Pi)^2},$$

that is, if

$$\frac{\gamma_I(1-d_I)}{[1+\frac{(1-\tau_\Pi)\gamma_I b_I(1-d_I)}{1-\sigma_I\tau_\Pi}]^2} > 1.$$

Recall that in Section (4.2.1) we argued that the founder wants to delegate if she can reduce the internal cost of capital, namely, if

$$s_I \equiv \frac{1-\sigma_I\tau_\Pi}{\frac{1-\sigma_I\tau_\Pi}{(1-d_I)\gamma_I} + (1-\tau_\Pi)b_I} > 1$$

or, equivalentely, if

$$\frac{\gamma_I(1-d_I)}{1+\frac{(1-d_I)\gamma_I(1-\tau_\Pi)b_I}{(1-\sigma_I\tau_\Pi)}} > 1.$$

Therefore, the condition $s_I > 1$ implies that in configuration (ii), $(\frac{\partial r}{\partial \tau_\Pi})$, in absolute terms, is larger than in the no delegation economy (iv). The proof regarding the full delegation economy (iii) follows immediately from the combination of the two cases just proved.

A.3 Profit taxes and entry: analytics

To understand the direct effect of the profit tax rate τ_Π on the return to entry (equity), in the delegation economy we derive the right-hand side of (30) with respect to τ_Π, taking as given s_I, $\frac{\dot{x}}{x}$ and z. We obtain

$$\begin{aligned}\frac{\partial r_N}{\partial \tau_\Pi} &= -\frac{(1-\tau_D)\gamma_X}{(1-\sigma_X\tau_\Pi)\chi}\left\{s_X\left[\left(\frac{1}{\theta}-1\right)-\frac{\phi}{x}\right]+(-\frac{\sigma_I}{s_I}-\frac{(1-\sigma_I\tau_\Pi)}{s_I^2}s_I')\frac{z}{x}\right\}+\\ &+\frac{\sigma_X\gamma_X}{\chi(1-\sigma_X\tau_\Pi)^2}\left\{(1-\tau_D)(1-\tau_\Pi)s_X\left[\left(\frac{1}{\theta}-1\right)-\frac{\phi}{x}\right]-\frac{(1-\sigma_I\tau_\Pi)z}{s_Ix}\right\},\end{aligned}$$

where

$$s_I' = -\frac{\sigma_I}{\frac{1-\sigma_I\tau_\Pi}{(1-d_I)\gamma_I}+(1-\tau_\Pi)b_I}+\frac{1-\sigma_I\tau_\Pi}{[\frac{1-\sigma_I\tau_\Pi}{(1-d_I)\gamma_I}+(1-\tau_\Pi)b_I]^2}(\frac{\sigma_I}{(1-d_I)\gamma_I}+b_I).$$

The $\frac{\partial r_N}{\partial \tau_\Pi}$ in the no delegation economy can be derived from the previous expression by setting $s_X = s_I = \gamma_I = \gamma_X = 1$:

$$\begin{aligned}\frac{\partial r_N}{\partial \tau_\Pi} &= -\frac{1-\tau_D}{(1-\sigma_X\tau_\Pi)\chi}\left[\left(\frac{1}{\theta}-1-\frac{\phi}{x}\right)-\sigma_I\frac{z}{x}\right]+\\ &+\sigma_X\frac{1-\tau_D}{\chi(1-\sigma_X\tau_\Pi)^2}\left[(1-\tau_\Pi)\left(\frac{1}{\theta}-1-\frac{\phi}{x}\right)-(1-\sigma_I\tau_\Pi)\frac{z}{x}\right].\end{aligned}$$

First, observe that τ_Π tends to have a positive effect on the return on entry through the tax rebate channel represented by σ_X. This effect is even stronger in the delegation economy, where firms are more profitable. Second, setting $\sigma_X = 0$, the entry response to τ_Π is negative in both economies, as it reduces the firm's net profit. However, if $\sigma_I > 0$ this reduction is partly offset by the higher R&D tax deduction. Overall, the effect of τ_Π on r_N in either economy depends on the specific set of parameters.

A.4 Proof of proposition

As stated in the paper, we consider parameters such that both in-house innovation and entry are always positive, i.e., $z > 0$ and $n > 0$. We will proceed in following steps.

