Financial Markets, Industry Dynamics, and Growth

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Abstract

We study the impact of corporate governance frictions in an economy where growth is driven both by the foundation of new firms and by the in-house investment of incumbent firms. Firms’ managers engage in resource diversion and empire building to the detriment of shareholders. Incentive compensation contracts and shareholders’ monitoring help discipline managers. The analysis reveals that the conflicts among firms’ stakeholders inhibit the entry of new firms, thereby increasing market concentration. In the long run the frictions can however lead incumbent firms to invest more aggressively in product improvement to exploit the concentrated market structure. By means of quantitative analysis, we characterize conditions under which corporate governance reforms boost or reduce welfare.

Keywords: Endogenous Growth, Market Structure, Financial Frictions, Corporate Governance.

JEL Codes: E44, O40, G30

1 Introduction

The quality of financial markets, including their ability to govern conflicts among firms’ financiers, managers and other stakeholders, is increasingly viewed as a major determinant of the long-run performance of industrialized and emerging economies. Several scholars argue that cross-country differences in growth and productivity can be attributed to a significant extent to differences in corporate governance (Bloom and Van Reenen, 2010; La Porta, Lopez-de-Silanes, Shleifer and Vishny, 2000). Recent empirical studies confirm the importance of corporate governance in the growth process (see, e.g., De Nicolo’, Laeven and Ueda, 2008). The OECD (2012) summarizes this body of evidence by arguing that “corporate governance exerts a strong influence on resource

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allocation. It impacts upon innovative activity and entrepreneurship. Better corporate governance, therefore, both within OECD and non-OECD countries should manifest itself in enhanced corporate performance and can lead to higher economic growth.”

Although there is a broad consensus that corporate governance can be relevant for growth, there is little agreement about the channels through which its effect operates. On the one hand, the advocates of the “rule of law” view maintain that economies in which financial markets guarantee stronger shareholder protection and managerial discipline enjoy more intense competition and better growth performance. According to this view, the inability of some emerging economies to ameliorate corporate governance problems hinders their efforts to catch up with advanced economies. On the other hand, the governments of several emerging countries and of some advanced ones have often pursued financial and corporate policies that have accommodated the informational opacity of businesses in financial markets as well as managers’ empire building attitudes (OECD, 2010). The experience of business groups – ubiquitous in middle-income countries – is paradigmatic in this respect. Many governments have enacted policies that have protected business group affiliates, allowing them to disclose limited information to financial markets. A consequence has been that managers of large group affiliates have often been able to engage in resource diversion at the expense of shareholders. In addition, in the belief that large businesses would better compete in global markets, governments have often favored the appointment of managers with empire building attitudes. The advocates of these policies stress that large business group affiliates have engaged in aggressive investment policies and turned out to be the engines of the rapid growth of several countries, such as Korea, Indonesia, Thailand, Brazil, Chile, and Japan. By contrast, their opponents maintain that these policies have forestalled competition and inhibited entrepreneurship. The impact on economic growth and the overall welfare consequences thus remain ambiguous a priori (see, e.g., Khanna, 2000, and Morck, Wolfenzon and Yeung, 2005, for a discussion).

This paper aims at shedding new light on this debate. Regardless of which view one endorses, the above discussion implies that, to understand the effects of corporate governance frictions on the long-run performance of an economy, one needs to investigate how such frictions influence both entrepreneurship, that is, the ease with which new firms can enter product markets, and the speed at which incumbent firms grow. On the extensive (firm entry) margin, scholars document the profound effects that corporate governance reforms have had on the market structure of various countries in recent decades, influencing the ease with which new firms can enter product markets, and the speed at which incumbent firms grow. On the intensive (incumbents’ investment) margin, there is established evidence that corporate governance frictions can distort upward or downward the investment decisions of incumbent firms (see, e.g., Aghion, Van Reenen and Zingales, 2013; Shleifer and Vishny, 1997; Morck, Wolfenzon and Yeung, 2005). Figure 1 offers suggestive evidence that in countries with lower degree of investor protection, incumbent firms tend to engage in somewhat more aggressive policies of investment in intangible
assets (a key driver of product improvement).\textsuperscript{1} Clearly, analyzing how corporate governance shapes both the entry of new firms and the growth of incumbent ones can also yield far-reaching insights for the current policy debate. The Great Recession has led to calls for financial and corporate reforms. Reforms that boost the investments of incumbent firms may entail a cost in terms of more rigidity in the entry of new firms and, hence, in the market structure (The Economist, 2012).

To explore these issues, we embed corporate governance frictions in a model economy where endogenous growth is driven both by the foundation of new firms that offer new intermediate products (the entry/extensive margin) and by the investment of incumbent firms in the improvement of their existing intermediate products (the investment/intensive margin). The economy is populated by households, who, besides working for firms, can act as firm managers and shareholders. Managers are in charge of production and investment decisions concerning existing products. The critical feature of our economy consists of the presence of conflicts between managers and shareholders. We model such conflicts taking a leaf from the finance literature. In particular, as in Nikolov and Whited (2014), managers can divert resources from firms (stealing) and pursue private benefits tied to firm size (empire building). Shareholders can discipline managers through internal control mechanisms. They can design incentive compensation (equity-based) contracts, surrendering part of firms’ surplus to managers. In a richer specification, they can also discipline managers by monitoring and by issuing a “hard claim”, debt.\textsuperscript{2} This way of modelling corporate governance frictions not only replicates prior studies but also matches the above-mentioned evidence on the corporate governance problems of several countries in recent decades.

We examine how corporate governance frictions affect incumbents’ investment and the entry of new firms and, through these margins, the market structure and growth. The analysis reveals that both resource diversion and empire building alter the market structure by exerting an upward pressure on the size of firms and slowing down the entry of new firms. This, in turn, implies that both frictions depress the variety of intermediate products. Intuitively, the corporate governance frictions act as an additional barrier to the entry of new firms, forcing shareholders not only to sustain standard technological entry costs, but also to commit additional expected returns to managers to mitigate conflicts inside firms. At the same time that they stiffen the entry/extensive margin by raising the cost of equity capital, the corporate governance frictions induce more aggressive investment by incumbent firms. They do so by directly distorting investment returns upward, especially in the case of empire building. And they do so through general equilibrium effects, by inducing a

\textsuperscript{1}In Figure 1, investor protection is the average of three 1-10 indices for extent of disclosure, extent of director liability, and ease of shareholder suits (World Bank’s Doing Business database, 2013 update). The data on firm entry refer to 99 industrialized and emerging countries. Firm entry is measured by the number of new limited liability corporations registered in 2012 per 1,000 people aged 15-64 (World Bank’s Entrepreneurship Survey and database). The data on incumbent firms’ investment in intangible assets refer to 42 industrialized and emerging countries. They represent the 2013 average rate of investment in intangible assets of manufacturing firms with at least four years of activity. For each country, the firm-level data constitute the whole sample of manufacturing firms with at least four years of activity covered by the Orbis database of Bureau van Dijk.

\textsuperscript{2}In this richer setting, we allow for conflicts between monitoring and non-monitoring shareholders, on top of the conflicts between managers and shareholders. In particular, monitors can shirk on their monitoring activity.
consolidation of the market structure. Intuitively, exactly because of the market consolidation and
the larger firm size sustainable in equilibrium, incumbents can reap larger benefits from investing
in the improvement of their products.

As suggested by the aforementioned debate, the welfare implications of corporate governance
frictions are not obvious a priori. The endogenous growth model in which we embed the frictions
is plagued by inefficiencies unrelated to corporate governance. Investment externalities tend to
distort firms’ investment below the welfare-maximizing level. And entry externalities can distort
firm entry below or above the optimal rate. The corporate governance frictions inhibit the entry
of new firms and shrink the array of intermediate products while inducing incumbents to invest
more aggressively. In some regions of parameters, these effects can dampen the impact of the
underlying frictions of the economy, mitigating underinvestment and excessive fragmentation of
the market structure. However, consistent with the rule of law view, in other parameter regions
these effects exacerbate those of the underlying distortions, leading to overinvestment and excessive
market concentration. Overall, the results of our quantitative analysis suggest that ameliorating
corporate governance promotes welfare more in countries with poor initial governance (e.g., emerg-
ing countries) than in countries with good initial governance (e.g., advanced economies). This has
important policy implications: the arguments often put forward in emerging countries to justify
firms’ informational opacity in financial markets and managers’ empire building behavior appear
to be misplaced.

The remainder of the paper is organized as follows. Section 2 relates the analysis to prior
literature. Sections 3 and 4 present the benchmark growth model, introduce corporate governance
frictions, and solve for agents’ decisions. Section 5 characterizes the general equilibrium structure
and solves for the steady state. In Sections 6 and 7, we investigate the dynamics of the economy
and the response to shocks to corporate governance frictions, for example reflecting corporate
governance reforms. Sections 8-10 study possible extensions and the robustness of the results.
Section 11 concludes. The proofs of the model are relegated to the Technical Appendix.

2 Prior literature

There is a growing literature on the role of financial markets in the growth process. Yet, little
is known about the role of corporate governance frictions, especially when we take the market
structure of the economy into account. Despite early attempts and calls for more research (see,
e.g., Aghion and Howitt, 1998), theoretical work on how corporate governance affects growth has
lagged behind the policy-oriented debate. A notable exception is recent work by Akcigit, Alp and
Peters (2014). Akcigit et al. consider an effort model in which the entry rate of new firms is given.
By holding up firms ex post, managers can discourage the increase in the scope of firms’ product
lines. Thus, in their model corporate governance frictions hamper the expansion of the range of
activities of incumbent firms. Other papers that study the long-run effect of corporate governance
include Caselli and Gennaioli (2013) and Cooley, Marimon and Quadrini (2014). Caselli and
Gennaioli (2013) model an economy in which credit market frictions can induce the transmission of firm ownership to inefficient heirs, inhibiting the reallocation of ownership to more productive agents. In turn, such a misallocation of ownership slows down growth. Cooley, Marimon and Quadrini (2014) investigate the long-run aggregate implications of corporate governance frictions inside financial firms. In particular, they study the effects of financial managers’ risk taking, when this risk taking influences the value of managers’ outside option. Our paper is also related more broadly to the literature on the impact of imperfect financial markets on growth (see, e.g., Aghion, Howitt and Mayer-Foulkes, 2005; Cooley and Quadrini, 2001; Greenwood and Jovanovic, 1990, and Bencivenga and Smith, 1991).

From a modelling point of view, because our goal is to understand how corporate governance affects both the behavior of entrepreneurs in establishing new firms and the investment decisions of incumbent firms, we build on the literature that has extended models of endogenous growth to include endogenous market structure (see, e.g., Peretto, 1996 and 1999, and, for a recent survey, Etro, 2009). A further important feature of this class of models is the neutrality of the aggregate size of the market with respect to the long-run growth of per capita income. This neutrality implies that fundamentals and policy variables that work through the size of the aggregate market have no growth effects, whereas fundamentals and policy variables that reallocate resources between incumbents’ investment and firm entry do have long-run growth effects (see, e.g., Peretto, 1998 and 1999; Dinopoulos and Thompson, 1998; Young, 1998; Howitt, 1999). This feature is particularly useful for our purposes because it allows us to study the impact of corporate governance reforms in an economy with growing population and an expanding variety of products.

Finally, the paper also relates to the literature that studies the investment distortions induced by corporate governance frictions. Immordino and Pagano (2012) examine the impact of managers’ empire building in a partial equilibrium model where managers can either be incentivized through the participation to firms’ equity or be audited by active shareholders. We follow a similar approach in modelling managers’ incentive structure. Eisfeldt and Rampini (2008) investigate firms’ investment decisions over the business cycle when managers derive private benefits from the capital under their control, due, for instance, to empire building motives. A few static partial equilibrium studies suggest that the agency costs structure of businesses in emerging countries prompts them to pursue aggressive investment policies (see, e.g., Bebchuk, Kraakman and Triantis, 1999; Lee, 2000). Indeed, several empirical studies find that in middle-income countries business group affiliates exhibit higher investment and growth rates than normal (see, e.g., Campbell and Keys, 2002, and Choi and Cowing, 1999), while the evidence about their relative profitability is generally ambiguous (Khanna and Palepu, 2000; Bertrand, Metha and Mullainathan, 2002).

3 The benchmark growth model

The benchmark growth model borrows its key elements from a large literature that has applied it to various issues. The version that best fits our goals builds on Aghion and Howitt (1998) and, partially, Barro and Sala-i-Martin (2005). Time is continuous and infinite. All variables are functions of time but to simplify the notation we omit the time argument unless necessary to avoid confusion. The economy is closed. The production side consists of a final sector producing a homogeneous good and an intermediate sector producing a continuum of differentiated non-durable goods. To keep things simple, there is no physical capital. The intermediate sector is the core of our economy: new firms enter the sector by developing new intermediate goods while incumbent firms invest in the quality of existing intermediate goods.

3.1 Households

The economy is populated by a representative household with \( L(t) = L_0 e^{\lambda t}, \) \( L_0 \equiv 1, \) members, each endowed with one unit of labor. The household has preferences

\[
U(t) = \int_t^{\infty} e^{-(\rho-\lambda)(s-t)} \log \left( \frac{C(s)}{L(s)} \right) ds, \quad \rho > \lambda \geq 0
\]  

where \( t \) is the point in time when the household makes decisions, \( \rho \) is the discount rate and \( C \) is consumption. The household supplies labor services inelastically. It thus faces the flow budget constraint

\[
\dot{A} = rA + wL - C,
\]

where \( A \) is assets holding, \( r \) is the rate of return on assets and \( w \) is the wage. The intertemporal consumption plan that maximizes (1) subject to (2) consists of the Euler equation

\[
r = \rho - \lambda + \dot{C}/C,
\]

the budget constraint (2) and the usual boundary conditions.

