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Irrelevance of Governance Structure

Finance Working Paper N° 606/2019
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Zohar Goshen
Columbia University and ECGI
Doron Levit
University of Pennsylvania and ECGI

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We are grateful to Yakov Amihud, Alex Edmans, Denis Gromb, Nadya Malenko, Fausto Panunzi, Christopher Parsons, conference participants at LBS Summer Symposium, Annual NYU/Penn Conference on Law & Finance, and seminar participants at Boston College, Columbia University, University of Washington, Tel-Aviv University, and Hebrew University for helpful comments and discussions.

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Abstract

Does corporate governance structure matter for firm value? We develop a model in which the allocation of control rights between shareholders and managers ("governance structure") affects managers' incentive to invest (strong governance tightens managerial freedom and weak governance loosens it), and firms' investment decisions are linked through a market for resources. We show that in a competitive equilibrium, which is socially efficient, corporate governance is irrelevant to firm value even in the presence of agency costs and incomplete markets. Our analysis therefore provides an important benchmark against which the effects of governance structures could be evaluated.

Keywords: Corporate Governance, Market Power, Shareholder Rights, Control Rights, Agency Costs, Principal Costs

JEL Classifications: D21, D23, D74, D83, G23, G30, G32, G34, K22

Zohar Goshen*
Jerome L. Green Professor of Transactional Law
Columbia University, Columbia Law School
435 West 116th Street
New York, NY 10027, United States
phone: +1 212 854 9760
e-mail: zohar.goshen@law.columbia.edu

Doron Levit
Assistant Professor of Finance
University of Pennsylvania, The Wharton School
3620 Locust Walk
Philadelphia, PA 19104, United States
phone: +1 215 573 8831
e-mail: dlevit@wharton.upenn.edu

*Corresponding Author

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Zohar Goshen† Columbia and ECGI

Doron Levit‡ Wharton and ECGI

April 14, 2020

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†Email: zgoshen@law.columbia.edu.

‡Email: dlevit@wharton.upenn.edu.

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1 Introduction

Why is corporate governance important? The central theme in the theory of corporate governance is that control rights allow shareholders to reduce agency costs (Jensen and Meckling 1976) by holding disloyal managers accountable (Bebchuk 2005). The policy implication and the empirical prediction that follow are that a strong governance structure—i.e., more control rights to shareholders—will result in a high shareholder value and good firm performance. The agency costs rational, associating strong governance with strong performance, has been very influential. Indeed, institutional investors are consistently pushing toward strong governance structures for publicly traded firms (Smith 1996; Carleton, Nelson and Weisbach 1998; McCahery, Sautner and Starks 2016),[1] and numerous academic studies have attempted to test the prediction that a strong governance structure is associated with a strong firm performance.

The importance of agency costs is obvious. Without a conflict corporate governance is irrelevant, as the agent will resign whenever is optimal to do so regardless of the allocation of control rights. But, does the presence of agency costs necessarily imply that corporate governance is relevant? The extensive public debate and academic research on this topic suggest that many assume that the answer is "yes." However, there are realities that question this assumption. In particular, contrary to the agency costs rational predicting a preference for strong governance structures, the market is populated with great variety of business entities ranging from weak to strong governance structures (mutual funds, private equity funds, venture capital funds, hedge funds, and corporations). And among the corporations that choose to go public many adopt weak governance structures, including staggered boards and dual-class share structures. This suggests that corporate governance involves various trade-offs. But are these trade-offs relevant to firm value? And if so, how and under what circumstances? A review of empirical studies does not provide a clear answer. Almost every aspect of corporate governance that was studied in the last forty years yielded conflicting empirical findings (Goshen and Squire 2017), for instance: dual-class shares;[2] anti-takeover defenses,[3] such as poison pills,[4]

[1] Institutional investors push toward strong governance structure via, for instance, destaggering boards (Bebchuk, Hirst and Rhee 2013), limiting the use of poison pills (Subramanian 2014), excluding dual-class firms from the indices (Friedman 2017), demanding mandatory sunsets for dual-class firms (NYSE petition 2018), and supporting hedge funds governance initiatives (Brav et al. 2008).

[2] Compare Smart, Thirumalai and Zutter (2008), Masulis,Wang and Xie (2009), Gompers, Ishii and Metrick (2010) with Partch (1987), Lehn, Netter and Poulsen (1990), Adams and Santos (2006), and Adams and Ferreira (2008).

[3] Straska and Waller (2014).

[4] Compare Ryngaert (1988) with Comment and Schwert (1995).

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staggered boards,[5] and protective state legislations;[6] and the strength of corporate governance as measured by several indices.[7]

What explains the prevalence and persistence of weak governance structures in the market and the conflicting empirical findings in the studies of corporate governance? To start the search for the answers, we explore the conditions under which corporate governance is irrelevant to firm value. We believe that it will allow us to identify the conditions under which corporate governance is relevant, and provide insights regarding the prevalence and persistence of variety of governance structures and the design of empirical studies.

For this purpose, we develop a model in which, a priori, corporate governance can either increase or decrease firm value, and firms' investment decisions are linked through a competitive resources market. Our main result shows that in a competitive equilibrium corporate governance is *irrelevant* to firm value. Importantly, and different from the "no transaction costs" model of Modigliani and Miller (1958), the irrelevance result in our model does not arise because there is "no conflict" between owners and managers. Instead, following the spirit of Miller (1977), who shows that capital structure remains irrelevant even with taxes,[8] we show that governance structure is irrelevant to shareholder value even in the presence of agency costs and incomplete markets.[9] Furthermore, and different from the argument that competitive forces substitute for corporate governance (e.g., Hart 1983), competition in our model does not reduce agency costs, but rather, it implies that these costs are exactly offset by "principal costs" such as shareholder incompetency when exercising control. Our analysis therefore provides an important benchmark against which the effects of governance structures could be evaluated. To complete the analysis and inform the design of empirical studies, we identify the conditions under which corporate governance is relevant.

[5] Compare Bebchuk and Cohen (2005) with Bates, Becher and Lemmon (2008).

[6] Catan and Kahan (2016).

[7] Compare Gompers, Ishii and Metrick (2003) with Bebchuk, Cohen and Ferrell (2009) and Cremers, Masconale and Sepe (2016).

[8] Miller (1977) considers the trade-off between the tax advantage of debt at the corporate level and the tax disadvantage at the personal level, showing that as long as there is a continuum of investors with varying marginal rates of personal taxes, capital structure will be irrelevant in equilibrium, as the cost of financing a project with debt or with equity will be the same.

[9] Shareholders with different preferences will be unanimous and production decisions can be separated from consumption decisions (Fisher separation) only if markets are complete. In those cases, corporate control is irrelevant. Indeed, Hirshleifer (1966) shows that Fisher separation obtains in an intertemporal production economy with complete markets in a state-preference framework. With incomplete markets, however, shareholders will generally disagree about the optimal production plans of the firm, since shareholders are not only interested in profit maximization but also in the influence of firms' decisions on product prices (e.g., Kelsey and Milne, 1996).

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Our model features multiple firms which run by managers and owned by shareholders. Managers, who differ in their integrity, can either preserve firm value by maintaining the status quo and paying out to shareholders, or change firm value by investing. Investment is non-contractible and requires resources (e.g., labor, raw materials, intellectual property, and corporate assets), which firms buy in a competitive market. By investing, loyal managers create firm value, and disloyal managers consume private benefits and destroy firm value. The variation in managers' integrity, which is their own private information, captures the central theme of corporate governance theory that control rights are necessary to reduce agent conflict. Shareholders, who are not fully informed and competent, deduce from decisions made by managers whether a manager is disloyal and should be fired. Since managers have career concerns, the fear of being fired can discipline disloyal managers. But, the fear of mistakenly being fired also distorts decisions made by those who are loyal. In our model, the incidences in which disloyal managers abuse their managerial freedom to invest in bad projects and consume private benefits are *agent costs*, and the incidences in which incompetent shareholders with control deter loyal managers from investing in good projects are *principal costs*.

The allocation of control rights allowing a shareholder to fire a manager can either be easy ("strong governance"), such as in dispersed-ownership firms without staggered boards and poison pills, or impossible ("weak governance"), such as in dual-class firms with public shareholders owning non-voting shares.[10] We focus on the right to fire the manager, as it is the most important and encompassing element of corporate control. Control rights are allocated at the outset by the firm's shareholders to maximize the expected value of the firm. Thus, while shareholders do not control the investment policy of their firm, they affect it indirectly through the firm's governance structure.