Step 1. We time-differentiate the production function (28), and combine the result with the return to saving (13) to obtain

$$r = s_X s_I \frac{1-\tau_\Pi}{1-\sigma_I \tau_\Pi} \alpha \left[\left(\frac{1}{\theta} - 1 \right) x - \phi \right], \tag{A.1}$$

$$r = \frac{1-\tau_D}{(1-\sigma_X \tau_\Pi)\chi} \left\{ (1-\tau_\Pi) s_X \left[\left(\frac{1}{\theta} - 1 \right) - \frac{\phi}{x} \right] - \frac{(1-\sigma_I \tau_\Pi) z}{s_I x} \right\} + \frac{\dot{x}}{x} + z, \tag{A.2}$$

and

$$\frac{\dot{c}}{c} = \frac{\dot{C}}{C} - \frac{\dot{Y}}{Y} = r - \rho + \lambda - \epsilon n - z - \lambda = r - \rho - \epsilon n - z.$$

We then combine this expression with the return to in-house innovation (25) to write

$$\frac{\dot{c}}{c} = \Psi_1 \alpha x \left(\frac{1}{\theta} - 1 - \frac{\phi}{x} \right) - \rho - \epsilon n - z, \tag{A.3}$$

where to make the notation tractable, we define

$$\Psi_1 \equiv \frac{s_I s_X (1-\tau_\Pi)}{1-\sigma_I \tau_\Pi}.$$

Next, we use (6) and the definition of x to write the return to equity in Proposition 1 as

$$r = \Psi_2 \left(\frac{1}{\theta} - 1 - \frac{\phi}{x} \right) - \Psi_3 \frac{z}{x} + \frac{\dot{Y}}{Y} - n,$$

where

$$\Psi_2 \equiv \frac{(1-\tau_D)\gamma_X}{(1-\sigma_X \tau_\Pi)\chi} (1-\tau_\Pi) s_X,$$

and

$$\Psi_3 \equiv \frac{(1-\tau_D)\gamma_X}{(1-\sigma_X \tau_\Pi)\chi} \frac{(1-\sigma_I \tau_\Pi)}{s_I}.$$

We combine the expression just derived with the saving schedule (13) to obtain, after some algebra,

$$n = \Psi_2 \left(\frac{1}{\theta} - 1 - \frac{\phi}{x} \right) - \Psi_3 \frac{z}{x} - \rho + \lambda - \frac{\dot{c}}{c}.$$

We combine the expression with (A.3) to write

$$(1-\epsilon)\, n = (\Psi_2 - \Psi_1 \alpha x) \left(\frac{1}{\theta} - 1 - \frac{\phi}{x} \right) - \left(\frac{\Psi_3}{x} - 1 \right) z + \lambda. \tag{A.4}$$

We have thus reduced the returns to in-house innovation, entry and saving to 2 equations in z, n and $\dot{c}/c$. We need another equation to solve for the 3 variables.

Step 2. Recall that the flow of profits is

$$\Pi = X \left(\frac{1}{\theta} - 1 - \frac{\phi}{x} \right).$$

After some algebra we also have that,

$$D = X\left[(1-\tau_\Pi)s_X\left(\frac{1}{\theta}-1-\frac{\phi}{x}\right)-\frac{1-\sigma_I\tau_\Pi}{s_I}\frac{z}{x}\right]$$

and

$$B = X\left[b_X\left(1-d_X\right)\left(\frac{1}{\theta}-1-\frac{\phi}{x}\right)+b_I\frac{z}{x}\right].$$

Let

$$\psi_0 = \theta^2(\tau_\Pi+\tau_D(1-\tau_\Pi))s_X$$

and

$$\psi_1 = \theta^2\{\tau_b b_I - \tau_D(\frac{1-\sigma_I\tau_\Pi}{\gamma_I(1-d_I)}+b_I(1-\tau_\Pi)) - (\frac{\sigma_I}{\gamma_I(1-d_I)}+b_I)\tau_\Pi\}.$$

Then the taxes over output ratio can be written as

$$\frac{T}{Y} = \psi_0\left(\frac{1}{\theta}-1-\frac{\phi}{x}\right)+\psi_1\frac{z}{x}+\theta^2\tau_b b_X\left(1-d_X\right)\left(\frac{1}{\theta}-1-\frac{\phi}{x}\right)-\theta^2\sigma_X\tau_\Pi n\frac{\chi}{\gamma_X}$$