3.2 Final producers

A competitive representative firm produces a final good that can be consumed, used to produce intermediate goods, invested in the improvement of the quality of existing intermediate goods, or invested in the creation of new intermediate goods. The final good is our numeraire. The technology for its production is

\[
Y = \int_0^N X_i^\theta \left[ Z_i^{\alpha} \frac{L}{N^{1-\alpha}} \right]^{1-\theta} di, \quad 0 < \theta, \alpha < 1, \ 0 \leq \sigma < 1
\]  

where \( Y \) is output, \( N \) is the mass of intermediate goods and \( X_i \) is the quantity of intermediate good \( i \) used in production. Given the inelastic labor supply of the household and the one-sector structure of the economy, labor market clearing yields that employment in the final sector equals
population size \( L \). Quality is the ability of an intermediate good to raise the productivity of the other factors: the contribution of intermediate good \( i \) depends on its own quality, \( Z_i \), and on the average quality, \( Z = \int_0^N (Z_j/N) dj \), of intermediate goods. We show below that the parameters \( \alpha \) and \( \sigma \) regulate the private returns to quality and the social returns to variety, respectively. The first-order conditions for the profit maximization problem of the final producer yield that each intermediate firm \( i \) faces the demand curve

\[
X_i = \left( \frac{\theta}{P_i} \right)^{\frac{1}{1-\sigma}} Z_i^\alpha Z^{1-\alpha} \frac{L}{N^{1-\sigma}},
\]

where \( P_i \) is the price of intermediate good \( i \). The first-order conditions then imply that the final producer pays total compensation

\[
\int_0^N P_i X_i di = \theta Y \quad \text{and} \quad wL = (1 - \theta) Y
\]

to intermediate goods and labor suppliers, respectively.

### 3.3 Intermediate producers

The typical intermediate firm \( i \) operates a technology that requires one unit of final good per unit of intermediate good produced and a fixed operating cost, \( \phi Z_i^\alpha Z^{1-\alpha} \), also in units of the final good. The firm can increase the quality of its intermediate good according to the technology

\[
\dot{Z}_i = I_i,
\]

where \( I_i \) is the firm’s investment in units of final good. Using (5), the firm’s net profit is

\[
\Pi_i = \left[ (P_i - 1) \left( \frac{\theta}{P_i} \right)^{\frac{1}{1-\sigma}} \frac{L}{N^{1-\sigma}} - \phi \right] Z_i^\alpha Z^{1-\alpha} - I_i.
\]

According to this expression, \( \alpha \) is the elasticity of the firm’s gross profit with respect to its own quality so that throughout the analysis we can think of it as the private return to quality. (We show below that the social return to quality is 1.) At time \( t \), the firm chooses for \( s \in [t, \infty) \) paths of the product’s price, \( P_i(s) \), and investment, \( I_i(s) \), that maximize the value of the firm

\[
V_i(t) = \int_t^\infty e^{-\int_t^s r(v)dv} \Pi_i(s)ds,
\]

subject to (7) and (8), and taking as given the paths of the interest rate, \( r(s) \), and of average quality, \( Z(s) \).

The typical intermediate firm \( i \) comes into existence when \( \beta X \) units of final good are invested to set up operations.\(^4\) Because of this sunk entry cost, the firm cannot supply an already existing

\(^4\) An analogous assumption is that the entrant must sink \( \beta Y/N \) units of final output (see Barro and Sala-i-Martin 2004, pp. 300-302). We also obtain qualitatively similar results if the entry cost is \( \beta Z \), but in this case the analysis is much more algebra-intensive. See Bollard, Klenow and Li (2014) for recent evidence that entry costs do indeed scale up with firm size.
good in Bertrand competition with the incumbent monopolist but must introduce a new intermediate good that expands product variety. The firm enters at the average quality level and, hence, at average size (this simplifying assumption preserves symmetry of equilibrium at all times, guaranteeing that all intermediate firms behave the same way; see below). The entry decision is then represented by the free-entry condition that the (maximized) value of the firm equal the entry cost, i.e., \( V_i(t) = \beta X(t) \).

4 Corporate governance

In this section we use principal-agent theory to study the consequences of the separation of ownership and control. Our goal is to understand how corporate governance frictions affect economic growth and market structure by causing production, investment and entry decisions to deviate from the frictionless benchmark set up in the previous section. In this section we concentrate on the micro (firm-level) components of the analysis. We study their general equilibrium implications in the following sections.

4.1 Conceptual setup: frictions and control mechanisms

As in the benchmark growth model, households finance the foundation of firms by providing the resources to pay the entry cost in exchange for equity, claims on the future dividends. We thus identify the households as the firms’ principal and refer to them as the founding shareholders (or simply as the founders or financiers). Next, we postulate that the principal hires a manager; the agent, who is rewarded with an equity share to set up the firm and then run everyday’s operations that consist of the investment, production and pricing decisions.

The manager’s objective function is not aligned with that of the founder due to a “resource diversion” friction, whereby the manager siphons resources off the firm, and an “empire building” friction, whereby the manager derives private benefits from investing beyond what shareholders’ value maximization calls for. These are the two frictions considered by Nikolov and Whited (2013) and a large body of corporate governance literature. Most importantly, these are the corporate governance frictions that have allegedly plagued several countries in recent decades (see, e.g., Khanna, 2000; Morck, Wolfenzon and Yeung, 2005; Campbell and Keys, 2002; Choi and Cowing, 1999).\(^5\)

At the foundation of the new firm, the founder makes two decisions. First, taking into account the conflict of interest with the manager, he chooses the future path of the equity shares allocated

\(^5\) A competitive managerial market, together with the possibility of hiring or firing managers contingent on their decisions, could discipline managers’ behavior. We do not explore this role of the managerial market as an external control mechanism because we want to focus, instead, on internal control mechanisms. Similarly, following a large literature (e.g., Schleifer and Vishny 1997), we postulate incomplete contracts that give rise to frictions. In our environment these frictions generate managerial rents. In an ideal world with complete contracts these could be dissipated. For instance a manager could be asked pay lump sum these rents to the founding shareholders. But in practice there are factors that limit such a transfer (for instance the manager could be cash constrained). We leave the study of external control mechanisms and (possibly) complete contracts to future work.
to himself and to the manager that maximizes the value of his stake in the firm. Second, he decides whether to finance the foundation of the firm in the first place. This decision is represented by the participation constraint that the (maximized) value of his stake in the firm be weakly larger than the funds he provides. Assuming that any household can fund the start-up of a firm, no-arbitrage requires that the founder’s participation constraint must hold with equality.

In Section 8 we extend our baseline environment and include a second agent, the monitor, who is rewarded with an equity share to supervise the manager and curb his diversion of resources. The objective is to enlarge the set of internal control mechanisms and explore additional implications of our setup.

4.2 Managers

The compensation package of the manager consists of an equity share $e_{m,i}$. The manager can steal a fraction $S_i$ of the net profit $\Pi_i$. The manager’s effort cost of stealing is $c^S(S_i) \cdot \Pi_i$, where the function $c^S(S_i)$ is increasing and convex. The manager’s objective can also depart from the founder’s objective due to an innate desire for building empires. In particular, as in Stulz (1990) and Jensen (1986), we let the manager derive private benefits from the firm’s volume of investment $I_i$. Formally, we write the manager’s utility flow as

$$u_{i,\text{manager}} = \left[ e_{m,i} (1 - S_i) + S_i - c^S(S_i) \right] \cdot (\Pi_i + \Omega I_i). \quad (10)$$

The parameter $\Omega \geq 0$ governs the intensity of the empire building friction. For reasons of tractability (see below), we scale it by the term in square brackets, which is the portion of net profit accruing to him (net of his cost of stealing).

At time $t$, the manager chooses for $s \in [t, \infty)$ the paths of price $P_i(s)$, investment $I_i(s)$, and stealing effort $S_i(s)$, given the path of his shareholding, $e_{m,i}(s)$, that maximize

$$V_{i,\text{manager}}(t) = \int_t^{+\infty} e^{-\int_t^s r(v) dv} u_{i,\text{manager}}(s) \, ds. \quad (11)$$

Expressions (10)-(11) make clear that, due to stealing and empire building, the manager’s objective is not the maximization of the value of the firm $V_i(t)$ defined in (9). By contrast, he forms the following Hamiltonian

$$H_i = \left[ e_{m,i} (1 - S_i) + S_i - c^S(S_i) \right] \cdot (\Pi_i + \Omega I_i) + q_i I_i,$$

where $q_i$ is the shadow value of the marginal increase in product quality. In the Technical Appendix, we report the full set of first-order conditions with respect to $P_i$, $I_i$, $Z_i$ and $S_i$. The first-order condition with respect to $P_i$ yields

$$P_i = \frac{1}{\delta} \quad (12)$$

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6 Specifically, the function is of class $C^\infty$ with $c^S(0) = 0$, $\partial c^S(S_i)/\partial S_i > 0$, $\lim_{S_i \to 0} \partial c^S(S_i)/\partial S_i = 0$, $\lim_{S_i \to 1} \partial c^S(S_i)/\partial S_i = \infty$.

7 We obtain the same qualitative results if the empire building friction is $\Omega Z_i$. Details are available from the authors.
which is the same price that would be chosen in an economy with frictionless corporate governance. Combining this result with the first-order conditions for \( I_i \) and \( Z_i \), we obtain the manager’s rate of return to investment:

\[
 r_Z = \frac{\alpha}{1 - \Omega} \left[ \left( \frac{1}{\delta} - 1 \right) \frac{X_i}{Z_i} - \phi \left( \frac{Z}{Z_i} \right)^{1-\alpha} \right] + \frac{\dot{q}_i}{q_i}, \tag{13}
\]

where

\[
 q_i = \left[ e_{m,i} (1 - S_i) + S_i - c^S(S_i) \right] \cdot (1 - \Omega). \tag{14}
\]

These expressions illustrate the distortions of the return to investment. First, the manager’s return is higher than the purely value-maximizing one because he obtains the additional marginal benefit \( [e_{m,i} (1 - S_i) + S_i - c^S(S_i)] \cdot \Omega \) from the volume of investment \( I_i \). Second, the manager’s return is distorted by the potential temporal variation of his shadow value of investing due to the possible temporal variation in \( e_{m,i} \) and \( S_i \). To see this more clearly, note that in an economy in which the manager’s objective is perfectly aligned with the founder’s one unit of investment is worth one unit of consumption so that the shadow value of investment satisfies \( q_i = 1 \) and \( \dot{q}_i/q_i = 0 \).\(^8\)

The first-order condition for the stealing effort \( S_i \) says that the manager sets the marginal benefit of his stealing effort equal to its marginal cost,

\[
 1 - e_{m,i} = \frac{\partial c^S(S_i)}{\partial S_i}. \tag{15}
\]

The marginal benefit is the net profit that the manager diverts from the share \( 1 - e_{m,i} \) that the ownership structure allocates to the founder. Accordingly, the equity share \( e_{m,i} \) discourages stealing because it raises the extent to which the manager makes costly effort to steal from himself. Given the properties of the function \( c^S(S_i) \), straightforward application of the implicit function theorem to equation (15) yields a function \( S_i(e_{m,i}) \) characterizing the manager’s stealing decision that has the following properties: \( S_i(0) = S_i^{\text{max}}; S_i'(e_{m,i}) < 0; S_i(1) = 0 \).

### 4.3 Founding shareholders

The founder makes two decisions: the first is whether to fund the start-up project in the first place; the second is to set the path \( e_{m,i}(s) \) for \( s \in [t, \infty) \) of the equity shares allocated to the manager in order to induce the behavior that maximizes the value of his stake in the firm. The first decision is represented by the participation constraint,

\[
 \beta X(t) \leq V_i^{\text{founder}}(t), \tag{16}
\]

which we argued holds with equality because any household can finance entry of a new firm. This constraint, therefore, yields the free-entry condition that we use to characterize the economy’s dynamics. It differs from that holding in the benchmark growth model because the value that must

\(^8\)Note, however, the special role of the empire building friction. A manager-owner with \( e_{m,i} = 1 \) sets \( S_i = 0 \) but still over-invests because his shadow price of investment is \( q_i = 1 - \Omega \) not \( q_i = 1 \).
equal the entry cost is not the value of the firm defined in (9) but the value of the founder’s stake in the firm. The two differ because of the need to delegate the firm’s management to an agent that pursues his own objectives.

To study the second decision, we use the function $S_i(e_{m,i})$ constructed above and write

$$V_{i,\text{founder}}(t) = \int_t^{+\infty} e^{-\int_t^s r(v)dv} [1 - e_{m,i}(s)] [1 - S_i(e_{m,i}(s))] \Pi_i(s) ds. \quad (17)$$

Our main result is then the following.