In equilibrium, strong governance and the threat of being fired by shareholders deter all types of managers from undertaking investments and buying resources; weak governance does the opposite. Intuitively, strong governance structures tighten managerial freedom and weak governance structures loosen it.[11] Therefore, the total demand for resources is affected by the division of the universe of firms between strong and weak governance. For instance, a large

[10] In Section 5 we show that the irrelevance result holds also when shareholders can choose from a whole spectrum of governance arrangements.

[11] We model agent costs as a problem of "over-investment" as there is extensive empirical evidence on the negative association between strong corporate governance and firm-level investment (e.g., Asker, Farre-Mensa, and Ljungqvist 2015; Billett, Garfinkel, and Jiang 2011; Fang, Tian, and Tice 2014; Gompers, Ishii, and Metrick 2003; Harford, Mansi, and Maxwell 2008; Richardson 2006; Wurgler 2000). However, in Section 5.1 we also discuss agent costs such as "enjoying the quiet life."

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number of firms with weak governance implies more investments and a higher demand for resources, which results in higher prices of resources and lower profitability of investments. In other words, the independent governance choices of individual firms affect the price at which the resources market clears, which in turn, feeds back into the profitability of each individual firm.

Our main result shows that the universe of firms will reach an equilibrium in which some firms have weak governance and other strong governance, but all firms will have the same value. A single firm and its shareholders cannot change the value of their firm by switching governance from weak to strong or the other way around; they are indifferent between these choices in equilibrium. Moreover, the competitive equilibrium is socially efficient in the sense that the allocation of resources cannot be improved, and a regulatory intervention is counterproductive.[12]

The intuition behind the irrelevance of governance structure is simple but powerful. Note that the competitive resources market can clear in equilibrium only if the price is fair in the sense that investment is a zero net present value (NPV) from shareholders' perspective. For example, if investment is expected to be a negative NPV, shareholders will switch their firms from weak to strong governance as a means to deter managers from investing, thereby increasing their firm value. As a result, the demand for resources and their price will decrease. A lower price of resources implies a higher NPV on investment, and firms will continue switching from weak to strong governance until the NPV is zero. A symmetric argument explains why the investment cannot be a positive NPV either. Since investment must be a zero NPV in a competitive equilibrium, shareholders are indifferent between strong and weak governance, which is the reflection of the governance irrelevance. That investment must be zero NPV reflects the balance between the *agent costs* and the *principal costs* in equilibrium. Due to competitive forces in the resources market, the agent costs that are imposed by the manager when the firm adopts a weak governance structure are exactly offset by the principal costs that are imposed by the shareholders when the firm adopts strong governance. The price of resources is the endogenous margin that equates agent costs and principal costs.

Our result has important implications for the study of corporate governance. The model informs the theory of corporate governance and the design of empirical studies, showing that the hypothesis tying weak-governance to weak-performance is insufficient. And it shows the additional factors affecting the equilibrium: availability and competitiveness in the relevant resource's market; firms' market power in the resources' markets; shareholders competence and

[12] While the governance structure is irrelevant at the firm level, it is relevant at the industry/market level.

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market power in the ownership of firms; and the strength of managers' conflict and career concerns. A violation of these conditions leads to governance relevance. Thus, the design of an empirical study should account for corporate governance being both firm-specific and market-specific, and specify the market conditions under which it expects strong-governance to outperform weak-governance.[13] Otherwise, misspecification is likely to result in inconclusive and conflicting findings.[14]

Our model also provides insights to understand the variety of corporate governance structures we observe in the market, and especially the persistence of weak governance structures. We show that a shift of control rights between principals (shareholders) and agents (managers) entails trade-offs between principal costs and agent costs. And that in a competitive equilibrium the costs of the manager's conflict are exactly offset by the costs of the shareholders' incompetence. Finding the equilibrium allows us to identify the firm-specific and market-specific elements affecting the trade-offs that can explain the variety of governance structures, as well as the persistence of weak governance structures.

Related Literature. The theoretical literature has identified the trade-off inherent in the allocation of control rights between "agent costs" and "principal costs" (Goshen and Squire 2017) and provided several channels through which the allocation of control rights to a principal is counterproductive. For example, by fostering managerial myopia (Stein 1988, 1989), weakening agent's incentives to acquire information (Aghion and Tirole 1997) or share information (Adams and Ferreira 2007; Chakraborty and Yilmaz 2017; Harris and Raviv 2008, 2010), undermining managerial initiatives (Burkart, Gromb, and Panunzi 1997), limiting the principal's ability to communicate with the agent (Levit 2020), or creating various distortions due to managerial career concerns (e.g., Hermalin and Weisbach 1998; Holmstrom 1999; and Zwiebel 1995). Our paper contributes to this literature by linking the allocation of control rights within firms to the resources market, and showing that the benefits of empowering shareholders is exactly offset by its costs in a competitive equilibrium; which implies the irrelevance of corporate governance. Our theory highlights the importance of real markets in resolving the various trade-offs of corporate governance.

Our model also contributes to the literature on governance externalities (Acharya and Volpin 2010; Dicks 2012; Acharya, Gabarro, and Volpin 2013; Burkart and Raff 2015; Nielsen 2006;

[13] Two exceptions are Coles, Daniel, and Naveen (2008) and Johnson, Karpoff, and Yi (2015), who find evidence that one size governance policies does not fit all.

[14] Since the empirical identification of casual effects of corporate governance is very challenging (e.g., Demsetz and Lehn 1985), the mixed empirical findings in the literature may stem not only from an insufficient hypothesis as we suggest, but also from an imperfect design of the empirical test.

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Cheng 2011; Levit and Malenko 2016) by identifying a novel channel of externalities that works through a competitive resources market, and as such, gives rise to new implications and empirical predictions.

Finally, our model contributes to the literature exploring the effects of product markets competition on management incentives to reduce agency costs (e.g., Hart 1983; Scharfstein 1988; Nickel 1996; Schmidt 1997; Raith 2003; Giroud and Mueller 2010, 2011). The theory is that competition in the *product market* could substitute for corporate governance since the pressure to keep the firm profitable disciplines *managers* and effectively eliminates their agency costs. By contrast, our model focuses on the effects of the competition in the *resources market* on *shareholders incentives* to adopt a strong or weak governance structure. In particular, in our model the competition in the resources market does not reduce or eliminate agency costs, instead, it implies that these costs are offset by the principal costs. Thus, even in competitive industries governance will affect firm's investment policy, but not firm's value.

The remainder of the paper is organized as follows. In Section 2 we present the model; in Section 3 we analyze the equilibrium and present the main result – the irrelevance of governance structure; in Section 4 we consider the conditions under which the governance structure becomes relevant: weak managerial career concerns, shareholder competence, heterogeneous firms, market power, and common ownership; in Section 5 we analyze several extensions to the baseline model and show that the irrelevance result is preserved: the "enjoying the quiet life" agency conflict, set-up and maintenance costs of strong governances structures, an endogenous allocation of cash-flow rights, negotiated governance arrangements, a product market competition, and "richer" investment and governance technologies; in Section 6 we discuss the implications of our results for the design of empirical studies and the explanation for the prevalence and persistence of variety of governance structures; and in Section 7 we conclude with final remarks.

2 Model Setup

Consider an economy with a mass of $N > 0$ ex-ante identical firms, indexed by i.[15] Each firm is run by a manager and owned by a representative shareholder, both of which are risk neutral.[16] The manager of firm i owns a fraction $\omega \in (0, 1)$ of the firm's cash flows rights; the rest is

[15] We consider a variant of the model with heterogeneous firms in Section 4.3.

[16] The assumption on risk-neutrality is for simplicity, it does not derive our main result.

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owned by the shareholder. To focus on the division of control rights rather than cash-flows rights, parameter ω is assumed to be exogenous. In Section 5.2 we endogenize ω.

Each manager can either keep the status quo of her firm ($x_i = 0$) or change it ($x_i \neq 0$). Changing the status quo involves, for instance, investment in new projects or R&D, whereas keeping the status quo represents hoarding cash or paying out to shareholders through dividends and stock buybacks. If the manger keeps the status quo then the expected firm value is normalized to $v > 0$. If the manager changes the status quo then she has to choose between two mutually exclusive projects, denoted by $x_i \in \{A, B\}$. The gross expected returns from investment in project A and B are $v + R_A$ and $v - R_B$, respectively, where $R_A > 0$ and $R_B > 0$. Since project A increases value while project B decreases value, all else equal, shareholders prefer project A over project B. In Section 5.6 we consider a richer investment technology.

Changing the status quo of the firm, however, requires resources that are provided by "suppliers." The resources can be skilled employees, raw materials, intellectual property, corporate assets, or anything that can be used for a new business activity. We assume a competitive market for these resources, and denote by p their market price. Therefore, under project A, firm value is $v + R_A - p$, and under project B firm value is $v - R_B - p$.