Therefore, we write the transfer ratio as

$$\frac{H}{Y} = \tau_H\frac{T}{Y} = \tau_H\theta^2\left[\hat{\tau}_\Pi\left(\frac{1}{\theta}-1-\frac{\phi}{x}\right)-\hat{\tau}_I\frac{z}{x}-\sigma_X\tau_\Pi n\frac{\chi}{\gamma_X}\right]$$

where

$$\hat{\tau}_\Pi \equiv (\tau_D(1-\tau_\Pi)+\tau_\Pi)s_X+\tau_b\gamma_X b_X\left(1-d_X\right),$$

and

$$\hat{\tau}_I \equiv [\sigma_I+b_I\gamma_I(1-d_I)]\tau_\Pi\gamma_I(1-d_I)+\tau_D\frac{1-\sigma_I\tau_\Pi}{s_I}-\tau_b b_I.$$

To summarize the dependence of the transfer ratio on x and c, we define the function

$$h\left(x,c\right) \equiv \tau_H\theta^2\left[\hat{\tau}_\Pi\left(\frac{1}{\theta}-1-\frac{\phi}{x}\right)-\hat{\tau}_I\frac{z(c,x)}{x}-\sigma_X\tau_\Pi n(c,x)\frac{\chi}{\gamma_X}\right].$$

Next, we use the free-entry condition, $NV = (1-\sigma_X\tau_\Pi)N\frac{\chi}{\gamma_X}X = (1-\sigma_X\tau_\Pi)\frac{\chi}{\gamma_X}\theta^2 Y$, and the saving rule (13), to obtain

$$\frac{\dot{N}V+N\dot{V}}{NV} = \rho-\lambda+\frac{\dot{C}}{C}+\frac{wL+H-C}{NV}.$$

After rearranging terms, this becomes

$$\frac{\dot{c}}{c} = \frac{c-(1-\theta)-h\left(x,c\right)}{(1-\sigma_X\tau_\Pi)\theta^2\chi/\gamma_X}+\left(\lambda-\rho\right),$$

which is equation (52) in Proposition 4.

Step 3. We combine (52) and (A.3) to write

$$\frac{\dot{c}}{c} = \Psi_1 \alpha x \left(\frac{1}{\theta} - 1 - \frac{\phi}{x} \right) - \rho - \epsilon n - z.$$

We solve this equation jointly with that in (A.4) to obtain:

$$n(x,c) = \frac{\left(\Psi_2 - \Psi_1 \alpha x (1 + \hat{\Psi}_3) - \hat{\Psi}_3 \frac{\tau_H \hat{\tau}_\Pi \gamma_X}{(1-\sigma_X \tau_\Pi)\chi} \right) \left(\frac{1}{\theta} - 1 - \frac{\phi}{x} \right) + \lambda (1 + \hat{\Psi}_3) + \hat{\Psi}_3 \frac{(c-1+\theta)\gamma_X}{(1-\sigma_X \tau_\Pi)\chi \theta^2}}{1 - \epsilon - (\epsilon + \frac{\tau_H \sigma_X \tau_\Pi}{1-\sigma_X \tau_\Pi}) \hat{\Psi}_3}$$

where $\hat{\Psi}_3 = \frac{\frac{\Psi_3}{x} - 1}{1 + \frac{\tau_H \hat{\tau}_I \gamma_X}{(1-\sigma_X \tau_\Pi)\chi} \frac{1}{x}}$ and

$$z(x,c) = \frac{(\Psi_1 \alpha x + \frac{\tau_H \hat{\tau}_\Pi \gamma_X}{(1-\sigma_X \tau_\Pi)\chi}) \left(\frac{1}{\theta} - 1 - \frac{\phi}{x} \right) - (\epsilon + \frac{\tau_H \sigma_X \tau_\Pi}{1-\sigma_X \tau_\Pi}) n - \frac{(c-1+\theta)\gamma_X}{(1-\sigma_X \tau_\Pi)\chi \theta^2} - \lambda}{1 + \frac{\tau_H \hat{\tau}_I \gamma_X}{(1-\sigma_X \tau_\Pi)\chi} \frac{1}{x}}$$