**Proposition 1 (Equity Shares)** Assume that the share $e_{m,i}$ is chosen at the time of foundation of the firm, $t$, and then held constant for $s > t$. Then the founder’s problem reduces to

$$\max_{e_{m,i}(t)} [1 - e_{m,i}(t)] [1 - S_i(e_{m,i}(t))]. \quad (18)$$

The solution to this problem yields a value $e_{m,i}$, constant over calendar time, that allows us to define

$$\Theta \equiv (1 - e_{m,i}) [1 - S_i(e_{m,i})]. \quad (19)$$

**Proof.** See the Technical Appendix. ■

To see the intuition for this result, recall expressions (13) and (14) for the manager’s return to investment. Temporal variation of the manager’s equity share would influence the investment path $I(s)$ chosen by the manager and, hence, the path of profits $\Pi(s)$. Our assumption that the ownership shares are set at time $t$ shuts down this dependence and, therefore, yields that the founder knows that for $s > t$ the path $\Pi_i(s)$ does not depend on the shares. More precisely: (i) his problem does not have a dynamic constraint, and thus reduces to a sequence of identical problems; (ii) it features $\partial \Pi_i(s)/\partial e_{m,i}(t) = 0$. A useful way to think about the latter property is to write the dividend flow inside (17) as

$$\left[\frac{[1 - e_{m,i}(s)] [1 - S_i(e_{m,i}(s))] \Pi_i(s)}{\text{share of the pie}} \cdot \frac{\Pi_i(s)}{\text{size of the pie}}\right].$$

Our structure isolates the “size of the pie” part from the equity shares decision. Accordingly, the founder solves the static (i.e., intratemporal) problem (18), obtaining a first-order condition that equalizes the marginal cost of incentivizing the manager through ownership shares to the marginal benefit due to the reduction of the manager’s stealing. The next step in the argument is to note that the decision rule $S_i(e_{m,i})$ obtained from the manager’s first-order condition does not contain time-varying factors or other endogenous variables of the model. Therefore, the solution of the founder’s problem yields a value $e_{m,i}$ that does not depend on the foundation date, $t$, and thus is constant with respect to the model’s index of calendar time. Accordingly, the founder’s “share of the pie” is also constant. The appropriation factor $\Theta$, defined in (19), fully captures the consequences of the manager’s stealing for the founder: at any date he receives as dividends only a constant fraction $\Theta < 1$ of the net profits generated by the firm.
To see the implications of resource diversion for the entry decision, now recall that the participation constraint of the founder (16) gives us the free-entry condition \( \beta X(t) = V_i^{\text{founder}}(t) \). Taking logs and time derivatives yields the return to entry

\[
r_N = \frac{\Theta \Pi_i}{V_i^{\text{founder}}} + \frac{\dot{V}_i^{\text{founder}}}{V_i^{\text{founder}}} = \frac{\Theta \Pi_i}{\beta X} + \frac{\dot{X}}{X},
\]

which equals the dividend price ratio plus capital gains/losses. The dividend features the appropriation factor \( \Theta \) that captures the two channels through which the resource diversion distortion manifests itself. The first channel is direct: the founder surrenders a fraction \( e_{m,i} \) of the dividend flow to the manager to mitigate the manager’s resource diversion. The second channel is indirect: given the shares \( (1 - e_{m,i}, e_{m,i}) \), the manager makes his stealing decision that results in a share \( S_i \) of the net profits being diverted from dividend distribution to the manager’s pockets.

### 4.4 Discussion

It is useful, before moving on to the general equilibrium of the model, to take stock of what we have done so far. The key simplification in our structure is that the appropriation factor \( \Theta \) is constant (i.e., time-invariant) because the equity shares \( (e_{m,i}, 1 - e_{m,i}) \) are constant. One advantage of this approach is that \( \Theta \) summarizes all the effects of the resource diversion friction that are relevant for the macroeconomic analysis. Consequently, our aggregate analytical results do not require specific functional forms but hold under very general conditions. It is only when we want to know how \( \Theta \) depends on features of the environment represented by specific properties of the function \( c^S(S_i) \) — or the more general microstructure that we consider later in the paper — that we need to specify it. We will do so in our numerical work in Section 7, since in that context we want to perform comparative statics and dynamics exercises on the role of micro parameters that govern the costs and benefits of the decisions of our principal and agent.

As stressed above, on the other hand, separability of the “share of the pie” and “size of the pie” components is important. More precisely, the following simplifications were instrumental in guaranteeing this separability: (i) we scale costs and benefits of stealing and monitoring by the net profit \( \Pi_i \); (ii) we scale the empire building friction \( \Omega \) by the factor \( [e_{m,i}(1 - S_i) + S_i - c^S(S_i)] \); and (iii) we impose that the equity shares are chosen at foundation and then held constant throughout the life of the firm. The benefit of these restrictions is that we are able to solve in closed form the general equilibrium dynamics of the model and thus gain substantial analytical insight on the mechanism that we study. The cost is that they suppress the potential dynamic interdependence of the manager’s investment decision with the stealing and the equity shares decisions. To simplify the exposition, until Section 10 we maintain the assumptions that guarantee separability. In the robustness section 10 we examine the implications of breaking such separability.
5 General equilibrium

We now turn to the general equilibrium of our economy. In this section we concentrate on the steady state. We study dynamics in Sections 6-7.

5.1 Corporate governance in general equilibrium

Before proceeding, we need to discuss how the general equilibrium structure of the benchmark growth model extends to our case with frictions. As mentioned, we assume that the representative household provides managerial services to firms. Such services are not in units of labor and thus their provision does not come out of labor supply. In other words, we think of them as an additional endowment owned by the household. As discussed in the previous section, the provision of such services is remunerated with ownership shares. Moreover, it allows the extraction of rents. In our scheme such rents are capitalized in the wealth that accrues to the household and thus are embedded in the asset income flow. Since this is an important component of our analysis, it is best to develop it formally.

First, note that the present value of the income flow accruing to the founder is not the market value of the firm, which is instead

\[ V_{\text{market}}(t) = \int_{t}^{+\infty} e^{-\int_{s}^{t} r(v)dv} [1 - S_i (e_{m,i} (s), e_{a,i} (s))] \Pi_i (s) ds. \]

Household wealth in our economy is

\[ A_i (t) = \int_{t}^{+\infty} e^{-\int_{s}^{t} r(v)dv} [1 - S_i (e_{m,i} (s), e_{a,i} (s))] \Pi_i (s) ds \]

Consolidating:

\[ A_i (t) = \int_{t}^{+\infty} e^{-\int_{s}^{t} r(v)dv} \Pi_i (s) ds = V_i (t). \]

Thus, wealth in our economy is still defined as the fundamental value of the \( N \) existing firms. The upshot of this discussion is that from the household side of the economy we obtain the same labor supply, budget constraint and, therefore, saving behavior as in the benchmark frictionless model. What changes with frictions are the returns to investment and entry and, therefore, the paths of market structure and economic growth. Crucially, because of these changes, the path of net profit of the typical firm, \( \Pi_i (s) \), changes as well, so that corporate governance frictions change the magnitude of the wealth, \( A (t) \), generated by the market. We now develop this part of the analysis.
5.2 Structure of the equilibrium

Models of this class have symmetric equilibria in which all intermediate firms charge the same price and have the same quality level at all times. Specifically, all intermediate firms charge price \( P = 1/\theta \) and receive \( N \cdot PX = \theta Y \) from the final producer. We can then write \( X = \theta^2 Y/N \). Next, we impose symmetry in the production function (4) and use the previous result to eliminate \( X \), obtaining

\[
Y = \theta^{1/\sigma} N^\sigma ZL.
\]

Thus, the reduced-form representation of the production function of our economy features social returns to variety equal to \( \sigma \) and social returns to quality equal to 1.

The definition of profit (8), symmetry and Proposition 1 allow us to rewrite equations (13) and (20) as:

\[
\begin{align*}
    r_Z &= \frac{\alpha}{1 - \Omega} \left[ \left( \frac{1}{\theta} - 1 \right) \frac{X}{Z} - \phi \right]; \\
    r_N &= \frac{\Theta}{\beta} \left[ \left( \frac{1}{\theta} - 1 \right) - \frac{\phi - I/Z}{X/Z} \right] + \frac{\dot{X}}{X}.
\end{align*}
\]

These expressions show that the returns to investment and to entry depend on the quality-adjusted firm size, measured by the quality-adjusted volume of production, \( X/Z \). They thus suggest that we use \( x = X/Z \) as our stationary state variable in the analysis of dynamics since in this model steady-state growth is driven by exponential growth in intermediate product quality. Using (21), we have

\[
x = \frac{X}{Z} = \frac{1}{P} \cdot \frac{\theta Y}{Z} \cdot \frac{1}{N} = \left( \frac{\theta}{P} \right)^{1/\sigma} \frac{L}{N^{1-\sigma}}.
\]

This expression shows the equilibrium determinants of quality-adjusted firm size and rationalizes our assumption that the social return to variety satisfies \( \sigma < 1 \): it ensures that the market share effect in the intermediate goods market — \( N \) at the denominator of the ratio \( \theta Y/NZ \) — dominates over the love-of-variety effect \( N^\sigma \) in final production so that the mass of firms ends up at the denominator of the expression for quality-adjusted gross firm size. Henceforth, we call \( x \) “firm size” for short.

With our choice of state variable, we obtain the following expressions for the returns to incumbents’ investment and to firms’ entry:

\[
r_Z = \frac{\alpha}{1 - \Omega} \left[ \left( \frac{1}{\theta} - 1 \right) x - \phi \right];
\]

\[
r_N = \frac{\Theta}{\beta} \left[ \left( \frac{1}{\theta} - 1 \right) - \frac{\phi - I/X}{X/Z} \right] + \frac{\dot{X}}{X}.
\]

---

\(^9\)See Peretto (1996, 1998, 1999) for the formal arguments. The conditions for symmetry in this paper are (i) that the firm-specific return to quality innovation is decreasing in \( Z_i \) (in this paper’s setup this follows from \( \alpha < 1 \)) and (ii) that entrants enter at the average level of quality \( Z \). The first condition implies that if one holds constant the mass of firms and starts the model from an asymmetric distribution of firm sizes, then the model converges to a symmetric distribution. The second requirement simply ensures that entrants do not perturb such symmetric distribution.

\(^{10}\)The fact that the social return to variety, \( \sigma \), is below the social return to quality (one) is purely coincidental. Given the definition of the quality-adjusted firm size, \( x \), the stock of quality \( Z \) does not influence the effect of \( N \) on \( x \). Thus, by construction the social return to quality is irrelevant in determining the upper bound on \( \sigma \).
where $z \equiv \frac{\dot{Z}}{Z} = \frac{I}{Z}$. These two equations show how the returns to investment and to 
entry depend on corporate governance frictions. Specifically, the empire building problem, $\Omega$, increases the 
return to investment (23) because managers derive utility from unprofitably expanding investment. The 
return to entry is decreasing in the severity of the resource diversion problem $(1 - \Theta)$: with 
no stealing $\Theta = 1$, with stealing $\Theta < 1$. Importantly, stealing acts as a barrier to entry, forcing 
founding shareholders not only to sustain standard technological entry costs, but also to surrender 
a fraction of the dividend flow to managers to mitigate resource diversion inside the firms.

To complete the characterization of the equilibrium effects of corporate governance frictions, we derive an expression for the GDP of our economy, denoted by $G$. Subtracting the cost of 
intermediate production from the final output $Y$ and using (22),

$$G = Y - N (X + \phi Z) = \left[1 - \frac{\theta}{P} \left(1 + \frac{\phi Z}{X}\right)\right] Y = \left[1 - \frac{\theta}{P} \left(1 + \frac{\phi}{x}\right)\right] Y.$$ 

GDP per capita thus equals

$$\frac{G}{L} = \underbrace{\left(\frac{\theta}{P}\right)}_{\text{final demand (static)}} \cdot \underbrace{\left[1 - \frac{\theta}{P} \left(1 + \frac{\phi}{x}\right)\right]}_{\text{intermediate efficiency (static IRS)}} \cdot \underbrace{\frac{N^\sigma Z}{x}}_{\text{intermediate technology (dynamic IRS)}}, \quad (25)$$

where $P = 1/\theta$. This expression decomposes GDP per capita in three terms. The first captures the 
role of the pricing decision in locating firms on their demand curve, thus determining their scale 
of activity. The second captures the existence of static economies of scale, which imply that larger 
firms produce at lower average cost. The third captures the role of product variety and product 
quality, which evolve over time according to the behavior dictated by the returns discussed above.

### 5.3 The steady state

We now turn to the characterization of the steady state. We begin with the formal result.

**Proposition 2** *(Steady State)* In steady state (quality-adjusted) firm size is

$$x^* = \frac{(1 - \frac{\alpha}{1-\Omega}) \phi - \left(\rho + \frac{\sigma \lambda}{1-\sigma}\right)}{(1 - \frac{\alpha}{1-\Omega}) (\frac{1}{\beta} - 1) - \frac{\beta}{\varphi} \left(\rho + \frac{\sigma \lambda}{1-\sigma}\right)}.$$

The associated rates of growth of quality, variety and income (GDP) per capita are, respectively:

$$z^* = \left[\frac{\alpha}{1-\Omega} \phi + \left(\rho + \frac{\sigma \lambda}{1-\sigma}\right) \frac{\beta}{\varphi} \left(\rho + \frac{\sigma \lambda}{1-\sigma}\right) \left(1 - \frac{\alpha}{1-\Omega} \left(\frac{1}{\beta} - 1\right) - \frac{\beta}{\varphi} \left(\rho + \frac{\sigma \lambda}{1-\sigma}\right)\right) \right] \left(\rho + \frac{\sigma \lambda}{1-\sigma}\right); \quad (27)$$

$$n^* \equiv \left(\frac{N}{N}\right)^* = \frac{\lambda}{1-\sigma}; \quad (28)$$
\[
\left( \frac{\dot{Y}}{Y} \right)^* - \lambda = \left( \frac{G}{G} \right)^* - \lambda = \frac{\sigma \lambda}{1 - \sigma} + z^*.
\]  
(29)

**Proof.** See the Technical Appendix. ■

To understand this result, note that households’ saving behavior yields

\[ r = \rho + \frac{\sigma \lambda}{1 - \sigma} + z. \]  
(30)

Substituting this expression into the returns to investment (23) and to entry (24) we obtain:

\[ z = \frac{\alpha}{1 - \Omega} \left( \frac{1}{\theta} - 1 \right) x - \frac{\alpha}{1 - \Omega} \phi - \left( \rho + \frac{\sigma \lambda}{1 - \sigma} \right) ; \]  
(CI)

\[ z = \left[ \frac{1}{\theta} - 1 - \frac{\beta}{\Theta} \left( \rho + \frac{\sigma \lambda}{1 - \sigma} \right) \right] x - \phi. \]  
(EI)

The first curve, which we call the corporate investment (CI) locus, describes the steady-state investment rate, \( z \equiv \dot{Z}/Z = I/Z \), that incumbent firms generate given the firm size \( x \) that they expect to achieve in equilibrium. The second curve, which we call the entry (EI) locus, describes the steady-state investment rate that equalizes the return to entry and the return to investment, given the value of \( x \) that both entrants and incumbents expect to achieve in equilibrium. The steady state is the intersection of these two curves in the \((x, z)\) space.\(^{11}\)

Figures 2 and 3 plot the CI locus and the EI locus and perform comparative statics exercises. For example, imagine that the government or the financial regulator enact a policy that accommodates the informational opacity of firms in financial markets or that (perhaps unintentionally) facilitates managers’ diversion of resources by relaxing accounting rules. This policy change is captured by a reduction in the managers’ cost of stealing \( c^S(S) \). Either shock would lead to an intensification of stealing \( 1 - \Theta \), that is, to a reduction of \( \Theta \), the share of net profits distributed to founding shareholders. Figure 2 shows that the drop in \( \Theta \) makes the EI locus rotate clockwise: for a given firm size \( x \), a lower \( \Theta \) reduces the investment rate \( z \) that regulates the entry condition. Intuitively, the expenditures on investment must drop to compensate for the fall in the share of profits that goes to the firm’s founding shareholder. The intensification of stealing does not affect the CI locus, though, because it equally erodes benefit and cost of investment. As Figure 2 shows, the overall effect of the shock is a greater steady-state firm size and a larger rate of investment of incumbent firms. Put differently, an increase in the severity of the stealing problem prompts incumbents to invest more aggressively and makes the industry structure more concentrated, inducing a fall in product variety.