The manager of each firm is either loyal or disloyal. We denote the type of firm $i's$ manager by $\theta_i \in \{loyal, disloyal\}$, and assume it is identically and independently distributed across firms. The prior probability a manager is loyal is $\lambda \in (0, 1)$. Disloyal managers obtain private benefits $b > 0$ from investment in project B. There are no private benefits from investment in project A. For example, while project A involves the development of an innovative product, project B is a waste of corporate resources that may personally benefit the manager (e.g., "pet projects" and "empire building" motives). Loyal managers have no private benefits from either project, although they can still invest in project B if they wish to. Alternatively, the moral standards of loyal managers are high enough to prevent them from consuming private benefits at the expense of shareholders.[17] In Section 5.1 we discuss how our model also extends to agency problems reflected in managers enjoying a "quiet life."

We assume that the private benefits of a disloyal manager are large relative to her cash-flows rights,

$$b/\omega > R_A + R_B. \tag{1}$$

This assumption guarantees that, everything else held equal, disloyal managers prefer project

[17] Note that a loyal manager still maximizes his own utility while taking into account all considerations, including career concerns which we later describe.

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B over project A. Without this assumption, managers have no conflict of interest with their shareholders, and without a meaningful conflict, clearly, the allocation of control rights will be irrelevant. We therefore rule out these trivial cases.

Timeline

1. Allocation of control rights. At the outset, each shareholder chooses the governance structure of his firm, $c_i \in \{SH, M\}$. If $c_i = SH$ then the shareholder has the right to fire its manager as we describe below.[18] If $c_i = M$ then the shareholder does not have this right. We will often refer to firms with $c_i = M$ as firms with weak governance, and firms with $c_i = SH$ as firms with strong governance. For example, firms with weak governance are firms with dual-class shares, or firms with staggered boards and poison pills. All shareholders make their governance decisions simultaneously, and these decisions become public. Notice that the allocation of control rights matters in our framework since investment decisions and choice of projects are not contractible (Grossman and Hart 1986; Hart and Moore 1990). In Section 5.6 we consider a variant of the model in which the shareholders can choose from a large menu of governance structures, and in Section 5.3 we discuss a variant of the model in which the choice of c_i is an outcome of negotiations between the manager and the shareholder of firm i.

2. Investment. Each manager privately observes his type θ_i and then decides on $x_i \in \{0, A, B\}$. Managers make their decisions simultaneously. The price of resources, p, is determined by market clearing, that is, demand equals supply. Suppliers are willing to sell their resources if and only if their alternative use of resources is smaller than the market price. We assume that the mass of suppliers whose alternative use of resources is smaller than p is $K(p) \geq 0$, where $K'(\cdot) > 0$ and $K(0) = 0$. We further assume

$$0 < K\left(\lambda R_A - (1-\lambda) R_B\right) < N, \tag{2}$$

which guarantees that the supply of resources is not too scarce or too abundant. The role of this assumption is discussed in greater details in the analysis below and in Section 4.5.

3. Realization of an interim signal. Shareholders observe whether their manager kept the status quo ($x_i = 0$) or changed it ($x_i \in \{A, B\}$), but they cannot distinguish between

[18] In practice, shareholders do not vote directly on the replacement of the CEO, it is the responsibility of the board of directors. Here we assume that the board will maximize the value of the shareholders, subject to the constraints given by the governance rule of the firm. Alternatively, one can relabel the manager with the board, and interpret the problem as shareholders' decision to oust directors.

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projects A and B. Instead, if the manager changes the status quo, shareholders observe a signal $s_i \in \{A, B\}$, where

$$\Pr\left[s = x | x \in \{A, B\}\right] = \tau \in (0.5, 1)\,. \tag{3}$$

Parameter τ is the signal's precision, and it can be interpreted as varying levels of *disclosure* and/or shareholder's *competence*,[19] to understand in real time whether non-routine actions that are taken by the manager create shareholder value (if project A is chosen) or destroy it (if project B is chosen).[20] Importantly, shareholders can never rule out the possibility that the signal is wrong (i.e., $\tau < 1$), an assumption which we further discuss in Section 4.2. Overall, this information structure implies that the status quo does not produce new information about the manager's loyalty, presumably because maintaining it does not require extraordinary actions. By contrast, a change to the status quo does provide shareholders with additional information, but only if the manager's choice between projects A and B is correlated with his loyalty θ_i.

4. Exercising control. After the manager makes his decision and the shareholder obtains the signal (whenever $x_i \neq 0$), the manager can be fired by the shareholder if $c_i = SH$. If the incumbent manager is fired, then the loyalty of the new manager is drawn independently from the same distribution as the incumbent (i.e., the new manager is loyal with probability λ). The shareholder's continuation value from retaining a manager is $\Lambda > 0$ if the manager is loyal, and zero otherwise. This assumption captures in a reduced form the relative benefit to shareholders from having their firm run by a loyal manager. If the shareholder is indifferent between firing and retaining the incumbent manager, then the manager is retained (e.g., there are small replacement costs). The additional payoff to the incumbent manager from keeping his job is $\Gamma > 0$. Parameter Γ measures in a reduced form the strength of managerial career concerns. We assume that these career concerns are sufficiently important and cannot be contracted away, that is,

$$\Gamma > \Gamma^* \equiv \omega \max\{R_A/\left(1-\tau\right), b/\omega - R_B\}. \tag{4}$$

The role of Assumption (4) will become clear in the analysis below, and it is further discussed in

[19] In case of full disclosure, the variation in the precision of the signal is affected only by the shareholder's competence.

[20] Note that at the end of the game, the shareholder can perfectly infer the choice of the manager between projects A and B. The analysis, however, would not change if the payoffs from the projects are stochastic. In particular, we can interpret $v - R_B - p$ and $v + R_A - p$ as the expected payoffs from project B and A, respectively. The realized payoff of each project could be high or low, and in this case, the shareholder will not be able to perfectly infer from the final outcomes the actual choice of the manager.

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Section 4.1. Finally, upon replacement, the new manager gets a utility of Γ, and the incumbent manager receives his outside option which is normalized to zero. Therefore, there are no welfare gains or losses from replacing the incumbent manager that are not related to his loyalty.[21] Figure 1 summarizes the timeline of the model.

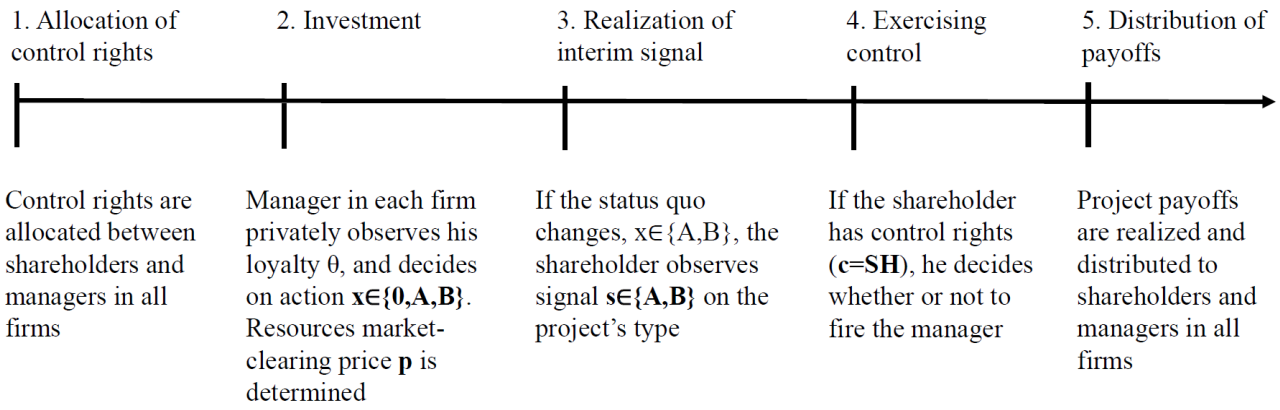


Figure 1 - timeline

3 Analysis

The goal of the analysis is to identify the conditions under which the expected shareholder value is invariant to the allocation of control rights in equilibrium. When these conditions are met, the structure of the firm's corporate governance is irrelevant. To this end, Section 3.1 characterizes the equilibrium of the model. The solution concept we adopt is a Perfect Bayesian Equilibrium in pure strategies that satisfies the Grossman and Perry (1986) criterion. This refinement selects a unique equilibrium of the game. For simplicity, we refer to an equilibrium that meets this condition as a competitive equilibrium. Section 3.2 presents our main governance irrelevance result, and Section 3.3 discusses the welfare implications.