Step 4. Now that we have $n(x,c)$ and $z(x,c)$, two functions characterize the equilibrium behavior of firms and entrepreneurs. The first is the R&D intensity function $\frac{z(x,c)}{x}$. Accounting for the corner solutions due to the non-negativity constraints $\frac{1-\theta}{\theta} - \frac{\phi}{x} \geq 0$ and $z \geq 0$, this function has the following properties: (i) it is positive for $x > x_Z(c) > \frac{\phi\theta}{1-\theta} > 0$; (ii) it is monotonically increasing and bounded above in x, converging to the value $z_\infty(c) > 0$; (iii) it is monotonically decreasing in c. Then, we have

$$\dot{c} \geq 0 : \quad c \geq c(x)_{\dot{c}=0},$$

where

$$c(x)_{\dot{c}=0} \equiv \arg\text{solve} \left\{ \begin{array}{c} c = \tau_H \theta^2 \left[\hat{\tau}_\Pi \left(\frac{1}{\theta} - 1 - \frac{\phi}{x} \right) - \sigma_X \tau_\Pi \frac{\chi}{\gamma_X} n(x,c) - \hat{\tau}_I \frac{z(x,c)}{x} \right] + \\ +1 - \theta + (1 - \sigma_X \tau_\Pi) \frac{\chi}{\gamma_X} \theta^2 (\rho - \lambda) \end{array} \right\}.$$

Applying the implicit function theorem, we establish that $c(x)_{\dot{c}=0}$ has the following properties: (i) it starts with value $c\left(\frac{\phi\theta}{1-\theta}\right)_{\dot{c}=0} = 1 - \theta + (1 - \sigma_X \tau_\Pi) \frac{\chi}{\gamma_X} \theta^2 (\rho - \lambda)$ for $x = \frac{\phi\theta}{1-\theta}$; (ii) it is monotonically increasing and bounded above in x, converging to

$$c(\infty)_{\dot{c}=0} = \arg\text{solve} \left\{ c = \tau_H \theta^2 \left[\hat{\tau}_\Pi \left(\frac{1}{\theta} - 1 \right) - \sigma_X \tau_\Pi \frac{\chi}{\gamma_X} \frac{\lambda}{1-\epsilon} - \hat{\tau}_I z_\infty(c) \right] + 1 - \theta + \frac{\chi}{\gamma_X} \theta^2 (\rho - \lambda) \right\}.$$

The second function is the entry function $n(x,c)$, which, accounting for the corner solutions due to the non-negativity constraints $\frac{1-\theta}{\theta} - \frac{\phi}{x} \geq 0$ and $n \geq 0$, has the following properties: (i) it is positive for $x > x_N(c) > \frac{\phi\theta}{1-\theta} > 0$; (ii) it is monotonically increasing and bounded above in x, converging to the value $n_\infty(c) > 0$; (iii) it is monotonically decreasing in c. Then, we have

$$\dot{x} \geq 0: \quad n(x, c) \geq \frac{\lambda}{1-\epsilon}.$$

Applying the implicit function theorem, we establish that $c(x)_{\dot{x}=0}$ has the following properties: (i) it is positive for $x > x_N > 0$, where

$$x_N = \arg\text{solve}\left\{n(x, 0) = \frac{\lambda}{1-\epsilon}\right\};$$

(ii) it is monotonically increasing and bounded above in x, converging to

$$c(\infty)_{\dot{c}=0} = \arg\text{solve}\left\{n(\infty, c) = \frac{\lambda}{1-\epsilon}\right\}.$$

The resulting phase diagram shows that the system is saddle path stable. We denote the saddle path $c = c_{sp}(x)$ and note that is is upward sloping and lies within the band

$$c\left(\frac{\phi\theta}{1-\theta}\right)_{\dot{c}=0} < c_{sp}(x) < c(\infty)_{\dot{c}=0}.$$

This band can be quite narrow, suggesting that the saddle path can be nearly flat. Indeed, this is what we find in our calibration.