The effects of an increase in the intensity of empire building are displayed in Figure 3. Again, this shock is interpreted as the outcome of a policy that favors managers’ empire building behavior.

\(^{11}\)Existence and stability of this steady state require the intercept condition that the EI curve starts out below the CI curve and the slope condition that the EI curve is steeper than the CI curve. Together they say that intersection exists with the EI line cutting the CI line from below. The restrictions on the parameters that guarantee this configuration are those stated in Propositions 4-5, that yield the global stability of the economy’s dynamics.
An increase in $\Omega$ pushes the CI locus up because the empire building friction raises the manager’s return to investment. Accordingly, it spurs the investment rate $z$ and thus must increase firm size $x$. As a result of the shock, therefore, the industry structure becomes more concentrated because that is what is required to have firms that invest more aggressively.

6 Dynamics and welfare: Analytical results

In this section we characterize analytically the dynamics of the model. The first interesting feature that will emerge is that in the very long run the economy evolves through three stages of development. In the most advanced stage, there is both entry of new firms and investment of incumbent firms. In earlier stages of development, either entry or investment, or both, can be zero. The second interesting feature of the dynamics is that we can solve the model in closed form and thus characterize welfare analytically. This allows us to conduct a positive analysis of the effects of imperfect corporate governance on the welfare attained by the representative household in the decentralized market equilibrium. To gain further intuition into these welfare effects, we conclude the section by performing a comparison of the decentralized market equilibrium with the allocation that would be chosen by a social planner.

6.1 Positive analysis

We begin with a useful result on the consumption ratio.

**Proposition 3** (Consumption Ratio) Let $c \equiv C/Y$ be the economy’s consumption ratio. In equilibrium,

$$
c = \begin{cases} 
1 - \theta + \theta^2 \left[ \left( \frac{1}{\theta} - 1 \right) - \frac{\phi + z}{x} \right] & n = 0 \quad z \geq 0 \\
1 - \theta + \frac{(\rho - \lambda)\theta^2}{\Theta} & n > 0 \quad z \geq 0
\end{cases}
$$

(31)

**Proof.** See the Technical Appendix. \(\blacksquare\)

Proposition 3 identifies two regimes. In one firm size $x$ is too small and there is no entry, in which case the consumption ratio is increasing in $x$ because firms earn escalating rents (uncontested by entrants) from the growing market size (recall that we postulate population growth). In the other regime, firm size $x$ is sufficiently large that there is entry, in which case the rents are capped and the consumption ratio is constant.

Proposition 4 examines the evolution of firm size across the three stages of development.

**Proposition 4** (General Equilibrium) There exists a finite threshold firm size $x_N$ that triggers entry and a finite threshold $x_Z$ that triggers investment by incumbents (see the proof for the expressions of $x_N$ and $x_Z$). Assume:

$$
\left( \frac{1}{\theta} - 1 \right) > \frac{\beta (\rho - \lambda)}{\Theta},
$$

(32)
\[
\left( \frac{1}{\theta} - 1 \right) x_N - \phi \left( \frac{\alpha}{1 - \Omega} - \frac{\sigma \Theta}{\beta x_N} \right) < (1 - \sigma) \rho + \sigma \lambda, \quad (33)
\]

Then, \( x_N < x_Z \) and in equilibrium the rates of investment and entry are

\[
z(x) = \begin{cases} 
0 & \phi \leq x \leq x_N \\
0 & x_N < x \leq x_Z \\
\left( \frac{(1 - \delta)x - \phi}{x} \right) - (1 - \sigma) \rho - \sigma \lambda & x_N < x < x_Z \\
x_z < x < \infty
\end{cases}, \quad (35)
\]

\[
n(x) = \begin{cases} 
0 & \phi \leq x \leq x_N \\
0 & x_N < x \leq x_Z \\
\frac{\Theta}{\beta} \left( \frac{(1 - \delta)x - \phi}{x} \right) - \rho + \lambda & x_N < x < x_Z \\
x_z < x < \infty
\end{cases} \quad (36)
\]

Firm size obeys the differential equation

\[
\frac{\dot{x}}{x} = \Psi(x) \equiv \lambda - (1 - \sigma) n(x). \quad (37)
\]

**Proof.** See the Technical Appendix. ■

The technical assumptions (32)-(34) allow us to focus on the most interesting sequence of development in which firm entry becomes active before incumbents start investing. Assumption (32) says that the threshold \( x_N \) for entry is finite. Assumption (33) says that when the economy crosses the threshold \( x_N \) and activates entry, investment is not yet profitable and it takes additional growth of firm size \( x \) to activate it \( (x_N < x_Z) \). Assumption (34) says that when the economy crosses the threshold \( x_Z \) the no-arbitrage condition that returns be equalized if both entry and investment are to take place identifies a stable Nash equilibrium (see also the proof of the proposition). Proposition 5 states the formal result, including the condition that ensures that the economy does cross \( x_Z \).

**Proposition 5 (Dynamics)** Assume

\[
\frac{\sigma \lambda}{1 - \sigma} + \rho > \frac{\Theta}{\beta} \left( \frac{1}{\theta} - 1 \right) - \frac{\phi}{x_Z}; \quad (38)
\]

\[
\lim_{x \to \infty} \Psi(x) = \lim_{x \to \infty} \left[ \rho + \frac{\sigma \lambda}{1 - \sigma} - \frac{\Theta}{\beta} \left( \frac{1}{1 - \Omega} \right) \left( \frac{1}{\theta} - 1 \right) \right] < 0. \quad (39)
\]

There exists a unique equilibrium trajectory: given initial condition \( x_0 \) the economy converges to the steady state \( x^* \).

**Proof.** See the Technical Appendix. ■

For \( x \leq x_N < x_Z \), \( \dot{x}/x = \lambda \) and therefore the economy crosses the threshold for entry in finite time in light of assumption (32) that guarantees that \( x_N \) is finite. For \( x_N < x < x_Z \),

\[
\frac{\dot{x}}{x} = \sigma \lambda + (1 - \sigma) \rho - \left(1 - \sigma\right) \frac{\Theta}{\beta} \left( \frac{1}{\theta} - 1 \right) - \frac{\phi}{x}. \quad (34)
\]
Therefore, the economy crosses the threshold for investment in finite time since \( x \) is still growing at \( x = x_Z \) in light of assumption (38). Figure 4 illustrates the evolution of \( x \) across the three stages of development.

The model yields a closed form solution for the dynamics of \( x \) so that we can obtain analytical results on the effects of corporate governance shocks on welfare. For brevity, we focus only on the last stage of the transition.

Proposition 6 (Welfare) Consider the transition path of an economy that starts at time 0 with initial condition \( x_0 > x_Z \) and converges to \( x^* \). Under the approximation \( \sigma \Theta / \beta x \approx 0 \) (i.e., \( x \) sufficiently large), \( x \) evolves according to the linear differential equation

\[
\dot{x} = \nu \cdot (x^* - x),
\]

where

\[
\nu \equiv (1 - \sigma) \left[ \left( 1 - \frac{\alpha}{1 - \Omega} \right) \left( \frac{1}{\theta} - 1 \right) \frac{\Theta}{\beta} - \left( \rho + \frac{\sigma \lambda}{1 - \sigma} \right) \right].
\]

Therefore, the explicit solution for the economy’s path is

\[
x(t) = x_0 e^{-\nu t} + x^*(1 - e^{-\nu t}).
\]

Using this result, the utility flow is

\[
\log \left( \frac{C}{L} \right) = \log \Lambda + \left( \frac{\sigma}{1 - \sigma} \lambda + z^* \right) t + \left[ \frac{\alpha}{1 - \Omega} \frac{x_0}{\nu} \left( \frac{1}{\theta} - 1 \right) + \frac{\sigma}{1 - \sigma} \right] \left( 1 - \frac{x^*}{x_0} \right) (1 - e^{-\nu t}),
\]

where

\[
\Lambda \equiv \left[ 1 - \theta + \frac{(\rho - \lambda) \beta \theta^2}{\Theta} \right] \theta^{\frac{2\rho}{1 - \sigma}}.
\]

Upon integration, welfare is

\[
U_0 = \frac{\log \Lambda}{\rho - \lambda} + \frac{\sigma \lambda}{1 - \sigma} + \frac{z^*}{(\rho - \lambda)^2} + \frac{\alpha}{1 - \Omega} x_0 \left( \frac{1}{\theta} - 1 \right) + \frac{\sigma \nu}{1 - \sigma} \left( \frac{1 - x^*}{x_0} \right). \quad (44)
\]

\[\text{Note that } x_Z \text{ is always finite so, given population growth, the economy can fail to cross it only if there is premature market saturation due to entry. The intuition behind the dynamics is that we have chosen a configuration of parameters such that the quality-adjusted gross profitability of firms, } (P - 1) X/Z, \text{ rises throughout the range } [\phi, x_Z]. \text{ Consequently, the dissipation of profitability due to entry gains sufficient force to induce convergence to a constant value of } x \text{ only in the region where firms have already activated investment.}

\[\text{The interested reader can consult Peretto (2015) for the full solution of the frictionless version of a similar type of model. The properties of that solution hold also in this set up with corporate governance frictions.}

\[\text{In turns out, that in the baseline calibration, the speed of converge so approximated is about 95\% of the actual one computed numerically evaluated around the steady state. Therefore, to simplify the exposition, in the quantitative section 7 we will use the speed of convergence obtained in this proposition.}\]
Proof. See the Technical Appendix.

According to Proposition 6, the welfare associated to the transition to the steady state \( x^* \) from initial condition \( x_0 \) has three components: the intercept component (or level effect) due to initial consumption, the steady-state growth component (or growth effect), and the transitional component. The expression for \( U_0 \) assigns to each of the three components its own weight reflecting discounting and the duration of the transition. The transitional component captures a key channel at work in this economy. Consider an increase in the intensity of the stealing or of the empire building friction that triggers a consolidation of the industry, so that over time it converges to larger firms that grow faster, i.e., a transition with \( x^* > x_0 \). While such consolidation entails an acceleration of corporate investment (quality growth), it also entails a slowdown of entry and thus a loss of product variety relative to the baseline path. To see it, recall the definition of \( x \), which gives us:

\[
x = \frac{X}{Z} = \theta^{\frac{1}{1-\sigma}} \frac{L}{N^{1-\sigma}} \Rightarrow n = \frac{\lambda}{1-\sigma} - \frac{\dot{x}}{x}.
\]

Throughout the transition to the higher \( x^* \), the rate of entry falls below its steady-state value \( \frac{\lambda}{1-\sigma} \).

In other words, the model exhibits a dynamic quality/variety trade-off that manifests itself as a trade off between firm size and firm growth on one side and the mass of firms on the other.

We can also compute analytically how a shock to the intensity of stealing or of empire building affects households’ welfare, from any initial condition. Consider a shock that causes \( \Theta \) to go from \( \Theta_0 \) to \( \Theta_1 \). We a slight abuse of notation a variable in the pre-shock and post-shock steady state is identified with an index 0 and 1, respectively. Let also \( \log \left( \frac{C}{L} \right) = \tilde{c} \). From (43) it immediately follows that

\[
\tilde{c}_1 - \tilde{c}_0 = \log \left( \frac{\Lambda_1}{\Lambda_0} \right) + (z_1 - z_0) t + \left[ \frac{\alpha}{1-\Omega} \frac{x_0}{\nu_1} \left( \frac{1}{\tilde{\theta}} - 1 \right) + \frac{\sigma}{1-\sigma} \right] \left( 1 - \frac{x_1}{x_0} \right) \left( 1 - e^{-\nu_1 t} \right),
\]

where \( \nu_1 \) is the eigenvalue in (41) when \( \Theta = \Theta_1 \). Integrating the above expression over time with a discount rate \( \rho \) and a rate of population growth of \( \lambda \) we get

\[
U_1 - U_0 = \frac{\log \left( \frac{\Lambda_1}{\Lambda_0} \right)}{\rho - \lambda} + \frac{z_1 - z_0}{(\rho - \lambda)^2} + \frac{\alpha}{1-\Omega} \frac{x_0}{(\rho - \lambda)(\rho - \lambda + \nu_1)} \left( 1 - \frac{x_1}{x_0} \right). \tag{46}
\]

Imagine that the shock causes a reduction in \( \Theta \). Then, the first term is positive because initial consumption rises, i.e., \( \Lambda_1 > \Lambda_0 \). The second term is also positive, reflecting the steady-state growth acceleration. The third term is negative because firms become larger, implying a slowdown of entry (i.e., product variety growth) along the transition. Consequently, the intensification of the stealing distortion leads to a welfare gain if the transitional effect of slower entry of new firms is smaller than the sum of the steady-state positive effect on more intense corporate investment and the initial positive effect due to the higher consumption-output ratio.

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\( ^{15} \)We present the results considering discrete jumps of the parameter as a way to introduce the shock experiments of the next section, but obviously they could be restated in terms of infinitesimal changes of the parameter.
In the next section we carry out a quantitative exercise to resolve this theoretical ambiguity using plausible parameters.