[21] The shareholder's continuation payoff from retaining a loyal manager (Λ) and the manager's continuation payoff from keeping his job (Γ), are modelled in a reduced form. In principle, if the continuation game was explicitly modelled, Λ could depend on the governance structure of the firm in future periods, and Γ could depend on the governance structure in other firms, which might effect the demand for managers in the labor market. However, the key assumptions that drive the irrelevance result is that shareholders value loyalty and that managers value keeping their job. Both seem reasonable, and the exact magnitudes or functional forms are less important for our analysis. For example, if the model had a second and terminal period in which the manager could make another independent decision whether to invest in project A or B, then without career concerns (since it is a terminal period) the loyal (disloyal) manager would choose project A (B) in that period, which will rationalize the preferences of shareholders toward loyal managers (i.e., $\Lambda > 0$). Similarly, assuming any imperfection in the labor market for senior executives (e.g., information asymmetry, transaction costs), will generate meaningful career concerns in our analysis.

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3.1 Equilibrium Characterization

We first analyze the decision making of an individual firm given its governance structure (c_i) and the price of resources (p), and then solve for the allocation of control rights in each firm and the market clearing price in equilibrium.

Consider first a firm with a weak governance structure. The shareholder does not have the right to fire its manager, and therefore his beliefs about the manager's loyalty are irrelevant. Without the threat of being fired, a loyal manager never chooses project B, and he prefers project A over the status quo if and only $\omega(v + R_A - p) + \Gamma \geq \omega v + \Gamma$, which is equivalent to $p \leq R_A$. By contrast, a disloyal manager has private benefits from investment in project B. Since $b/\omega - R_B \geq R_A$, the disloyal manager always prefers project B over project A, and he prefers project B over the status quo if and only if $b + \omega(v - R_B - p) + \Gamma \geq \omega v + \Gamma$, which is equivalent to $p \leq b/\omega - R_B$. The next result immediately follows.

Lemma 1 *Suppose the price of resources is p and the firm adopts a weak governance structure ($c_i = M$). Then, in equilibrium, the loyal manager invests in project A if $p \leq R_A$ and keeps the status quo otherwise, and the disloyal manager invests in project B if $p \leq b/\omega - R_B$ and keeps the status quo otherwise.*

Next, we show that decision making of managers in firms with a strong governance structure is fundamentally different. All proofs not in the main text are given in the Appendix.

Lemma 2 *Suppose the price of resources is p and the firm adopts a strong governance structure ($c_i = SH$). Then, in equilibrium, the manager keeps the status quo regardless of his loyalty, and he is never fired by the shareholder on the equilibrium path. Off the equilibrium path, the shareholder believes the manager is disloyal if the status quo changes, and consequently fires the manager with probability one.*

According to Lemma 2, when the shareholder has the right to fire the manager, the manager always keeps the status quo in equilibrium.[22] To understand the intuition, notice that the shareholder fires the manager only if the shareholder has an indication that the manager is more likely to be disloyal than a potential replacement. Such indication is obtained upon a change to the status quo. In particular, the shareholder can be confident that a loyal manager will not choose project B, and a disloyal manager will not choose project A. Since the shareholder's

[22] The proof of Lemma 2 shows that given p and $c_i = M$, the equilibrium at the firm level that is described by Lemma 2 always exists, that is, it survives the Grossman and Perry (1986) criterion.

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signal is informative about the manager's actions even if only partly ($\tau > 0.5$), a signal $s = B$ is an indication that manager has taken project B, and therefore, that the manager is more likely to be disloyal. In other words, conditional on signal $s = B$, the shareholder believes that the incumbent manager is loyal with a probability strictly smaller than λ. Since a potential replacement is expected to be loyal with probability λ, the shareholder has the incentive to fire the manager in those cases.

The fear from being fired deters the disloyal manager from choosing project B. Specifically, the manager's career concerns (i.e., $\Gamma > \Gamma^*$) guarantee that he will try to avoid the possibility of being fired even if it means forgoing investment in project B and the associated private benefits. Similarly, a loyal manager will be deterred from choosing project A. Indeed, since $\tau < 1$, there is always a possibility that the shareholder will get the wrong signal (i.e., obtaining $s_i = B$ even though $x_i = A$) and mistakenly fire the loyal manager. In equilibrium, the manager finds a safe heaven in keeping the status quo of the firm. If the manager keeps the status quo regardless of her loyalty, then the shareholder does not learn new information about the manager's loyalty, and thus has no reason to fire her.

Lemmas 1 and 2 show that the allocation of control rights affects managers' actions, and therefore, has a potential effect on the expected shareholder value. In equilibrium, the shareholder of each firm chooses the governance structure that maximizes his expected value, taking as given the expected behavior of shareholders and managers in other firms. Seemingly, the governance structure is relevant. However, the consequences of managers' actions on the shareholder value also depend on market forces, that is, the equilibrium price of resources. If governance affects managers' actions, it will also have an indirect effect on prices through the market clearing process. Accounting for this dynamics, the next result fully characterizes the equilibrium of the game.

Proposition 1 *A generically unique equilibrium exists. In equilibrium, the price of resources is*

$$p^* = \lambda R_A - (1 - \lambda) R_B, \tag{5}$$

a mass of $n^* \in (0, N)$ firms adopt a weak governance structure, and a mass of $N - n^*$ firms adopt a strong governance structure, where $n^* \equiv K(p^*)$. Moreover:

(*i*) *In firms with weak governance ($c_i^* = M$), the loyal manager chooses project A and the disloyal manager chooses project B.*

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(*ii*) *In firms with strong governance ($c_i^* = SH$), the actions of managers and shareholders, as well as their beliefs, are characterized by Lemma 2.*

Proposition 1 characterizes the price of resources in equilibrium, as well as the number of firms that adopt strong governance.[23] The characterization of managerial actions follows directly from Lemmas 1 and 2. Notice that the price of resources in equilibrium, which is given by Expression (5), is smaller than R_A. Since $p^* < R_A < b/\omega - R_B$, managers change the status quo of their firms if and only if the governance of their firm is weak. Therefore, the demand for resources equals the mass of firms with weak governance. At the same time, if the price of resources in equilibrium is given by Expression (5), then the supply of these resources must be $K(p^*)$. Therefore, the market clears only if exactly $K(p^*)$ firms adopt weak governance. Assumption (2) ensures an interior solution, that is, $K(p^*) \in (0, N)$. This logic explains why the number of firms that adopt weak governance in equilibrium is as stated by Proposition 1.

The arguments above, however, do not explain how the price of resources is determined in equilibrium. In equilibrium, shareholders of firms with weak governance must not benefit from switching to strong governance, and vice-versa. Since firms are price-takers, all shareholders must be indifferent with respect to the corporate governance of their firms. Otherwise, all firms will adopt the same corporate governance. If on the contrary all firms adopt strong governance, then according to Lemma 2, no manager will change the status quo. With no demand for resources, their price must drop to zero. However, such a low price presents an opportunity for firms with strong governance to obtain positive abnormal returns. Indeed, by switching to weak governance, managers are assured they will not be fired by shareholders, thereby inducing a profitable change to the status quo of the firm. Therefore, in equilibrium, some firms must choose weak governance. Similarly, if on the contrary all firms adopt weak governance, then according to Lemma 1, managers will change the status quo of their firms, and the demand for resources will be very high. Assumption (2) guarantees a scarce supply of resources and a high price in those circumstances. If the price of resources is too high, shareholders would benefit from switching to strong governance as a means to deter managers from pursuing value-destroying changes to the status quo of their firm. Therefore, in equilibrium, some firms must choose strong governance. Overall, the equilibrium is characterized by a subset of firms which adopt weak governance and a complement set of firms which adopt a strong governance structure.

[23] The equilibrium is generically unique in the sense that it does not pin down the identity of the firms that choose $c_i^* = M$, only their total mass. In addition, other off-equilibrium beliefs can support this equilibrium.

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The price $p^* = \lambda R_A - (1-\lambda) R_B$ has the unique property of keeping shareholders indifferent between weak and strong governance under the expected behavior of managers. Specifically, under a strong governance structure, the manager keeps the status quo of the firm, and the expected shareholder value is

$$(1-\omega) v + \lambda \Lambda. \tag{6}$$

Under a weak governance structure, the manager changes the status quo as described by part (i) of Proposition 1, and the expected shareholder value is

$$(1-\omega) [\lambda (v + R_A - p^*) + (1-\lambda) (v - R_B - p^*)] + \lambda \Lambda. \tag{7}$$

Indeed, since $p^* < R_A$, a loyal manager chooses project A and creates a value of $v + R_A - p^*$, and a disloyal manager chooses project B and creates a value of $v - R_B - p^*$. Expression (7) is the weighted average of these valuations, given the shareholder's prior on the manager's loyalty. A comparison between Expressions (6) and (7) reveals that they are identical if and only if $p^* = \lambda R_A - (1-\lambda) R_B$. The indifference of shareholders between weak and strong governance in equilibrium implies that the price of resources must be given by Expression (5).