A.5 GE accounting

In this section, we verify that the households budget constraint (12) is consistent with the economy's resource constraints. In doing so we also review key accounting relationships. The budget constraint in (12) can be written as

$$\dot{N}V = (1-\tau_D) D + wL + \tau_H T + (1-\tau_H)T - G - C.$$

Since the government runs a government budget $G = (1-\tau_H)T$. It follows that

$$\dot{N}V = (1-\tau_D) D + wL + T - G - C.$$

We now explicit managers' consumption

$$C^m = N\left[(1-\tau_b) B + d_X \Pi + d_I I\right],$$

where

$$B = b_X (1-d_X) \Pi + \gamma_I (1-d_I) b_I I.$$

Therefore, we have:

$$\dot{N}V = (1-\tau_D) ND + wL + T - G - C - C^m + N\left[(1-\tau_b) B + d_X \Pi + d_I I\right]$$

Combining this with the expression in (31), reported here for conveinence,

$$T = N\{\tau_D D + \tau_\Pi (1-d_X)(1-b_X)\,\Pi - [\sigma_I + b_I\gamma_I(1-d_I)]\tau_\Pi I - \sigma_X \tau_\Pi n \frac{\chi}{\gamma_X} X + \tau_b B\},$$

we obtain

$$\begin{aligned} \dot{N}V &= ND + wL + \tau_\Pi (1-d_X)(1-b_X)\,N\Pi - [\sigma_I + b_I\gamma_I(1-d_I)]\tau_\Pi NI + \\ &\quad -\sigma_X\tau_\Pi n\frac{\chi}{\gamma_X}X - G - C - C^m + N\left[B + d_X\Pi + d_I I\right]. \end{aligned}$$

Recall that the flow of dividends (20) is

$$D = (1-\tau_\Pi)\left[(1-d_X)(1-b_X)\right]\Pi - (1-\sigma_I\tau_\Pi)I - (1-\tau_\Pi)b\gamma_I(1-d_I)I.$$

The last two equations combined become

$$\begin{aligned} \dot{N}V &= (1-\tau_\Pi)\left[(1-d_X)(1-b_X)\right]N\Pi - (1-\sigma_I\tau_\Pi)NI - (1-\tau_\Pi)b\gamma_I(1-d_I)NI \\ &\quad + wL + \tau_\Pi (1-d_X)(1-b_X)\,N\Pi - [\sigma_I + b_I\gamma_I(1-d_I)]\tau_\Pi NI - \sigma_X\tau_\Pi n\frac{\chi}{\gamma_X}X \\ &\quad - G - C - C^m + b_X\,(1-d_X)\,N\Pi + \gamma_I(1-d_I)b_I NI + d_X N\Pi + d_I NI, \end{aligned}$$

where we also replaced B with $b_X\,(1-d_X)\,\Pi + \gamma_I(1-d_I)b_I I$.

Simplifying terms, the above expression becomes

$$\dot{N}V = N\Pi - (1-d_I)NI + wL - \sigma_X\tau_\Pi n\frac{\chi}{\gamma_X}X - G - C - C^m.$$

We use the entry condition $V = (1-\sigma_X\tau_\Pi\chi)X$ and obtain

$$\frac{\dot{N}}{N}(1-\sigma_X\tau_\Pi)\frac{\chi}{\gamma_X}NX = N\Pi - (1-d_I)NI + wL - \sigma_X\tau_\Pi n\frac{\chi}{\gamma_X}X - G - C - C^m$$

or

$$\dot{N}\frac{\chi}{\gamma_X}X = N\Pi - (1-d_I)NI + wL - G - C - C^m.$$

Recall that $\Pi = (P-1)X - \phi\gamma_X Z$, that $PNX = \theta Y$, and that $wL = (1-\theta)Y$. Therefore we have

$$\dot{N}\frac{\chi}{\gamma_X}X = \theta Y - NX - (1-d_I)NI + (1-\theta)Y - G - C - C^m,$$

that can be rearranged as

$$Y = G + C + C^m + \dot{N}\frac{\chi}{\gamma_X}X + [X + (1-d_I)I]N.$$

This says that one part of the flow of the final good is consumed by the government and by the households and managers; another part is used to set up new firms. The remaining resources are used by intermediate firms to produce intermediate products and to accumulate the stock of knowledge – only a share of $1-d_I$ of the allocated funds is effectively employed by the firm to accumulate knowledge, as the share d_I is diverted by the R&D managers and is included in C^m.

A.6 Sensitivity Analysis

This objective of this section is to examine the sensitivity of the quantitative and welfare results presented in Sections 7 and 8 to institutional specifications and the initial set of taxes. We explore the effects of a profit tax reform on economies with different initial profit tax rates (τ_{Π}) or initial R&D allowances (σ_I, σ_X). Additionally, we investigate whether the effects of the rule of law reform are proportional to the magnitude of the reform and whether they depend on the initial state of the rule of law. Tables A1 and A2 provide a summary of the results.