6.2 Positive versus Normative Analysis

In the next section we study how key endogenous variables respond to changes in parameters in an environment with decentralized decision making and interactions through markets, computing the welfare effects by means of (44). This expression is also a useful guide for a policy maker who, taking as given market interactions, wants to implement optimal interventions. By analogy with the theory of Pigouvian instruments, we can think of $\Theta$ as a term that contains instruments subject to the choice of the policy maker. For instance, the policy maker can affect $\Theta$ through by raising the parameter $b$ that regulates the managers’ cost of stealing. Formally, we compute the effect of such an action by simply differentiating the expression in equation (44) with respect to $\Theta$ and then differentiating $\Theta$ with respect to the policy instrument under consideration.

In other words, because we solve the model in closed form, and thus have expression (44), we can compute the optimal value of any policy instrument modeled as constant throughout the transition as the solution of a standard Ramsey problem.

An alternative, more traditional, approach studies the centralized decisions of a social planner and compares the resulting allocation to the decentralized market equilibrium. The exercise shows how the endogenous variables of the model are affected by a change in the decision making protocol of the economy for unchanged parameters. In our model the social planner chooses the paths of consumption, $C$, the flow of new intermediate firms, $\bar{N}$, quality investment $I$, and the volume of production per firm, $X$, in order to maximize households’ utility in (1) subject to the resource and technological constraints. The resulting allocation is quite different from that of the decentralized market equilibrium because there are several distortions. Two distortions are due to the knowledge spillovers generated by investments in quality, measured by $1 - \alpha$, and to the love-of-variety variety externality captured by the parameter $\sigma$. The former yields lower than optimal quality investment in the decentralized equilibrium; the failure of firms to internalize the love-of-variety externality yields lower than optimal entry. Nevertheless, there are also forces that push toward excessive entry in the decentralized equilibrium. Because a new firm entering the market lowers the market share of existing firms (business stealing), there is an excess in operating fixed costs, $\phi N Z$, and in investment outlays $NI$, relative to what a social planner would choose. Finally, there is the classic monopolistic price distortion. Corporate governance distortions only add to the list. Managers’ empire building bias contrasts the investment externality $1 - \alpha$, for it gives a further boost to quality investment. Resource diversion compounds the distortion due to the love-of-variety externality, since it slows down entry, but contrasts the business stealing effect. Since there are many distortions operating in different directions, the first-best allocation could exhibit larger or smaller firms, and higher or lower investment rate, than the decentralized

16 A Technical Appendix contains a detailed formal derivation of different versions of social planner allocations, and comparisons between these allocations and the decentralized market equilibrium.
market equilibrium. It all depends on the underlying technology and preferences. Overall, when the equilibrium of the benchmark economy features larger firm size and investment than the first best, the corporate governance frictions will exacerbate such problems by inducing consolidation of the market structure and more aggressive investment of incumbents. Conversely, when in the benchmark economy firm size and investment are depressed below the first best, the governance frictions may partially correct these issues.

This normative analysis directs us on the type of intervation that a policy maker could implement to reduce the welfare costs caused by distortions. For instance if the planner allocation calls for larger firms relative to the decentralized equilibrium, because the business stealing effect dominates the love-for-variety externalities, then several policies could be devised, depending on the institutional constraints. Mankiw and Whinston (1986) in a similar but more simplified environment, assume, for instance, that a policy maker has the power to influence firm entry but not the behavior of firms after entry. In our context that would mean to solve for an allocation where the social planner chooses the number of firms (directly through a regulatory type of intervation, or indirectly altering the entry cost), under the constraints that incumbent firms behave with respect to investments, volumes of production, and prices as in the decentralized market equilibrium. From the first-best analysis we already know that an entry policy instrument is quite powerful because, by restricting entry, the social planner can affect the level of consumption, reduce the overall operating costs, and also induce firms to invest more.

In fact, in light of proposition (6), we can assess precisely the effects of a such a policy intervention by evaluating how the level of welfare changes as a response to variations to any parameter that is directly or indirectly under the control of a higher authority. By following such a Ramsey-like approach, we can check, for instance, what welfare gains or losses are associated to a variation in entry cost. From equation (44) it follows:

\[
\frac{\partial U_0}{\partial \beta} = \frac{\partial}{\partial \beta} \left( \log \Lambda \right) + \frac{\partial}{\partial \beta} \left( \frac{\sigma \lambda}{\rho - \lambda} \frac{z^*}{(\rho - \lambda)^2} \right) + \frac{\partial}{\partial \beta} \left( \frac{\alpha x_0 (1 - 1)}{(\rho - \lambda) (\rho - \lambda + \nu)} \left( 1 - \frac{x^*}{x_0} \right) \right).
\]

Clearly, if the cost of entry is manipulated by the social planner by means of a tax or a subsidy, we would also need to integrate in the welfare calculation the additional distortion possibly generated by such a policy. In general, since \(U_0\) is a function of parameters, we can track through it any policy instrument we wish to add, provided such an instrument is restricted to be time-invariant. If we want the instrument time-variant, then we need to recompute the DME so that agents respond to such time variation.

7 Dynamics: Quantitative analysis

In this section we study the dynamics quantitatively. First, we perform impulse-response exercises describing the adjustment process of an economy that is hit by a corporate governance shock when
it is on its balanced growth path. The shocks can be thought as the effects of policy reforms. In recent decades, a large number of corporate governance reforms have been enacted in advanced and emerging economies. These reforms have modified the rules governing the activity of auditors, the composition and prerogatives of boards of directors, the allocation of power among corporate stakeholders, the punishment of corporate frauds, the disclosure requirements in capital markets (OECD, 2012). Next, we compare the long-run development paths of two economies that differ in the quality of corporate governance. In particular, we study how the behavior of the main macroeconomic variables along the transition and the duration of each development phase depend on corporate governance frictions.

7.1 Calibration

Table 1, Panel A, displays the baseline parameterization. The population growth rate $\lambda$ is set at 1.21 percent, which corresponds to the average population growth rate in the United States from 1910 to 2009 (Maddison data). The private return to quality, $\alpha$, is inferred from comparing the private return on capital with the social return to investment in product quality. If the investment decisions were taken by internalizing the spillover effects of investment, the return would be $1/\alpha$ times the private return (see (23)). Jones and Williams (1998) survey several empirical studies that put the rate of return on R&D (a proxy for investment in product quality) in the range of 30-100 percent. Using a conservative lower bound of 30% for the social return and a private rate of return on capital of 5%, we set $\alpha$ equal to 1/6. This implies a level of spillovers of 83%, which is in line with the Baumol (2002, pp.133-134) calculation of spillovers of about 80%. On the basis of previous estimates on the subject, Baumol uses a value of social rate of return of 53% and a private return between 10% and 12.5%, implying $1-\alpha$ between 76 and 81%. This might seem surprisingly large, but it is in fact in line with another quite different way of estimating uncompensated external benefits proposed by Baumol (p. 132). If one admits that innovations have contributed to the more than nine-fold increase of the U.S. per capita GDP since 1870, then it seems obvious that the great bulk of the benefits have not gone to the innovators, for the aggregate expenditure on R&D is just a small fraction of the GDP.

The social return to variety, $\sigma$, is pinned down by the steady state relationship (28), $\sigma = 1-\lambda/n$. Laincz and Peretto (2006) observe that in recent years the net entry rate of establishments in the U.S. manufacturing sector has roughly been equal to the population growth rate, implying $\sigma = 0$. According to the World Bank Entrepreneurship database, in 2005 firm entry and exit rates in the United States were 12.5 and 10 percent, respectively, implying a net entry rate $n$ of 2.5% and $\sigma = 0.5$. We pick a value of $\sigma$ in the middle of the interval, letting $\sigma = 0.25$. Then, the associated entry rate $n$ is 1.61 percent. The monopolistic price $P$ is set to 1.3, following the empirical literature on the Lerner index. As a result, the corresponding value of the parameter $\theta$ is 0.769. Because we target a long-run growth rate of per capita income of 2% and an interest rate of 5%, the discount rate, $\rho$, is set to 0.03.

Based on a sample of 1438 U.S. firms, for the time period 1992 to 2008, Nikolov and Whited
(2014) estimate (see their table VI, Panel B) managerial empire building activities for about 0.7% of the firms’ gross profits – which in this model correspond to \( \Pi + I \). They also estimate an investment rate of 12% (see their Table II). Since our average firm evaluated in steady state is \( \Pi/r \), if we take an interest rate of 5%, the distortion \( \Omega I \) corresponds to 0.7% \( \times \left( \frac{5}{17} I + I \right) \), which implies \( \Omega \approx 1\% \). The function describing managers’ effort cost of stealing is specified as \( c(S) = S(1 + b) - a \log(1 + S) \), leading to solutions for the share of profits diverted by managers and for the managerial equity stake of \( S = \sqrt{\frac{2a}{1+2b}} - 1 \) and \( e_m = a(\sqrt{\frac{1+b}{2a}} - b) \), respectively. The parameters \( a \) and \( b \) are then chosen to induce a level of resource diversion \( S = 0.016\% \). This is also obtained from Nikolov and Whited’s estimate. They found a diversion of around 0.01% (Table III) on the ensemble of profits and cash holdings. Adjusting for the presence of cash – which they estimate to be 10% of the assets – and considering a profit rate of 17% (Table II), we obtain \( S = 0.016\% \). Turning to \( e_m \), previous studies have estimated equity stakes of managers in a range between 3.6% (Leslie and Oyer, 2009) and 12.7% (Muscarella and Vetsuypens, 1990); Kaplan (1989) and Morck, Shleifer and Vishny (1988) estimate managerial equity stakes of 7.1% and 10.6%, respectively. On the basis of these findings, we pick a value of \( e_m \) of 10%. Hence, the estimates of \( S = 0.016\% \) and \( e_m = 10\% \) imply \( a = 0.9 \) and \( b = 0.8 \).

Finally, the values of \( \phi \) and \( \beta \) are chosen to match a balanced growth rate of per capita gross final output, \( y = \bar{Y}/Y \), of 2% and a saving rate \( s \) close to 10%, as suggested again by the U.S. experience (the saving rate is defined as the fraction of the GDP not consumed, i.e., \( s = 1 - C/G \)).\(^{17}\) Since \( z = y - \sigma n \) (see (28) and (29)), the baseline investment rate \( z \) is 1.60 percent, nearly the same as the net entry rate \( n \) (1.61 percent).

### 7.2 Response to shocks

We study the macroeconomic consequences of changes in parameters that regulate empire building and resource diversion. The shocks are permanent (and are perceived as such), as they mimic structural policy reforms, and they are not anticipated. In Section 6 we noted that any corporate governance shock affects the two sources of growth – entry and incumbents’ investment – in opposite ways: it boosts one and depresses the other. In that section we also noted that the short-run and the long-run consequences also tend to go in opposite directions. The aim of this section is to disentangle the various channels that lead to an acceleration or a deceleration of growth for the calibrated economy. Specifically, we investigate how firms’ responses to corporate governance shocks affect the behavior of macroeconomic variables, such as the rate of investment, the entry rate, and the rate of output growth, both directly and through the general equilibrium channel.

In reviewing the welfare results of the experiments, it is important to bear in mind that the competitive equilibrium is obtained in an environment with various underlying distortions. For instance, of the total return on investment in product quality the firm appropriates only a share

\(^{17}\) According to data from the Bureau of Economic Analysis the gross national saving rate in the post-war period fluctuated between 15% and 20%. Allowing for a depreciation rate of 5–10 percent, we obtain a net saving rate, as a ratio of GDP, in the interval of 5–15 percent. Our calibration delivers a saving rate in the middle of this interval.
α – this is 0.167 in the calibration. The relatively high level of investment spillovers suggests one way to improve the competitive equilibrium: search for allocations where firms invest more. Interestingly, as noted, shocks that make corporate governance frictions more severe may push incumbent firms to invest more aggressively. On the other hand, firms' entry decisions do not internalize the advantage that final good producers have in accessing a more advanced technology – an expanded set of intermediate goods (love-of-variety effect). Therefore, shocks that exacerbate resource diversion can reduce welfare by preventing more firms from entering into the industry. The experiments of this section sort out these channels and their interactions.

7.2.1 Empire building

The parameter Ω that governs empire building drops permanently by half of its initial level – for instance because of a reform that tightens managerial discipline. Panel B of Table 1 summarizes the pre-shock steady state. Figure 5 plots the impulse responses to the shock. An immediate consequence of the shock is a reduction of incumbents’ investment, as managers engage less in empire building. The improvement of managerial discipline is a positive development from the perspective of potential entrants. The acceleration of firms’ entry and the gradual downsizing of incumbent firms cause a further deceleration of investments, on top the direct effect of the shock. The greater variety of intermediate goods is good news for final good producers, and ultimately for consumers. The saving rate $s$ may go up after the shock, to account for the acceleration of entry, but later on it declines as investments absorb fewer resources. The lower demand for investments also pushes the rate of interest down.

Figure 6 shows the impulse response to the same shock in an economy with higher $\Omega$ or a more intense investment externality $(1 - \alpha)$. Table 4 summarizes the long-run changes. The key variables of the economy with a higher initial distortion $\Omega$ exhibit wider movements after the shock. In particular, the entry rate shoots up more significantly and the investment rate declines at a faster pace. This experiment suggests that a reform aimed at keeping managerial empire building in check is of greater consequences in economies where managerial discipline is rather loose to start with. In contrast, the effects of the empire building shock in an economy with stronger investment externalities are more contained, both in the short and in the long run, because in this environment a firm gets less in return for its own investment.

Figure 9, Panel A, plots the welfare changes induced by the same shock in the baseline economy. Following the welfare decomposition of equation (43), it emphasizes three components: long run, transition, and level. Because the values are discounted, the long-run and the transition components exhibit a hump-shaped behavior (there is no level effect because the shock does not affect the consumption-output ratio). As noted earlier, the investment externalities $1 - \alpha$ are rather large. Since firms eventually lower their investment rate, the long-run welfare change is negative. Conversely, the transition component is positive because the shock causes an acceleration of entry along the transition, meaning that the economy benefits from a greater variety of intermediate goods relative to the baseline path. The relative magnitude of the long- and short-run components
determine the overall welfare change.