3.2 Irrelevance of Governance Structure

Building on Proposition 1, we are now ready to state our main result.

Theorem 1 *The corporate governance structure is irrelevant, namely, in a competitive equilibrium the expected shareholder value in each firm is invariant to the firm's allocation of control rights.*

Theorem 1 states that, in equilibrium, shareholders are indifferent between strong and weak corporate governance, and therefore, this choice is irrelevant at the firm level. In other words, the theory predicts that one should not expect to observe a change to the shareholder value if, everything else held equal, the firm's corporate governance structure changes exogenously.

Essentially, the irrelevance is obtained because in equilibrium market clearing requires the price of resources to be fair in the sense that a change to the status quo is a zero net present value (NPV) investment from the shareholders' perspective. If, to the contrary, strong governance increases (decreases) shareholder value in equilibrium, it must be that a change to the status quo is a negative (positive) NPV. If so, more and more shareholders will switch their firms to

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strong (weak) governance as a means to induce managers to maintain (change) the status quo. As a result, the demand for resources will decrease (increase), and consequently, so will their price. A lower (higher) price of resources implies a higher (lower) NPV to a change to the status quo. Firms will continue switching to strong (weak) governance as long as the NPV is negative (positive). For this reason, in equilibrium, the NPV must be zero, which implies that shareholders are indifferent between strong and weak governance.[24]

Remark. Theorem 1 does not suggest that the *aggregate* level of corporate governance is irrelevant. Indeed, Proposition 1 characterizes the unique number of firms with strong governance in equilibrium. This number depends on features of the resources market (i.e., the supply function $K(\cdot)$), the payoffs of good and bad projects (i.e., R_A and R_B), as well as the likelihood that managers are loyal (i.e., λ). Since these characteristics could vary across economies and industries, the aggregate level of corporate governance, denoted by n^*, could also differ in the cross-section.

3.3 Welfare Implications

3.3.1 Social Welfare

In this section we study whether regulators can improve social welfare by changing the balance of power between shareholders and managers. While a regulator has the power to determine the allocation of control rights in every firm, we assume that a regulator cannot directly determine the price of resources or force managers to choose between project A, project B, and the status quo. Obviously, such unimaginable power could potentially improve social welfare above and beyond what is obtained in the competitive equilibrium.

The expected social welfare in the competitive equilibrium, which is characterized by Proposition 1, is given by

$$W^* = Nv + K(p^*)\,p^* + \int_{p^*}^{\infty} y dK(y) + N\Gamma + N\lambda\Lambda. \tag{8}$$

The first term, Nv, is the baseline value of all firms. The second term, $K(p^*)\,p^*$, is the additional expected value created to shareholders by firms with weak governance, gross of the resources price (which is a transfer between firms and suppliers). To understand why, recall

[24] The irrelevance result will also hold when the universe of firms is a specific industry, as long as the resources markets for that industry are competitive and affected by the demand of the firms in that industry.

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that $K(p^*)$ firms adopt weak governance in equilibrium. Firms with weak governance choose project A whenever their managers are loyal (which happens with probability λ) and project B whenever their managers are disloyal (which happens with probability $1-\lambda$). Therefore, the additional expected value created by these firms is $p^* = \lambda R_A - (1-\lambda) R_B$, which is the price of resources in a competitive equilibrium. The third term, $\int_{p^*}^{\infty} y dK(y)$, is the alternative valuation of the resources by suppliers who did not sell in equilibrium. Indeed, in equilibrium, suppliers retain their resources if and only if the alternative use of these resources is higher than the market price p^*. The fourth term, $N\Gamma$, is the value of managers from retaining their job (recall manages are never fired on the equilibrium path). The fifth term, $N\lambda\Lambda$, is the continuation value to shareholders from retaining their managers. This explains the expression behind W^*.[25]

The next result shows that the competitive allocation of control rights maximizes the expected social welfare subject to the constraints we outlined above.

Proposition 2 *The competitive equilibrium allocation of control rights, n^*, is socially efficient.*

Proposition 2 implies that in the context of our model, a regulatory intervention would be counterproductive. Intuitively, the competitive allocation ensures that a change to the status quo is a zero NPV investment. In particular, the alternative value of the marginal supplier who sells her asset in equilibrium is given by $p^* = \lambda R_A - (1-\lambda) R_B$. On the other hand, relative to a firm with strong governance (which always keeps the status quo), the expected social value that is created by a firm with weak governance is $\lambda(v + R_A) + (1-\lambda)(v - R_B) - v$. Since the two terms are identical, the regulator cannot increase social welfare by changing the allocation of control rights across firms.

3.3.2 Aggregate Shareholder Value and Common Ownership

In this section we characterize the allocation of control rights that maximizes the value of shareholders on *aggregate*. That is, suppose shareholders of all firms could coordinate their decision-making, would they benefit as a whole from changing the competitive allocation? This question is motivated by the steep growth of large asset managers in the United States (e.g.,

[25] Notice that the social welfare function does not account for managerial private benefits. If it did, then the socially optimal allocation would require more firms with weak governance relative to the competitive allocation (so disloyal manager who choose project B can enjoy these private benefits). See Section 5.3 for related discussion.

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BlackRock, Vanguard, State Street, and others) which own a large equity stake in virtually every publicly traded company.

A direct implication of Proposition 2 is that any deviation from the competitive allocation is socially inefficient. Therefore, to the extent that large asset managers benefit from changing the competitive allocation, it would be socially undesirable. But does BlackRock, as an example, have incentives to change the competitive allocation? The next result clarifies that the answer to this question could be positive.

Proposition 3 *The allocation of control rights that maximizes the aggregate shareholder value, denoted by n^*_{co}, requires the number of firms with weak governance to be strictly smaller than n^*, the competitive allocation. Under this allocation, the price of resources, denoted by p^*_{co}, is strictly smaller than p^*, the competitive price, and the expected shareholder value of firms with weak governance is strictly greater than the expected shareholder value of firms with strong governance. Moreover, both n^*_{co} and p^*_{co} increase with the term $\lambda R_A - (1-\lambda) R_B$.*

To understand Proposition 3, notice that a direct implication of Theorem 1 is that under the competitive allocation, the expected value of each firm (net of the value of retaining loyal managers) is v regardless of the strength of its governance or the price of resources. Since the expected shareholder value of firms with strong governance is always v, a change in the allocation can be beneficial only if it increases the expected shareholder value of firms with weak governance.

Consider a policy of BlackRock that increases the mass of firms with weak governance above the competitive allocation. Since firms with weak governance are more likely to change the status quo, such policy creates more demand for resources, and as a result, increases the market price paid by all firms with weak governance. Therefore, the value of firms with weak governance under this alternative allocation must be lower than their value under the competitive allocation. As a result, such a policy is undesirable from the perspective of a shareholder who holds the market portfolio, like BlackRock.

However, BlackRock can enhance the value of its market portfolio by increasing the mass of firms with strong governance above the competitive allocation. Such policy will create less demand for resources (and therefore, less investment) by deterring more managers from changing the status quo of their firms. As a result, the market price of resources will decrease below its competitive level, and the value of remaining weak governance firms will increase. In other words, by pushing more firms to adopt strong governance, BlackRock mitigates the negative

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price externality that firms with weak governance impose on one another when changing their status quo, thereby creating abnormal returns to firms with weak governance (which invest more than firms with strong governance). The optimal policy from BlackRock's perspective will trade off a lower number of weak governance firms in its portfolio with a higher abnormal profit for each of these firms. Proposition 3 shows that a larger managerial added value, as captured by the term $\lambda R_A - (1-\lambda) R_B$, will tilt this trade-off in a way that pushes the market portfolio closer to the competitive allocation.

More generally, common ownership reduces the aggregate level of investment in the economy, while increasing the profitability of each particular investment. This policy, however, is socially inefficient since BlackRock does not internalize the social benefit that occurs when firms with weak governance buy the resources from suppliers whose alternative use of these assets is lower than the value that can be generated by those firms.

Finally, notice that under the allocation of control rights that maximizes the aggregate shareholder value, the governance structure is relevant: firms with weak governance structure have higher valuations than firms with strong governance structures, and thus shareholders with undiversified portfolios will have incentives to give more power to their managers.

4 Breaking the Irrelevance Result

In this section we discuss the assumptions that are key for the governance irrelevance result. Highlighting the importance of these assumptions will also clarify under what conditions our model predicts that the corporate governance will be relevant. Omitted proofs can be found in the Online Appendix.