Initial profit tax rate. When the initial τ_{Π} is smaller, the three types of economies are less sensitive to a tax reform, both in the short and long run. This finding is mainly due to industry dynamics. In our framework, a country with a low profit tax is characterized by relatively smaller firms, as measured by x. Consequently, in the short run, the rate of innovation, z, experiences a relatively smaller increase. For instance, the immediate response of z in the baseline delegation economy with $\tau_{\Pi} = 0.38$, is a rise of 0.65%, whereas in the same economy with $\tau_{\Pi} = 0.28$ it is 0.49%. Similarly, the steady state variation of z in the these two economies is -0.54% and -0.35%, respectively.

Regarding welfare, in contrast to the baseline delegation economy where positive welfare gains persist for at least half a century after the shock, the economy with a lower initial τ_{Π}, tends to experience negative welfare changes during this time interval, except for a few years following approximately a decade of the shock. The decrease in the inequality measure, Γ, is about half of that observed in the baseline delegation economy (0.6% vs. 1.03%). This outcome can be attributed to the fact that the surplus extracted by managers, C^m/Y, is positively related to the size of the firm, x (see Table A1).

Initial R&D tax deduction. The degree of R&D tax deductibility frequently changes. Currently, in most countries, it is only a fraction of the actual spending. A recent study (OECD 2021) indicates that the average rate for the OECD countries is 20% and that of the USA is 5% (this is the value we used for the main calibration). We find that the effects of a profit tax cuts show very little sensitivity to σ_I and σ_X. Panel A of Table A1 indicates that the short and long-run responses of economies with $\sigma_I = 0.1$ or $\sigma_X = 0.1$, are similar to those of the baseline delegation economy. While the differences in responses are small, it appears that the deduction of R&D of incumbent firms, σ_I, matters relatively more than that for firm creation, σ_X. This finding can be explained by the observation that that the profit tax interacts with the R&D agency costs in incumbent firms, whereas there are no agency costs for the creation of a new firm. With a larger σ_I, the surplus, s_I , reacts more strongly. For instance, when $\sigma_I = 0.1$, the change in s_I is 0.28%, whereas in an economy with $\sigma_I = 0.05$, it is half of that. The decline of the welfare inequality index, η, is also more modest with $\sigma_I = 0.1$ or with $\sigma_X = 0.1$ (see Table A1).

Initial rule of law and size of the reform. The initial characterization of the economy in terms of agency costs has little consequence for quantifying the outcome of a rule of law reform. In particular, an increase in the diversion costs (β_I, β_X) causes slightly stronger near-term reactions in the threshold economy compared to the baseline delegation economy (see Tables 4, 5, and A2). This result is influenced by the property that the initial firm size, x_0, is greater in the threshold economy than in the baseline delegation economy (2.608 and 2.490, respectively, as shown in Table 3). The reduction of inequality is also slightly more pronounced in the threshold economy than in the baseline delegation economy: The reform that expands the owners' surplus by 10% causes their respective Γ to go down by 1.69% and 1.54%. As discussed in Section 7.2, a rule of law reform that triggers delegation in the non-delegation economy would have a multiplication effect output according to the productive factor γ_X. However, the short run responses of the rate of entry and the rate of innovation of the non-delegation economy would similar to those of the threshold economy. The long run change in the income growth rate is the same across the three types of economies. We have also determined that the economy's responses are approximately proportional to the size of the reform. For instance, a rule of law reform that increases the surplus factors s_I and s_X from 1 to 1.2 causes short and long term consequences that are about twice as strong as a reform that induces such surplus factors to go from 1 to 1.1 (see Table A2).