Countries can differ substantially in the intensity of corporate governance frictions. In fact, Dyck and Zingales (2004) find large cross-country variations in the block premium – a proxy for the intensity of corporate governance frictions. Motivated by this observation, Figure 10, Panel A, gives a bird’s eye view of how the transition and long-run forces weigh in the determination of welfare changes across economies with different degrees of corporate governance frictions (the two left plots) and non-corporate frictions (investment externalities and entry externalities, the two right plots). The curves represent the level, transition, and long-run welfare changes summed up over time (see equation 46). Both the transition and the long-run welfare changes are larger in economies that have a lower quality corporate governance (high \( \Omega \) or low \( b \)), quite the opposite of what happens with the investment externalities.

7.2.2 Resource diversion

Consider now a shock that alters the stealing cost function \( c^S(S) \) so that the new equilibrium level of stealing is half of the baseline one (Table 1). It could be the result of a policy reform that hinders managers’ resource diversion. For simplicity the shock hits only \( b \) – the slope of the linear part of the stealing-cost function. Unlike in the \( \Omega \)-experiment, the shock now affects the allocation of equity shares and the intensity of stealing. The reduction in managers’ ability to divert resources induces founding shareholders to scale down the equity stake \( e_m \) awarded to managers by 0.22%. The founding shareholders’ appropriation factor \( \Theta \) increases by 0.29%, that is, by more than the decline in \( e_m \) thanks to the lower level of stealing. Figure 7 shows the industry dynamics: there is an acceleration of firms’ entry and consequently the downsizing of average firm size. As a result, firms’ return to investment goes down. (Unlike in the empire-building experiment, in this case the shock does not interfere directly with this return). In the long run, the economy converges to an equilibrium with more firms of smaller size that devote a relatively smaller share of their sales to investment. The entry effect is stronger than in the \( \Omega \)-experiment: in the current scenario there is a clear jump up of the saving rate because the entry effect more than compensates the deceleration of investments. Therefore, households forego consumption relatively more in order to finance the entry of new firms.

As with the set of \( \Omega \)-experiments, Figure 8 considers how a more distorted economy, due to lower quality corporate governance (lower \( b \)) or stronger investment externalities (higher \( 1 - \alpha \)), responds to a similar shock to \( b \). Table 4 summarizes the long-run effects. A low-\( b \) economy (i.e., where it is easier to divert resources) generates similar impulse responses but of smaller amplitude. Hence, in a low-\( b \) economy the entry rate does not increase as much as in the baseline economy, there is a slower decline in firms’ size, and a smaller drop in the investment rate of incumbents. This conclusion contrasts with the one reached in the previous section: the economy with the more severe corporate governance friction (low \( b \)) is less sensitive to the reform. Finally, in the economy with stronger investment externalities, the impact of the shock on firms’ entry is quite similar in magnitude to that of baseline economy.
Panel B of Figure 9 shows the welfare effects of the shock in the baseline economy. The decline of the long-run component of welfare is still caused by the drop of the investment rate, like in the empire-building experiment (bottom U-shaped line) whereas the welfare gains are due to the greater variety of intermediate goods induced by the acceleration of firms’ entry (top hump-shaped curve). As the entry effect is stronger in the case of resource diversion relative to the Ω-experiment, the short run effects are quantitatively more important. An additional term that appears here is the level effect: as a result of the shock, households now drop permanently their consumption relative to output.

The intensity of resource diversion can exhibit large variation across countries. Studying managers’ resource diversion in a sample of Russian firms, Mironov (2013) estimates shares of resources diverted by managers significantly larger than those found by Nikolov and Whited (2014) for U.S. managers. Figure 10, Panel B, compares the welfare changes of economies that suffer different degrees of non-governance distortions (two right plots) with changes in economies that vary in the quality of corporate governance (two left plots). Specifically, the figure provides a visual summary of the welfare consequences of the resource diversion shock for economies that differ in Ω, b, α, and σ. It turns out that the welfare changes resemble, from a qualitative point of view, the ones surveyed for the Ω-experiment. It is noticeable, however, that the welfare component associated with the transition is now significantly more important – reflecting the more direct way in which the shock bites on entry. The figure also confirms an important difference with respect to the Ω-experiment: the magnitude of both the long- and short-term component of the welfare changes are smaller in economies with a lower quality of corporate governance, here captured through a smaller b.

7.3 Long run

In the previous section we investigated the effects of shocks to corporate governance frictions having in mind the adoption of policy measures that correct corporate governance distortions. For this reason it was convenient to assume an economy in steady state. We now consider a rather different type of exercise: how the quality of corporate governance affects the development pattern of an economy. This change of perspective brings back into the quantitative analysis the evolution of the economy presented in Section 6. According to that analysis, the economy can go through three phases of development: a first phase with no entry and no investment, a second one with only entry, and a third phase with both investment and entry. In this section we show that the quality of corporate governance regulates the speed at which the economy travels along the three phases and, perhaps more interestingly, that it also plays a role in the timing of the threshold-crossing events that characterize the whole transition.

Figure 11 compares the long-run evolution of two economies that differ only in the intensity of empire building. We use the baseline parameters of Table 1 for the low-friction economy (solid lines). The intensity of empire building (Ω) is two times higher in the alternative, high-friction economy (dashed lines). Both economies start from the same initial firm size $x_0$. At first, they
simply produce the final good using an exogenously given variety of intermediate goods: there is no entry and no investment. Specifically, the returns to investment and to entry in (23) and (24) are too low relative to the discount rate, the whole net output is consumed and there is no saving. In this phase, therefore, the only source of dynamics is the enlargement of the population that causes a gradual increase of firms’ size $x$ and thereby of firms’ profitability. As the (quality-adjusted) profit rate rises, at a certain point firms’ entry becomes profitable. The trigger point is reached at the same time in the two economies, because the empire building bias is not relevant yet. In the second phase, incumbent firms do not yet invest because it is not profitable to do so — formally, the return to investment in (23) is smaller than the return to entry in (24). The low-friction economy enters the investment phase of development (third phase) later than the high-friction economy, and has a relatively lower investment rate even when investment is profitable in both economies. Conversely the low-friction economy is more dynamic when we look at the entry rate. This increases even further the investment gap between the two economies because firms of smaller size tend to have a lower investment rate.

We next compare the transition paths of two economies characterized by a different stealing cost function $c^S(S)$. In Figure 12 the solid lines represent the same baseline economy as in Figure 11 and the dashed lines a more distorted economy where resource diversion is more intense. The intermediate phase of development, in which $n > 0$ but $z = 0$, is visibly shorter in the more distorted economy. Indeed this economy stays relatively longer in the first phase ($n = z = 0$) and is relatively quick to start quality innovation. The key variable that explains the different transitional experiences of the two economies is the appropriation factor $\Theta$, the share of profits that remains in the hands of founding shareholders. Because this is smaller in the more distorted economy, entry occurs later and thereafter is still more depressed than in the baseline economy. As a result, firm’s size is always larger, which explains the higher rate of investment. Despite these differences in the market structure, the two economies do not necessarily differ in a substantial way in their welfare levels, evaluated from the initial viewpoint: the baseline economy benefits relatively more on the variety dimension, whereas the more distorted economy reaps relatively more benefits from the faster pace at which incumbents invest in their intermediate products. In general, during the transition neither economy systematically outperforms the other with respect to the per capita output growth rate.

8 Extension: Monitoring

We extend our baseline environment and include a second agent, the monitor, who is rewarded with an equity share to supervise the manager and curb his diversion of resources. The objective is to enlarge the set of internal control mechanisms and explore additional implications of our setup.
8.1 Monitor

The monitor can mitigate the manager’s stealing but, because of his private cost, requires incentives through the participation to the profits of the firm. We let \( e_{a,i} \) denote the equity share of the monitor. The manager now steals a fraction \( \Sigma(M, S) \) of the net profits \( \Pi \), where \( S \) is his stealing effort and \( M \) is the monitor’s effort.\(^{18}\) We assume \( \partial \Sigma(M, S)/\partial S = \Sigma_S (M, S) > 0 \) and \( \Sigma_M (M, S) < 0 \). The effort cost of monitoring is \( c^M(M_i) \cdot \Pi_i \), where \( \partial c^M(M_i)/\partial M_i > 0 \), \( \partial^2 c^M(M_i)/\partial M_i^2 \geq 0 \). At time \( t \), given the paths \( S_i(s), P_i(s), I_i(s) \) and \( e_{a,i}(s) \), for \( s \in [t, \infty) \), the monitor chooses the path of monitoring \( M_i(s) \) to maximize

\[
V_{i \text{monitor}}(t) = \int_t^{+\infty} e^{-\int_t^s r(v) dv} \left[ e_{a,i}(s) \left[ 1 - \Sigma_i(M_i(s), S_i(s))\right] - c^M(M_i(s)) \right] \Pi_i(s) ds.
\]

(47)

Since this problem does not have a dynamic constraint, it reduces to a sequence of identical intratemporal problems. Moreover, because the monitor takes as given the actions of the manager, he takes as given the path \( \Pi_i(s) \). Consequently, he sets \( \partial \Pi_i(s)/\partial M_i(s) = 0 \) and his first-order condition is

\[-e_{a,i} \frac{\partial \Sigma_i(M_i, S_i)}{\partial M_i} = \frac{\partial c^M(M_i)}{\partial M_i}.\]

(48)

This conveys a similar intuition as the first-order condition for the manager’s stealing that now reads

\[(1 - e_{m,i}) \frac{\partial \Sigma_i(M_i, S_i)}{\partial S_i} = \frac{\partial c^S(S_i)}{\partial S_i}.
\]

(49)

The equity share \( e_{a,i} \) of the monitor determines the extent to which he mitigates the manager’s stealing.

8.2 The stealing-monitoring Nash equilibrium

We think of the first-order conditions (49) and (48) for stealing and monitoring as reaction functions that at time \( s \geq t \) yield a Nash equilibrium in simultaneous moves. Formally:

**Proposition 7** (Stealing-Monitoring NE) Assume

\[
\frac{\partial}{\partial M_i} \left( \frac{\partial \Sigma_i(M_i, S_i)}{\partial S_i} \right) \leq 0 \quad \text{and} \quad \frac{\partial}{\partial S_i} \left( -\frac{\partial \Sigma_i(M_i, S_i)}{\partial M_i} \right) \geq 0.
\]

(50)

There exists a stealing-monitoring NE, consisting of two functions \( S_i(e_{m,i}, e_{a,i}) \), \( M_i(e_{m,i}, e_{a,i}) \) with the property:

\[
\frac{\partial S_i(e_{m,i}, e_{a,i})}{\partial e_{m,i}} < 0, \quad \frac{\partial M_i(e_{m,i}, e_{a,i})}{\partial e_{m,i}} < 0;
\]

\[
\frac{\partial S_i(e_{m,i}, e_{a,i})}{\partial e_{a,i}} < 0, \quad \frac{\partial M_i(e_{m,i}, e_{a,i})}{\partial e_{a,i}} > 0.
\]

\(^{18}\)For simplicity, monitoring does not directly affect the private benefits the manager enjoys from empire building.

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Accordingly, there exists the function $\Sigma_i (M_i (e_{m,i}, e_{a,i}), S_i (e_{m,i}, e_{a,i})) = \Sigma_i (e_{m,i}, e_{a,i})$ with the property:

$$
\frac{\partial \Sigma_i (e_{m,i}, e_{a,i})}{\partial e_{m,i}} < 0 \quad \text{and} \quad \frac{\partial \Sigma_i (e_{m,i}, e_{a,i})}{\partial e_{a,i}} < 0.
$$

**Proof.** See the Technical Appendix. 

This result summarizes the interaction between our two agents. Equations (49) and (48) define in implicit form the reaction functions of the manager and the monitor. The properties of these reaction functions follow solely from the concavity of the stealing function $\Sigma_i (M_i, S_i)$ with respect to each argument, holding the other constant, and the convexity of the stealing and monitoring cost functions $c^S (S_i)$ and $c^M (M_i)$. To characterize the NE we need assumptions on the second cross-partial derivatives. We thus assume that monitoring (weakly) reduces the marginal benefit to stealing, the first restriction in (50), obtaining that the reaction function of the manager is (weakly) decreasing in monitoring. A well-defined, stable, NE then only requires that in the $(S_i, M_i)$ space the reaction function of the manager be steeper than that of the monitor. A sufficient condition for this to be the case is that the reaction function of the monitor be (weakly) increasing, that is, that the marginal benefit of monitoring be (weakly) increasing in the manager’s stealing effort. This is the second restriction in (50). To summarize, given the properties of the function $\Sigma_i (M_i, S_i)$, the first order conditions of the manager and the monitor yield a pair $(M_i, S_i)$ that depends on the equity shares $(e_{m,i}, e_{a,i})$. We thus can write stealing as the function $\Sigma_i (M_i (e_{m,i}, e_{a,i}), S_i (e_{m,i}, e_{a,i})) = \Sigma_i (e_{m,i}, e_{a,i})$.

### 8.3 Founding shareholders

The problem of the founder changes as follows. He now makes two decisions: the first is whether to fund the start-up project in the first place; the second is to set the paths $e_{m,i}(s)$ and $e_{a,i}(s)$ of the equity shares allocated to the manager and to the monitor in order to induce the behavior that maximizes his stake in the firm. The first decision is represented by the same participation constraint as in the baseline case. To study formally the second decision, we use the function $\Sigma_i (e_{m,i}, e_{a,i})$ constructed in Proposition 7 and write

$$
V_i^{\text{founder}} (t) = \int_t^{+\infty} e^{-\int_t^r r(u) du} \left[ 1 - e_{m,i}(s) - e_{a,i}(s) \right] \left[ 1 - \Sigma_i (e_{m,i} (s), e_{a,i} (s)) \right] \Pi_i(s) ds. \tag{51}
$$

Our main result is then the following.