4.1 Weak Managerial Career Concerns

The irrelevance of corporate governance requires managers to be sufficiently concerned about the implications of their present actions on the prospects of their career. The model captures these career concerns in a reduced form by parameter Γ, and requires it to be larger than Γ^*, as defined in (4). The cutoff Γ^* is determined such that the manager, regardless of her loyalty, would rather avoid the risk of being fired even at the "price" of keeping the status quo of the firm.[26] In other words, we require corporate governance to affect real outcomes, not

[26] Specifically, assuming $\Gamma/\omega > b/\omega - R_B$ ($\Gamma/\omega > R_A/(1-\tau)$) guarantees that the disloyal (loyal) manager prefers the status quo and keeping his job if he expects to be fired with probability 1 (probability $1-\tau$) upon

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just the identity of the executive in office. Since corporate governance affects real outcomes, there is a link between the corporate governance and the demand for resources, and the market for resources clears only if shareholders are indifferent between strong and weak governance. Therefore, this link is crucial for the irrelevance of corporate governance.

To emphasize this point, suppose $\Gamma = 0$. In this extreme case, the manager is indifferent to the shareholder's decision to fire him, and therefore, the manager's behavior is unaffected by the allocation of control rights. In particular, if $\Gamma = 0$ then the manager's behavior would be characterized by Lemma 1, whether the governance is strong or weak. In equilibrium, the resources market must still clear, but the market clearing condition will be determined by the manager's indifference rather than the shareholder's indifference. That is, the aggregate allocation of control will not have an effect on the price of resources. Moreover, it follows from Lemma 1 that the decision of the manager will provide shareholders with new information about the manager's loyalty, and as a result, the option to fire the manager would be valuable. For example, if in equilibrium $p < R_A$, then a combination of a change to the status quo and signal $s = B$ reveals that the manager is likely to be disloyal, and the shareholder will benefit from firing the manager. Therefore, strong corporate governance will maximize the shareholder value not because it disciplines the manager's behavior, but rather, because it allows the shareholder to appoint better managers going forward.

Overall, if managers have weak career concerns (i.e., $\Gamma = 0$) then shareholders will prefer strong governance and, relative to weak governance, strong governance will generate abnormal returns to shareholders from the option to fire the manager. The governance structure will be relevant.

4.2 Shareholder Competence

The irrelevance of corporate governance also requires shareholders to have limited competence in the sense that their signal about the manager's actions cannot be too precise. Indeed, the condition in (4) is violated whenever $\tau \geq 1 - \min\{\frac{R_A}{b/\omega - R_B}, \frac{R_A}{\Gamma/\omega}\}$. To gain intuition about the importance of shareholder competence for the irrelevance result, suppose that the signal that shareholders observe is prefect, that is, $\tau = 1$. In this case, and if the firm adopts a strong governance structure, the loyal manager does not face the risk of mistakenly being fired by the shareholder after choosing project A; the shareholder will always recognize that project A was chosen. Similarly, the disloyal manager can be certain that if she chooses project B then

choosing project B (project A), even if the price of resources is the lowest possible, zero.

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the shareholder will notice it and will consequently fire her. If managerial career concerns are sufficiently large as we assume in the model,[27] then the disloyal manager will avoid the risk of being fired by pooling with the loyal manager. However, unlike the baseline model, since the loyal manager does not face the risk of being fired following a choice of project A, the pooling will be on project A rather than on the status quo. As a result, shareholders will strictly prefer strong governance as a means to deter disloyal managers from choosing project B. For this reason, corporate governance becomes relevant when shareholders have perfect competence.

The importance of shareholder competence suggests that the irrelevance of governance structure is more likely to hold when the average public equity investor lacks sophistication, which is expected when the supply of "smart" capital and institutional investors such as activist hedge funds and the like is low. As long as there is a limited supply of "smart" capital, which seems to be the reality in most financial markets, the irrelevance of governance structure is likely to hold.

4.3 Heterogeneous Firms

In our model all firms and shareholders are ex-ante identical. Importantly, the irrelevance of governance structure remains robust to cases in which firms differ with respect to parameters Λ, Γ, b, ω, v, and τ, as long as they satisfy (1) and (4). However, the irrelevance of governance structure may not hold if firms differ with respect to R_A, R_B, and λ, or more specifically, with respect $\lambda R_A - (1-\lambda) R_B$. The term $\lambda R_A - (1-\lambda) R_B$ is the added firm value a manager is expected to generate by changing the status quo. If the manager's expected added value is higher than average, then one would expect the shareholders of this firm, given the price of resources, to choose weak governance as a means to encourage their manager to change the status quo of the firm. On the other hand, if the manager's added value is lower than average, then shareholders would choose strong governance as a means to deter their manager from changing the status quo. In both cases, shareholders will have strict preferences over the governance structure of their firms; the governance structure becomes relevant. Moreover, firms with weak governance will outperform firms with strong governance, since weak governance is optimal whenever the conflict with the manager is relatively small (large λ_i) and return on investment is relatively large (high $R_{A,i}$ and low $R_{B,i}$).

However, it is important to note that the heterogeneity of firms with respect to $\lambda R_A - (1-\lambda) R_B$ affects the relevance of governance only if shareholders are able to identify the ab-

[27] If managerial career concerns are weak, then governance is relevant for the reasons stated in Section 4.1.

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normal added value of their managers. That is, the relevance of governance requires shareholders to pay attention to idiosyncratic differences among firms in their portfolios. Firm-specific characteristics could be important for the optimal governance structure (Coles, Daniel, and Naveen 2008; Johnson, Karpoff, and Yi 2015), but are nevertheless hard to identify ex-ante. In this respect, our model suggests that the relevance of governance structure requires a high level of shareholder competence, which is also consistent with our observation in Section 4.2.

4.4 Firm's Market Power

In the model, firms are price-takers, namely, the demand of a single firm cannot change the market clearing price of resources. This assumption is a key force behind the governance irrelevance in Theorem 1, which is a reminiscent of the indifference of shareholders between strong and weak governance in the competitive equilibrium. However, when a firm has market power, a change of its governance structure from strong to weak will increase the aggregate demand for resources and their price. Shareholders of firms with market power and strong governance internalize this effect on the expected value of the firm, and as a result, might be strictly worse off by adopting a weak governance structure. In equilibrium, shareholders might not be indifferent, and firms with weak governance could outperform firms with strong governance.[28] In other words, the governance structure can be relevant when firms have market power.

Nevertheless, even with market power, the incentive of shareholders to choose the governance structure that maximizes the value of their firm limits the outperformance of firms with weak governance in equilibrium. Specifically, recall that if the demand for resources is n, then the price that clears the market is $K^{-1}(n)$. It can be shown that, with market power, the number of firms with weak governance in equilibrium, denoted by n^*, must satisfy

$$K^{-1}(n^*) \leq \lambda R_A - (1-\lambda) R_B \leq K^{-1}(n^*+1). \tag{9}$$

Intuitively, the left (right) inequality guarantees that firms with weak (strong) governance do not benefit from switching to strong (weak) governance. Moreover, Condition (9) implies that the price of resources in equilibrium, $K^{-1}(n^*)$, cannot be too different from the competitive price, which according to Proposition 1 is given by $\lambda R_A - (1-\lambda) R_B$. The outperformance of

[28] Notice that this effect is asymmetric: shareholders of firms with weak governance which switch to strong governance can expect the price of resources to decrease, however, since firms with strong governance maintain the status quo, the negative pressure on the price does not affect the considerations of these shareholders.

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firms with weak governance is therefore given by $\lambda R_A - (1-\lambda) R_B - K^{-1}(n^*)$, and according to Condition (9), it is bounded by $K^{-1}(n^*+1) - K^{-1}(n^*)$. The latter term is the price impact of a single firm on the price of resources, and can be thought of as a measure of its market power. A larger market power implies a higher scope for outperformance of firms with weak governance in equilibrium.

4.5 Extreme Supply of Resources

Our result of governance irrelevance depends on Condition (2), which guarantees that the supply of resources needed for changing the status quo is neither too scarce nor too abundant. To see more clearly why, note that if $K(\lambda R_A - (1-\lambda) R_B) < 0$ then the supply of resources is too scarce, and the price of resources that clears the market is greater than $\lambda R_A - (1-\lambda) R_B$ even without any demand from firms (i.e., the alternative use of these resource to their owners is higher). In other words, the price of resources is too high to make investment profitable, and in order to deter managers from investment, all shareholders choose a strong governance structure in equilibrium. The opposite intuition holds when the supply of resources is too abundant, that is, $K(\lambda R_A - (1-\lambda) R_B) > N$. In this case, the price of resources is so low such that investment is profitable even if all firms demand resources. In equilibrium, all shareholders prefer a weak governance structure. Overall, when the supply of resources is too scarce or too abundant, the governance structure becomes relevant.