Table A1: 10% Cut of Profit Tax Rate, Sensitivity Analysis

Panel A: Short and Long Run Changes

	Impact				Long Run			
	Baseline	τ_Π=0.28	σ_I=0.1	σ_X=0.1	Baseline	τ_Π=0.28	σ_I=0.1	σ_X=0.1
x	0	0	0	0	-0.1996	-0.1274	-0.2025	-0.1884
c	-0.0055	-0.0045	-0.0055	-0.0052	-0.0088	-0.0064	-0.0088	-0.0085
n	0.0047	0.0039	0.0047	0.0046	0	0	0	0
z	0.0065	0.0049	0.0065	0.0064	-0.0054	-0.0035	-0.0058	-0.005
y	0.0077	0.0059	0.0077	0.0076	-0.0054	-0.0035	-0.0058	-0.005
gdp	0.0063	0.0046	0.0062	0.0062	-0.0054	-0.0035	-0.0058	-0.005
d_X	0	0	0	0	0	0	0	0
b_X	0	0	0	0	0	0	0	0
d_I	-0.0022	-0.0022	-0.0044	-0.0022	-0.0022	-0.0022	-0.0044	-0.0022
b_I	0.0019	0.0019	0.0039	0.0019	0.0019	0.0019	0.0039	0.0019
s_X	0	0	0	0	0	0	0	0
s_I	0.0014	0.0014	0.0028	0.0014	0.0014	0.0014	0.0028	0.0014
C^m/Y					-0.0036	-0.0019	-0.0026	-0.0025
Γ					-0.0103	-0.006	-0.0078	-0.0075

Panel B: Welfare Changes

(i) Baseline Delegation Economy

	η	$\log(\tilde{c}/c)$	$\varepsilon\log(\tilde{N}/N)$	$\log(\tilde{Z}/Z)$
Impact	-0.0224	-0.0226	0	0
10 years	0.027	-0.0274	0.0443	0.1425

(ii) τ_Π=0.28

	η	$\log(\tilde{c}/c)$	$\varepsilon\log(\tilde{N}/N)$	$\log(\tilde{Z}/Z)$
Impact	-0.019	-0.0192	0	0
10 years	0.024	-0.0244	0.012	0.0361

(iii) σ_I=0.1

	η	$\log(\tilde{c}/c)$	$\varepsilon\log(\tilde{N}/N)$	$\log(\tilde{Z}/Z)$
Impact	-0.0223	-0.0226	0	0
10 years	0.0367	-0.0304	0.0158	0.0507

(iv) σ_X=0.1

	η	$\log(\tilde{c}/c)$	$\varepsilon\log(\tilde{N}/N)$	$\log(\tilde{Z}/Z)$
Impact	-0.0215	-0.0217	0	0
10 years	0.0408	-0.0294	0.0152	0.0541

Table A2: Rule of Law, Sensitivity Analysis

Panel A: Short and Long Run Changes

	Baseline	Threshold Economy		Baseline	Threshold Economy	
	Basic	Basic	Bigger Reform	Basic	Basic	Bigger Reform
x	0	0	0	-0.0922	-0.1164	-0.2086
c	0.0018	0.002	0.0041	-0.0001	-0.0001	-0.0003
n	0.0019	0.002	0.0043	0	0	0
z	0.009	0.0094	0.0197	0.0033	0.0031	0.0063
y	0.0095	0.0099	0.0208	0.0033	0.0031	0.0063
gdp	0.0089	0.0093	0.0196	0.0033	0.0031	0.0063
d_X	-0.0334	-0.0341	-0.0675	-0.0334	-0.0341	-0.0675
b_X	-0.0445	-0.0455	-0.09	-0.0445	-0.0455	-0.09
d_I	0	0	0	0	0	0
b_I	-0.0991	-0.1174	-0.2165	-0.0991	-0.1174	-0.2165
s_X	0.1	0.1	0.2	0.1	0.1	0.2
s_I	0.1	0.1	0.2	0.1	0.1	0.2
C^m/Y				-0.0042	-0.0048	-0.009
Γ				-0.0154	-0.0169	-0.0323

Panel B: Welfare Changes

(i) Baseline Economy, Basic Reform

	η	$\log(\tilde{c}/c)$	$\varepsilon\log(\tilde{N}/N)$	$\log(\tilde{Z}/Z)$
Impact	0.0075	0.0074	0	0
10 years	0.1633	0.0035	0.0063	0.1414

(ii) Threshold Economy, Basic Reform

	η	$\log(\tilde{c}/c)$	$\varepsilon\log(\tilde{N}/N)$	$\log(\tilde{Z}/Z)$
Impact	0.0083	0.0082	0	0
10 years	0.1737	0.0042	0.0071	0.1488

(iii) Threshold Economy, Bigger Reform

	η	$\log(\tilde{c}/c)$	$\varepsilon\log(\tilde{N}/N)$	$\log(\tilde{Z}/Z)$
Impact	0.0165	0.0164	0	0
10 years	0.3824	0.0075	0.0147	0.3016