**Proposition 8 (Equity Shares)** Assume that the shares $(e_{m,i}, e_{a,i})$ are chosen at the time of foundation of the firm, $t$, and then held constant for $s > t$. Then the founder’s problem reduces to

$$
\max_{e_{m,i}(t), e_{a,i}(t)} [1 - e_{m,i}(t) - e_{a,i}(t)] [1 - \Sigma_i (e_{m,i} (t), e_{a,i} (t))]. \tag{52}
$$

The solution to this problem yields a pair of constant values $e_{m,i}, e_{a,i}$ that allow us to define

$$
\Theta \equiv [1 - e_{m,i} - e_{a,i}] [1 - \Sigma_i (e_{m,i}, e_{a,i})]. \tag{53}
$$
The proof is in the Technical Appendix where we also show that the consumption output-ratio of the economy is still represented by (31). The analysis shows that monitoring curbs the manager’s resource diversion, affecting the appropriation factor $\Theta$. (To economize on notation, we keep the same symbol as in the baseline model.) However, monitoring entails a conflict among shareholders: the monitor maximizes the value of his own stake in the firm rather than the value of all shareholders. Thus, as the first order condition for monitoring (48) illustrates, if the founding shareholder retains a higher equity share he weakens the monitor’s incentive to oversee the manager. At the optimum, the founding shareholder is indifferent between obtaining a marginal reduction in stealing $\Sigma(e_m, e_a)$ directly, by giving ownership shares to the manager, or indirectly, by giving ownership shares to the monitor to incentivize his monitoring activity.

The trade-off faced by founding shareholders can be further understood by revisiting the effects of corporate governance shocks. In particular, imagine that we want to replicate the type of experiment shown in Figure (7) in this extended setting. In that experiment, the shock led to an increase in the parameter $b$ of the stealing cost function $c(S) = S(1 + b) - a \log(1 + S)$. We now let the stealing-benefit function and the cost of stealing and monitoring be respectively

\[
\Sigma_i(M_i, S_i) = \mu_S \log(1 + S_i) - \mu_M \log(1 + M_i) ;
\]

\[
c^M(M_i) = \eta_M M \quad \text{and} \quad c^S(S_i) = \eta_S S_i .
\]

A similar shock to the stealing technology now corresponds to a rise in the stealing cost parameter $\eta_S$. We choose the initial values of the additional parameters $\mu_M$, $\eta_M$, $\mu_S$ and $\eta_S$ assuming a target share of stolen profits of $\Sigma = 0.016\%$ and a managerial equity share of $e_m = 10\%$, as in the baseline case in Section 7.1. In addition, we target an equity share of the monitor of $e_a = 2\%$. This is in the ballpark of the estimates of the equity stake of boards of directors in Bryan and Klein (2008), for example — see the Technical Appendix for details on calibrated values as well as the explicit solutions for $e_m$, $e_a$, $M$, and $S$. Table 5 shows the long-run effects of the shock to $\eta_S$. By construction, the long-run changes in $z, r,$ and $x$ are the same as those of the baseline economy. The economy with monitoring, however, exhibits a richer adjustment mechanism in the ownership structure of the firms, due to the larger set of internal control mechanisms available to founding shareholders. In fact, the manager’s equity share goes down relatively more than in the baseline case; part of the spared shares goes to the monitor to induce him to oversee the manager and part is retained by the founding shareholder.19

### 8.4 Monitoring technology

Our setting can also accommodate more refined hypotheses about the monitoring technology. We explored a case in which the monitoring cost is $c^M(M, \pi) \cdot \Pi$, where $\pi \equiv \Pi/X$ is the profit rate.

---

19The same macroeconomic scenario obtains through a reduction of $\mu_M$, capturing for instance a deterioration of the capacity of board of directors to monitor managers. The manager’s and monitor’s responses are now larger and the fraction diverted, $\Sigma$, increases (see Table (5) second row from the top).
Monitoring could be harder when the profits to be monitored are larger \( (\partial c^M(\cdot)/\partial \pi > 0) \), perhaps because of higher business complexity. Alternatively, it could be harder when profits are low \( (\partial c^M(\cdot)/\partial \pi < 0) \): in firms on the verge of losses distinguishing bad luck from bad management may be difficult. When \( \partial c^M(\cdot)/\partial \pi > 0 \) a shock to a parameter that intensifies resource diversion (lowers \( \Theta \)) rotates the EI locus clockwise more than when \( \partial c^M(\cdot)/\partial \pi = 0 \). The resulting increase in the steady state firm size \( (x) \) and investment \( (z) \) is larger. By contrast, there is a more modest rotation of the EI locus when \( \partial c^M(\cdot)/\partial \pi < 0 \). Intuitively, an increase in firm size induced by the intensification of resource diversion alters the monitoring effectiveness (increasing it when \( \partial c^M(\cdot)/\partial \pi > 0 \), reducing it when \( \partial c^M(\cdot)/\partial \pi < 0 \)). In turn, the intensity \( 1 - \Theta(\cdot) \) of resource diversion affects \( x \) and \( z \), causing a mutual interaction between the degree of consolidation of the market structure and the intensity of resource diversion. The main insight is that the qualitative results carry through, but feedback effects can magnify or moderate the impact of corporate governance shocks. Finally, observe that this variation is also representative of situations in which the stealing cost per unit of profits stolen depends on the firm’s profits. For example, the assumption that monitoring exhibits scale economies with respect to profits is equivalent to one of diseconomies of scale in the stealing technology.

### 9 Extension: Debt

It is often argued that, being a “hard claim”, debt can directly curb managers’ resource diversion (see, e.g., Hart and Moore, 1995 and 1998; Shleifer and Wolfenzon, 2002). To explore how this disciplining role of debt can influence our analysis, we now posit that the founding shareholder of a firm can seek credit from households. We denote by \( \gamma_d \) the fraction of the entry cost financed with debt and by \( R_{d,i}(s) \) the flow debt repayment at time \( s \) (partial repayment of principal plus payment of interests). To capture the nature of debt as a hard claim, we let the manager divert profits only after the scheduled debt repayment \( R_{d,i} \) is made. The manager’s effort cost of stealing is the same as in the baseline case, \( c^S(S_i) \cdot (\Pi_i - R_{d,i}) \). The manager’s utility flow then reads

\[
 u_{i, \text{manager}}^{\text{manager}} = [e_{m,i} (1 - S_i) + S_i - c^S(S_i)] \cdot (\Pi_i - R_{d,i} + \Omega I_i).
\]

His decision structure yields the same expressions for the price, \( P_i \), and the return to investment, \( r_Z \), obtained in the baseline environment. The first-order condition for the manager’s stealing effort remains

\[
 1 - e_{m,i} = \frac{\partial c^S(S_i)}{\partial S_i},
\]

yielding a function \( S_i(e_{m,i}) \) that characterizes the manager’s stealing decision.

At the foundation time, the founding shareholder chooses the path \( e_{m}(s) \) of the equity shares allocated to the manager that maximize the value of his own stake in the firm,

\[
 V_{\text{founder}}^i(t) = \int_t^{+\infty} e^{-\int_t^s r(v)dv} [(1 - e_{m,i}(s))(1 - S_i(e_{m,i}(s)))] [\Pi_i(s) - R_{d,i}(s)] ds,
\]

32
where we have used the function $S_i(e_{m,i})$ obtained above. The debt amortization schedule, $R_{d,i}(s)$, must satisfy the creditors’ participation constraint,

$$
\int_{0}^{+\infty} e^{-f^{*}r(v)dv} R_{d,i}(s)ds \geq \gamma_d \beta X(t),
$$

which holds with equality if the credit market is fully competitive. It is easy to verify that the result of Proposition 1 carries through to this environment with debt. Using this result, in the Technical Appendix we then show that the founder’s free entry condition $V_{\text{founder}}(t) = (1 - \gamma_d) \beta X(t)$ now reduces to $\Theta' V_{i}(t) = \beta X(t)$, where

$$
\Theta' \equiv \frac{(1 - e_{m,i})[1 - S_i(e_{m,i})]}{1 - \gamma_d [e_{m,i} + S_i(e_{m,i})(1 - e_{m,i})]}.
$$

Debt reduces the amount of profits that the manager can divert, raising the founding shareholder’s appropriation factor $\Theta'$. This effect of debt is captured by the term $\gamma_d [e_{m,i} + S_i(e_{m,i})(1 - e_{m,i})]$ in the denominator of the expression for $\Theta'$ (note that $\Theta' \in [\Theta, 1]$ and boils down to the appropriation factor $\Theta$ of the baseline case when $\gamma_d = 1$, that is, in the absence of debt). Clearly, in our setting debt can achieve the benefit of curbing resource diversion without entailing agency or bankruptcy costs. Thus, we had to exogenously fix the share $\gamma_d$ of the entry cost financed with debt and study the implications of debt for a given $\gamma_d$. We leave to future work a more comprehensive analysis featuring agency costs of debt.

## 10 Robustness

In the baseline model, we introduced two assumptions for reasons of analytical tractability: (i) empire building benefits proportional to managers’ profit stake; and (ii) a sticky equity allocation. In this section, we provide an empirical interpretation of these assumptions and show how the set up of the problem and the equilibrium solutions change under alternative specifications.

### 10.1 Specifications of empire building

The utility flow in (10) implies that a larger managerial profit stake $[e_{m,i}(1 - S_i) + S_i - e^S(S_i)]$ scales up by the same factor the manager’s cost of investing and his private benefits from the investment volume. As a result, this specification does not take an a priori stance on whether a larger managerial stake in the firm moderates or exacerbates empire building. The literature distinguishes two channels whereby managers’ stake can affect empire building. On the one hand (alignment effect) a manager with a larger stake in the firm’s profits has more to lose from value-destroying investments (Jensen and Meckling, 1976). On the other hand (entrenchment effect) a manager with a larger equity share and control of resources has more freedom to indulge in empire building undisturbed, for example because he has more influence and voting power or can better resist firing threats (Demsetz, 1983). The specification in (10) captures the entrenchment effect in reduced form by positing that a manager with a larger stake can extract more private benefits.
from the investment volume. Many empirical studies find that neither effect obviously dominates the other so that firms’ investment and value do not clearly depend on the managerial stake in a positive or negative way (Morck, Shleifer and Vishny, 1988). In line with these findings, our baseline specification agnostically lets the two channels offset each other. We now consider the following specification

$$u^\text{manager}_i = \Theta_m \Pi_i + \Omega I_i,$$

(57)

where

$$\Theta_m \equiv [e_{m,i} (1 - S_i) + S_i - c^S (S_i)]$$

denotes the manager’s profit stake. This specification implies that a larger stake scales up the investment costs borne by the manager but leaves his benefits from empire building unchanged.

The manager’s pricing and stealing decisions are still governed by (12) and (15) like in the baseline environment. The manager’s return to investment becomes

$$r_Z = \frac{\alpha}{1 - \frac{\Theta_m}{\Theta} \left[\frac{1}{\theta} - 1\right]} \left[\frac{X_i}{Z_i} - \phi(Z_i) \right]^{1-\alpha} + \frac{\dot{q}_i}{q_i},$$

(58)

Unlike (13) of the baseline environment, (58) shows that a larger profit stake $\Theta_m$ of the manager dampens the distortionary effect of empire building ($\Omega$) on the investment return, thus influencing the investment path. An interpretation is that now the alignment effect dominates the entrenchment effect and a manager with a larger stake in the firm’s profits is less prone to value-destroying investments.

The shareholder now also needs to take into account the impact of the manager’s equity share $e_{m,i}$ on the path of investment and profits through $\Theta_m$, when at foundation he maximizes

$$V^\text{founder}_i (t) = \int_t^{+\infty} e^{-\int_t^s r(v) dv} \left[1 - e_{m,i}(s) \right] \left[1 - S(e_{m,i}(s)) \right] \Pi_i(\Theta_m; s) ds.$$

With this specification of empire building, the separability of the “share of the pie” and “size of the pie” components no longer holds. In particular, relative to the baseline specification, the shareholder faces an additional trade-off: reducing the manager’s stake $\Theta_m$ to increase his own “share of the pie” $\Theta$ or increasing $\Theta_m$ to mitigate the manager’s overinvestment due to empire building (expand the “size of the pie”). If the intensity $\Omega$ of empire building is not too high, the shareholder may find it optimal to choose the equity share $e_m$ that maximizes his appropriation factor $\Theta$, like in the baseline environment, or depart from it only marginally. Because the trade-off cannot be studied analytically, we developed an algorithm to pin down numerically the equity share that maximizes the value of the shareholder’s stake. Figure (13) shows that the larger $\Omega$, the higher is the equity share allocated to the manager. The differences are small, however: doubling the baseline value of $\Omega$ of 1% produces an increase in $e_m$ less than 1%, suggesting that the shareholder is reluctant to sacrifice his profit share to mitigate empire building.

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$^{20}$Morck, Shleifer and Vishny (1988) find that at low levels of managerial equity ownership, the alignment effect slightly prevails, while at higher levels the entrenchment effect slightly dominates.

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We can next revisit the effects of corporate governance frictions. The CI and the EI loci are

\[
\begin{align*}
z = & \frac{\alpha}{1 - \frac{\Omega}{\Theta_m}} \left[ \left( \frac{1}{\theta} - 1 \right) x - \phi \right] - \left( \rho + \frac{\sigma \lambda}{1 - \sigma} \right) \quad \text{(CI)} \\
= & \left[ \frac{1}{\theta} - 1 - \frac{\beta}{\Theta} \left( \rho + \frac{\sigma \lambda}{1 - \sigma} \right) \right] x - \phi. \quad \text{(EI)}
\end{align*}
\]

While the EI locus remains the same as in the baseline environment, now the slope and intercept of the CI locus depend on the manager’s stake \(\Theta_m\). It is easy to verify that, like in the baseline environment, in steady state the economy with corporate governance frictions exhibits larger firms (a more concentrated market structure) and more aggressive investment of incumbents than the benchmark growth economy with frictionless governance. We can also revisit the effects of corporate governance shocks on the steady state. Figure (14) revisits the impact of a decrease in the stealing cost using the parameterization in Table 1, Panel A. The reduction of \(\Theta\) (the shareholder’s appropriation factor) still causes the EI locus to rotate downward. Now, however, the increase in \(\Theta_m\) causes a slight downward rotation of the CI locus. In fact, the increase in the manager’s stake better aligns his interests with those of the shareholder, slightly mitigating empire building. The overall effect of the shock is similar to that of the baseline environment. The only difference is that, due to the rotation of the CI locus caused by the attenuation of empire building, the increase in investment and in market concentration is slightly smaller than in the baseline environment.