5 Preserving the Irrelevance Result

In this section we consider several extensions of the baseline model under which the governances structure remains irrelevant. Omitted proofs can be found in the Online Appendix.

5.1 Enjoying the Quiet-life

In our model, agent conflict results in over-investment, namely, unconstrained disloyal managers will invest in projects that destroy shareholder value. This is consistent with the studies cited in the introduction, documenting a negative association between strong corporate governance and firm-level investment. However, the over-investment problem in our model can also be interpreted as managerial decisions not to shut down under-performing business-lines (which will include divesting assets, renegotiating discounts with suppliers, cutting salaries, and laying-

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off employees). In this respect, our model can capture disloyal managers enjoying the quiet-life (Bertrand and Mullainathan 2003).

To see that, consider the following reinterpretation of our model: $x_i = 0$ is a decision to shut-down a business-line, and $x_i = A$ ($x_i = B$) is a decision to retain a profitable (non-profitable) one. Disloyal managers have incentives to retain non-profitable business-lines, perhaps due to laziness and other private benefits. Shareholders obtain information on the quality of retained business-lines and the firm's governance structure will thus affect managers' decisions: managers in firms with weak (strong) governance structure will retain (divest) existing business-line. In turn, the firm-level decisions will affect the aggregate demand for resources.[29] If $K(\cdot)$ is interpreted as the aggregate demand for resources (and thus, it is downward-sloping), the governance structure will remain irrelevant for the same reasons as in our baseline model. The key difference is that here weak (strong) governance is associated with more (less) managerial passiveness.

5.2 Endogenous Allocation of Cash-Flow Rights

To focus on the allocation of control rights, we modeled an exogenous allocation of cash-flow rights between managers and shareholders. Suppose instead that shareholders choose both the governance structure of the firm and the compensation of their manager as captured by parameter ω. The trade-off in choosing ω is intuitive: while a larger ω better aligns managers' incentives with shareholders' interests by increasing the sensitivity of managers' compensation to firm's value, it also leaves shareholder with a smaller economic ownership of the firm.

To see this trade-off more clearly, we distinguish between two cases. First, if $0 \leq \omega < \frac{b}{R_A+R_B}$ then a disloyal manager prefers the value-destroying project due to his private benefits.[30] Since this assumption was made in our baseline model, the analysis of Section 3 applies here as well: the governance structure is irrelevant and the expected shareholder value in equilibrium is $(1-\omega)\, v + \lambda\Lambda$. Within this range, the shareholder offers the manager $\omega = 0$ and obtains an expected value of $v + \lambda\Lambda$. Second, if $\frac{b}{R_A+R_B} \leq \omega \leq 1$, then the agency problem is essentially contracted away: the disloyal manager prefers the value-increasing project even if it means forgoing her private benefits. In this case, the governance structure is irrelevant because there are no agency costs: the manager will never choose project B, and it will choose project

[29] Under this interpretation of the model, by shutting-down a business-line the firm obtains $v_0 + p$, where p is market-price of resources. By retaining a profitable (non-profitable) business-line the firm obtains $v_0 + R_A$ ($v_0 - R_B$). This payoff structure is mathematically equivalent to the structure in our baseline model.

[30] To ensure $\Gamma > \Gamma^*$ for any value of $\omega \in [0,1]$, we assume $\Gamma > \max\{\frac{R_A}{1-\tau}, b\}$.

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A as long as it increases shareholder value, i.e., $R_A \geq p$. It can be shown that in equilibrium the expected shareholder value is $(1-\omega)\left(v+\max\left\{0, R_A - K^{-1}(N)\right\}\right)+\lambda\Lambda$.[31] Within this range, the shareholder offers the manager $\omega = \frac{b}{R_A+R_B}$ and obtains an expected value of $\frac{R_A+R_B-b}{R_A+R_B}\left(v+\max\left\{0, R_A - K^{-1}(N)\right\}\right)+\lambda\Lambda$. Overall, the shareholder is better off by contracting away the agency problem (i.e., choosing $\omega = \frac{b}{R_A+R_B}$ over $\omega = 0$) if and only if

$$\frac{b}{R_A+R_B} < \frac{R_A - K^{-1}(N)}{v + R_A - K^{-1}(N)}. \tag{10}$$

Intuitively, if managerial private benefits (b) are high relative to the value created by project A ($R_A - K^{-1}(N)$), it becomes "too expansive" for the shareholder to contract away the agency problem. In our baseline model, we implicitly assume that contracting away the agency problem is "too expansive" in this sense.

5.3 Negotiated Governance Arrangements

In our model, the irrelevance of governance structure is with respect to shareholder value. Shareholders do not consider managers' private benefits when deciding whether to adopt a strong or a weak governance. However, when setting the corporate governance of the firm, shareholders might negotiate the governance structure with the manager. Without other frictions (e.g., asymmetric information about the manager's type at the negotiation stage), the negotiation process will reach the outcome that maximizes the surplus of the shareholders and the manager combined, for example, by adjusting the manager's cash-flow rights ω (or side-payments).

Under these alternative assumptions, the choice of corporate governance would also internalize the additional private benefits of disloyal managers from project B. The governance structure will be irrelevant with respect to total firm value, for the same reasons as in the baseline model. Indeed, the expected firm value under strong governance is $v+\lambda\Lambda$, and under weak governance it is $v+\lambda R_A+(1-\lambda)(-R_B+b)-p^*+\lambda\Lambda$. The price that keeps the firm indifferent between the two governance structures is $\lambda R_A-(1-\lambda)R_B+(1-\lambda)b$, which is larger by $(1-\lambda)b$ than the competitive price of resources as given by Proposition 1. Intuitively, since the private benefits are only obtained if the status quo changes, the indifference of the firm between strong and weak governance requires the price of resources to be higher in order to offset the additional private benefits of the manager. Other than this modification, the analysis

[31] This result is based on Proposition 5 in the Online Appendix, which calculates the expected shareholder value in equilibrium in which both loyal and disloyal managers choose project A even under weak governance.

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remains the same. The corporate governance structure is irrelevant with respect to total firm value and the competitive allocation remains socially efficient.

5.4 Products Markets

In our model firms' investment decisions are linked through the resources market. However, the irrelevance of governance structure continues to hold if instead firms are linked through the products market. To see that, suppose that the payoff of projects A and B are $v + R_A + p$ and $v - R_B + p$, where p is the endogenous part of the project's return that stems from the revenue generated by selling the company's products. Suppose also that $K(p)$ is reinterpreted as the aggregate demand for the product (and thus, it is downward-sloping). All other assumptions remain the same. Thus, as more firms adopt a weak governance structure, the investment level and the supply of the products increases, and consequently the price of the products and the NPV of the project decrease. In a competitive equilibrium, the product price will adjust such that investment is zero NPV, and the irrelevance of governance structure will hold for the same reasons as in the baseline model.

5.5 Costly Strong Governance Structure

In our model shareholders do not bear any direct costs from setting and maintaining a strong governance structure. But, in practice, allocating control rights to shareholders, as well as preserving and using those rights, might require expensive activism that distracts firm's management and reduces firm's productivity. To investigate the effects of such direct costs on our analysis, we assume that setting and maintaining a strong governance structure costs the firm $q > 0$. Our main result of governance irrelevance remains unchanged. The main difference is that the market clearing price, that keeps shareholders indifferent between strong and weak governance in equilibrium, satisfies

$$p^* = \lambda R_A - (1 - \lambda) R_B + q/(1 - \omega), \tag{11}$$

which relative to the baseline model it has the additional term $q/(1 - \omega)$. Intuitively, since strong governance structure involves an exogenous cost q, the resources market can clear only if shareholders of strong governance firms do not have incentives to save these costs (of which they only internalize a fraction $1 - \omega$) by switching to a weak governance structure. This behavior is deterred in equilibrium by endogenously setting the price of resources to be high enough

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such that investment by managers is on average a negative NPV. The endogenous cost of a weak governance structure is having a negative NPV investment. Since the price of resources has to be higher with the direct costs, the number of firms with a weak governance structure and the overall level of investment are also higher in equilibrium. Nevertheless, the governance structure remains irrelevant in this case as well.

5.6 Rich Governance Structure and Investment Technology

In this Section we demonstrate that our main results extend beyond a binary governance structure and investment technology. For this purpose, we extend the model along two different dimensions. First, we introduce a menu of governance structures to better reflect the whole spectrum of governance arrangements we observe in practice. We let the governance structure of firm i be $c_i > 0$, which is the cost the shareholder of firm i must incur in order to fire the manager.[32] A higher cost of firing the manager implies a weaker governance structure. In the baseline model, weak governance implied $c_i = \infty$, and strong governance implied $c_i = 0$. Second, we assume that each manager can also choose the scale of investment in projects A and B. As in the baseline model, projects A and B are mutually exclusive. The shareholder observes the scale of investment, but not the type of project (i.e., A or B). A larger scale provides the shareholder more precise information about the type of project. We also assume that investment involves a fixed cost and can exhibit a decreasing return to scale. The exact details and formal analysis are provided in the Online Appendix.