Finally, we can revisit the effects of a shock that increases the intensity of empire building \(\Omega\). As in the baseline scenario, this produces an upward rotation of the CI locus, while leaving the EI locus unchanged. Again, the qualitative effects of the shock remain the same as in the baseline environment. The only difference is that the extent of the rotation of the CI locus and, hence, the increase in investment and firm size depend on managers’ stake \(\Theta_m\).\(^{21}\)

### 10.2 Changes in ownership structure

In the baseline model, the equity allocation chosen at foundation is retained during the firm’s lifetime. Firms’ ownership structures exhibit strong inertia. Bebchuk and Roe (1999) discuss several reasons for this strong inertia, including sunk costs, externalities, and stakeholders’ vested interests. For example, a manager could oppose a change in the equity allocation that would reduce his appropriation of profits. Moreover, because of free rider problems, dispersed shareholders could be reluctant to sell their shares. We now show that, even without evoking these problems, in our economy founding shareholders could prefer a constant equity allocation.

We introduce a contract that allows equity shares to change over the firm’s lifetime. In the baseline environment, a manager’s return to investment is

\[
r_Z = \frac{\alpha}{1 - \Omega} \left[ \left( \frac{1}{\theta} - 1 \right) x_i - \phi \left( \frac{Z}{Z_i} \right)^{1 - \alpha} \right] + \frac{\hat{q}_i}{q_i}.
\]

\(^{21}\) Using the expression for the CI locus, it is straightforward to show that the larger \(\Theta_m\), the smaller the effects.
where
\[ q_i = \left[ e_{m,i} (1 - S_i) + S_i - c^S (S_i) \right] \cdot (1 - \Omega) . \] (60)

Expressions (59)-(60) show that the shareholder can influence the manager’s return, and hence the investment path, by affecting the evolution of the shadow value \( q_i \) of investment through \( e_{m,i} \). Suppose that at foundation the contract sets a managerial equity share \( e_{m,i} \) that decreases over time. The manager’s incentive to invest will be lower than in the constant-quota environment because at any time his share of investment cost is higher than his share of future investment returns (implying \( \dot{q}_i / q_i < 0 \)). By setting a path of decreasing managerial equity stakes, the shareholder could then mitigate the overinvestment induced by empire building. However, from the standpoint of resource diversion, departing from a constant equity allocation reduces the shareholder’s appropriation factor \( \Theta \). In fact, as shown in the baseline environment, there is a unique managerial equity stake that maximizes \( \Theta \). The shareholder thus faces a trade-off between mitigating empire building (expanding the “size of the pie”) and obtaining a larger fraction of the firm value (i.e., a larger “share of the pie”). If the intensity \( \Omega \) of empire building is not too high, he can prefer a sticky equity allocation.

Although we cannot derive analytical conditions under which a shareholder prefers a sticky equity allocation, we developed an algorithm to gain insights into the problem. In Figure (??) we compare the value of the shareholder’s stake under the sticky equity allocation of the baseline environment with the value if the managerial equity share \( e_{m,i} \) decreased or increased at a constant rate over the firm’s lifetime. The figure shows that the founding shareholder would strictly prefer the sticky equity allocation to the alternative paths with changing equity shares.\(^{22}\)

To conclude, we argue that if founding shareholders used contracts with changing equity shares the overall impact of corporate governance frictions on the steady state would be qualitatively the same as in the baseline environment. Consider a polar case in which founders set a path of \( e_{m,i} \) that fully offsets the impact of empire building (\( \Omega \)) on the investment return in (59). The CI locus will be as in the benchmark economy with frictionless governance. However, the EI locus will be rotated downward relative to the benchmark economy, and possibly more than in the baseline environment (with changing equity shares, founding shareholders obtain a smaller profit share \( \Theta \)). Thus, as in the baseline environment, the economy will exhibit higher market concentration and more aggressive investment by incumbents than the benchmark economy with frictionless governance.

11 Conclusion

This paper has investigated the impact of financial market imperfections, in the form of corporate governance frictions, on growth and industry dynamics. Following prior literature, we have posited two frictions: an empire building issue, such that managers enjoy private benefits from expanding firms’ size, and a resource diversion issue, such that managers syphon resources off firms. In our economy, shareholders can partially discipline managers through internal control mechanisms

\(^{22}\)Clearly, other paths of the equity allocation are possible, with variable growth rates of managerial ownership.
(equity-based compensation contracts, monitoring, and debt). The analysis reveals that both corporate governance frictions tend to increase the concentration of the market structure and depress the entry rate of new firms. At the same time, the frictions make incumbent firms invest more aggressively.

When the economy is hit by a shock to the intensity of resource diversion or of empire building, the mechanisms described above shape the welfare impact of the shock. For example, following a reduction in the intensity of resource diversion or of empire building, the acceleration in firms’ entry can have a positive welfare effect. Yet, the overall welfare impact of such a shock is not obvious a priori. The less aggressive investment of incumbents induced by the acceleration of firms’ entry can reduce welfare if the economy features relevant investment externalities. Importantly, the analysis predicts that policy reforms that enhance corporate governance benefit economies with poor corporate governance more than economies with good governance.

The analysis leaves interesting questions open for future research. In order to emphasize the distortions associated with managers’ resource diversion and empire building, we have abstracted from other issues such as short-termism of managers or possible myopia of consumers and investors (who could behave in ways inconsistent with an infinite forward-looking utility function). As for managers’ short-termism, it is worth noting that the corporate governance literature shows that short-termism may have implications not dissimilar from empire building attitudes, when the market can easily observe managers’ investment (Bebchuk and Stole, 1993). As for households’ myopic behavior, myopic shareholders could be inclined to favor the expansion of firms’ current profits to the detriment of investment in product quality.

Future research could also integrate more sophisticated market interactions. For instance, more could be done on the dynamics of price competition. For analytical convenience, following Dixit and Stiglitz (1977), we assumed that atomistic monopolists choose prices with constant markups independently one from the other. This had the advantage of formulating the optimization problem of an intermediate firm without considering the feedback of the pricing decisions of other firms. Alternative approaches that consider jointly price (or quantity) and entry decisions are available (among others, see Peretto, 1999, Melitz, 2003, and Etro, 2004, and Burstein and Gopinath, 2014, for a comprehensive discussion). In the context of our economy, one could consider a price decision that is decreasing not only in the degree of product substitutability, but also in the number of firms. In this alternative setting, corporate governance shocks could influence firms’ markups by altering firms’ market size, thus generating richer aggregate effects.

References


Table 1: Baseline Economy, Steady State
Panel A: Parameters
<table>
<thead>
<tr>
<th>Production and Entry</th>
<th>Households</th>
<th>Corporate Governance</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\alpha$</td>
<td>$\sigma$</td>
<td>$\theta$</td>
</tr>
<tr>
<td>0.167</td>
<td>0.25</td>
<td>0.769</td>
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Panel B: Steady State

<table>
<thead>
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<th>Ratio</th>
<th>Percentages</th>
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<td>$x^*$</td>
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<tr>
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Table 2: Economy with Monitoring, Steady State
Panel A: Parameters
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<th>Households</th>
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<tbody>
<tr>
<td>$\alpha$</td>
<td>$\sigma$</td>
<td>$\theta$</td>
</tr>
<tr>
<td>0.167</td>
<td>0.25</td>
<td>0.769</td>
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Panel B: Steady State

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<thead>
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Table 3: Reduction of Empire Building Friction

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<th>$\Delta$ Steady State (%)</th>
<th>$\Delta$ Welfare</th>
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<tr>
<td>$x^*$, $z$, $y$, $r$, $s$</td>
<td>$-0.15$</td>
<td>$-0.0327$</td>
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<td>Baseline</td>
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</tr>
<tr>
<td>higher $\Omega$</td>
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<td>0.14</td>
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<tr>
<td>lower $\alpha$</td>
<td>0</td>
<td>0.04</td>
</tr>
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</table>

Note: The value of $\Omega$ drops by half of its initial value (1%). The last three columns summarize the welfare changes (see equation (46)).

Table 4: Higher Stealing Costs

<table>
<thead>
<tr>
<th></th>
<th>$\Delta$ Steady State (%)</th>
<th>$\Delta$ Welfare</th>
</tr>
</thead>
<tbody>
<tr>
<td>$x^*$, $z$, $y$, $r$, $1-e_m$, $e_m$, $S$, $\Theta$, $s$</td>
<td>$-0.54$</td>
<td>$-0.027$</td>
</tr>
<tr>
<td>Baseline</td>
<td>-0.02</td>
<td>0.29</td>
</tr>
<tr>
<td>lower $b$</td>
<td>-0.76</td>
<td>-0.038</td>
</tr>
<tr>
<td>lower $\alpha$</td>
<td>-0.50</td>
<td>-0.020</td>
</tr>
</tbody>
</table>

Note: The shock to the cost stealing function (the parameter $b$ goes up by 0.36%) causes a reduction of $S$ by half of its initial value (0.016%). In the second and third row from the top, the experiment is repeated for an economy with $b$ at 80% of its original value (0.8) and one with $\alpha=0.13$. The last three columns summarize the welfare changes (see equation (46)).
Table 5: Lower Monitoring Costs

<table>
<thead>
<tr>
<th>Type of Shock</th>
<th>Δ Steady State (%)</th>
<th>Δ Welfare</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \eta_S )</td>
<td>( x^* ) ( z, y, r ) ( e_m ) ( e_a ) ( \Sigma ) ( \Theta ) ( s )</td>
<td>Level</td>
</tr>
<tr>
<td>( -0.54 )</td>
<td>( -0.027 )</td>
<td>( -0.284 )</td>
</tr>
</tbody>
</table>

Note: The shock causes an increase of the stealing cost parameter \( \eta_S \) (which is comparable to the parameter \( b \) in Table 4 by 0.31%) so as to match the long-run decline in investment of the baseline experiment, summarized in the first row of Table 4. The same effects (not shown) are generated through a reduction of the monitoring cost parameter \( \eta_M \) by 12.8%. The last three columns summarize the welfare changes (see equation (46)).
Figure 1: Investor Protection, Firm Entry, and Investment in Intangibles

- Note: Authors' elaboration based on data described in footnote 1 in the main text. The figure plots the percentage rates of firm entry (star) and the average percentage rate of incumbents' investment in intangible fixed assets (ball) against the index of investor protection in the country. Incumbents are manufacturing firms with at least four years of activity.
Figure 2: Steady-State Effect of an Increase in Resource Diversion

Figure 3: Steady-State Effect of an Increase in Empire Building
Figure 4: Equilibrium Dynamics

![Figure 4: Equilibrium Dynamics](image)

Figure 5: Impulse Responses to Empire Building Shock

![Figure 5: Impulse Responses to Empire Building Shock](image)

- Note: The rates are in percentages. The parameter \( \Omega \) is reduced by half from its baseline value (1%). The parameters and the steady state values (before the shock) are in Table 1.
Figure 6: Empire Building – Comparing Impulse Responses

– Note: The parameter $\Omega$ is reduced by half of its baseline value (1%). The plots show percentage changes relative to the pre-shock state. The bold lines refer to the baseline experiment shown in Figure 5. The dotted and dashed light lines refer to an economy characterized by $\alpha = 0.13$ and by an initial $\Omega = 2\%$ (twice the baseline value), respectively.
Figure 7: Impulse Responses to Stealing Cost Shock

- Note: The rates are in percentages. The shock to the stealing cost function (i.e. to the parameter $b$) yields a reduction of $S$ by half relative the pre-shock level value (Table 1, Panel B).

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Note: The cost stealing function is hit by the same shock as in Figure 7. The plots show percentage changes relative to the pre-shock state. The bold lines refer to the baseline experiment of Figure 7. The dotted and dashed lines refer to an economy characterized by $\alpha = 0.13$ and by $b$ equal to 80% of its baseline value, respectively.
Note: The lines are the three terms reported in equation (45) discounted at a rate $(\rho - \lambda)$. The differences are in percentages of the values of the economy not hit by the shock. The economy is initially on a steady state (see Table 1 for the baseline economy). Panel A refers to a reduction of $\Omega$ by half of its initial value (1%). In Panel B the shock to the stealing function (parameter $b$) reduces $S$ by half of its value in the baseline calibration (0.016%). The welfare changes described in equation (46) correspond to the integrals (over time) of the three curves.
Figure 10: Welfare Change – Wide Range of Economies
Panel A: Empire Building

Panel B: Diversion

Note: The four graphs of Panel A plot welfare changes, decomposed in level, transitional dynamics, and long run (see equation 46), due to a reduction of $\Omega$ by 0.05% (same change as in Figure 5) against different initial values of $\Omega$, $b$, $1 - \alpha$, and $\sigma$ (loosely speaking they are cross-partial derivatives of (44)). Panel B replicates similar experiments generated through an increase of $b$ of the same magnitude as in Figure 7. The baseline parameters are in Table 1.
Figure 11: Empire Building and Phases of Development

- Note: The solid lines represent the dynamics of an economy characterized by the parameters in Table 1, Panel A. The dashed lines refer instead to an economy with a greater intensity of the empire-building friction ($\Omega=0.1$). The two economies have the same initial condition on $x$. 
Figure 12: Diversion and Phases of Development

- Note: The solid lines represent the dynamics of an economy characterized by the parameter values in Table 1, Panel A. The dashed lines refer to an economy where it is easier to divert profits \( b \) is only 95\% of that of the other economy. The two economies have the same initial condition on \( x \).

Figure 13: Additive Specification – Manager’s and Founder’s Stakes

- Note: The graphs show steady state values.
Figure 14: Additive Specification — Reduction in Stealing Costs

- Note: Steady state effects of a reduction of $b$ by 1%.