In equilibrium, the loyal and disloyal manager invest the same amount, and both invest more when the governance structure is weaker (i.e., c_i is larger). The intuition is similar to the baseline model: the threat of being fired deters managers from investing. Managers choose the most profitable investment scale subject to not triggering a decision by the shareholder to fire them upon observing signal $s = B$. In equilibrium, the manager is not fired, and shareholders choose a weak (strong) governance structure to encourage (discourage) the manager to invest if investment is expected to be a positive (negative) NPV. As in the baseline model, the market can clear only if investment is a zero NPV. If shareholders are restricted to a binary governance structure, or if investment exhibits a constant return to scale, then shareholders are indifferent to the available governance structures in equilibrium, implying governance irrelevance. However,

[32] c_i captures search costs, excess compensation a new manger might demand, cost of overcoming managerial entrenchment (e.g., offering the incumbent manager a severance package), cost of overcoming coordination problem among shareholders, cost of a legal challenge, or how quickly can shareholders fire the manager once they reached the conclusion that it is in their best interests to do so.

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when shareholders can choose from the spectrum of governance structures and investment exhibits a decreasing return to scale, then, in equilibrium, two endogenous governance structures will be superior to all other governance structures. While some governance structures are strictly inferior, the irrelevance is preserved between the two endogenously chosen governance structures for the same reasons as in the baseline model. In particular, the irrelevance holds with respect to all governance structures that are observed on the equilibrium path.

5.7 Other Aspects of Corporate Governance

In our model, we used the strength of the shareholders' right to fire mangers as a proxy for the strength of governance structure, because the right to replace managers is the most important and the most encompassing control right. Not surprisingly, the effect of "management entrenchment" on firm performance is the center of corporate governance scholarship. Indeed, great variety of control mechanisms that affect the ease by which shareholders can replace board members—such as staggered boards, poison pills, dual class shares, anti-takeover legislation, golden parachutes, majority vote, and proxy access—were extensively studied for their effect on firm performance. Importantly, even when control rights allow shareholders to directly influence the business strategy—such as when supporting hedge fund activism—this influence is only a derivative effect of the right to replace board members.

We thus believe the right to fire managers captures the essential issues in corporate governance, and would add two comments on two cases outside of its scope. First, unlike other control rights, the right for information (i.e. disclosure) can reduce agency costs independently of the right to fire managers. Indeed, our model does not capture changes in disclosure levels as variations in governance structures but rather as a parameter (τ). However, given that disclosure has direct costs (producing, verifying, and disclosing the information) and indirect costs (when it distorts managers' incentives and investment choices), disclosure is never complete. Importantly, as long as shareholders do not have perfect competence, disclosure will not change the model's irrelevance result.

Second, our model does not capture agency costs that are not associated with investments, such as stealing. Clearly, all shareholders will want to prevent stealing. However, while control rights are necessary for non-contractible investments, they are unnecessary to prevent activities—such as stealing—that are observable and verifiable in court. The law (or the parties) can define stealing and prohibit it regardless of the allocation of control rights between shareholders and managers. Thus, even when shareholders have no voting rights (e.g., in Snap),

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managers' stealing is still prohibited.

6 Discussion and Empirical Implications

In our model, the demand for resources by the universe of firms is affected by the level of managerial freedom a manager enjoys within a firm's governance structure. While strong governance disincentivizes managers to invest and buy resources, weak governance does the opposite. Total demand for the resources is affected by the division of the universe of firms between strong and weak governance. Our model shows that the universe of firms will reach an equilibrium in which some firms have weak governance and other strong governance, but all firms will have the same value. A single firm, or a single shareholder, who are price-takers, cannot change the value of their firm by switching governance from weak to strong or the other way around. The implications of our model's governance irrelevance result are discussed next.

6.1 Empirical Studies

A central theme of corporate governance theory is that governance structure is relevant due to the need of principals to remove disloyal agents, thereby minimizing agency costs. However, our model shows that this justification for governance relevance is insufficient: even when agents vary in their integrity, corporate governance is irrelevant in equilibrium. Therefore, the common hypothesis—that weak governance leads to weak performance—used in many empirical studies is also insufficient.

Take for instance the studies of corporate governance indices (Gompers, Ishii and Metrick 2003; Bebchuk, Cohen and Ferrell 2009). A governance index measures the allocation of control rights between shareholders and managers and rank them along a spectrum from weak (more rights to managers) to strong (more rights to shareholders), and then test for a correlation with firm performance. The hypothesis being that the index will predict firm performance: weak governance will correlate with weak performance and strong governance with strong performance. However, as the model shows, although the universe of firms will split between weak and strong governance, in equilibrium, no difference in firm performance should be expected. Moreover, in a market out-of-equilibrium, weak governance firms might either outperform or underperform strong governance firms depending on the direction of the deviation from the equilibrium. Thus, to predict firm performance a governance index must specify which of our model's assumptions do not hold, and the reasons for assuming the market is out-of-equilibrium

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in a specific direction. Indeed, absent such specifications, the predictive power and validity of governance indices were strongly challenged (Core, Guay and Rusticus 2006; Cremers, Nair and John 2009; Johnson, Moorman and Sorescu 2009).

More generally, the lack of specifications can explain the inconclusive results of other empirical studies. Here are a few commonly absent specifications in the design of empirical studies of corporate governance.

6.1.1 Firms, Shareholders and Managers Characteristics

As the model shows, several characteristics of firms, shareholders and managers are important for the irrelevance result. Do firms have market power in the resources markets? With market power, a high demand for resources will move prices up, thereby reducing the return to weak governance firms. Thus, strong governance firms with market power will not switch to weak governance. In equilibrium, firms with weak governance will have higher returns than firms with strong governance, but a switch to weak governance will generate negative returns to shareholders of the switching firms due to their market power.

Do shareholders have perfect competence? If they do, they will prefer strong governance, as strong governance will generate abnormal returns to shareholders. Can shareholders observe the idiosyncratic differences among firms? If they do, they will prefer weak governance for firms with above average good managers, and strong governance otherwise. Importantly, empirical studies assuming heterogeneity among firms or managers need to specify how this heterogeneity is captured in the study. Do shareholders have market power in the ownership of firms? If they do, they can affect the division of weak and strong governance firms to be out of the socially efficient equilibrium. This might be the case of common ownership analyzed above.

Do managers have meaningful career concerns? If managers have weak career concerns, then shareholders will prefer strong governance, because strong governance will generate abnormal returns to shareholders. Do managers have sufficient conflict? If they do not, then governance is irrelevant regardless of the other factors.

In sum, empirical studies of corporate governance need to specify these issues to be able to provide more accurate and conclusive results.

6.2 The Variety of Corporate Governance Structures

Our model also provides insights to understand the variety of corporate governance structures we observe in the market, and especially the persistence of weak governance structures. The

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exercise of control rights generates costs and benefits. The main control benefit is the discretion to take value-increasing actions in circumstances that contracts could not specify or anticipate. However, firms will suffer control costs regardless of who exercises control—shareholders or managers (Goshen and Squire, 2017). While *principal costs* are costs attributable to the exercise of control by shareholders, *agent costs* are costs attributable to the exercise of control by managers. The control costs can be the consequence of competence (i.e., honest mistakes and the efforts to avoid such mistakes) or conflict (i.e., disloyal conduct and the efforts to prevent such conduct). In general, any shift of control rights between principals and agents entails trade-offs between principal costs and agent costs. The net effect of the shift—and thus the optimal control structure—depends on firm-specific characteristics (e.g., the firm's business strategy, industry, and the personal characteristics of its shareholders and managers).

Although these various trade-offs can explain the variety of governance structures, without identifying the specific elements that explain how these trade-offs are resolved for a particular firm, a corporate governance structure is likely irrelevant to firm value. Indeed, our model shows that in a competitive equilibrium the costs of the manager's conflict are exactly offset by the costs of the shareholders' incompetence. In this respect, our model made the first step in analyzing the conditions under which corporate governance is indeed irrelevant to firm value, and in doing so, yielded the firm-specific and market-specific elements that will make corporate governance relevant.

7 Concluding Remarks

The central theme in the theory of corporate governance is that control rights are necessary to hold disloyal managers accountable and thereby minimize agency costs. Empowering shareholders—i.e., allocating more control rights to shareholders—will, therefore, reduce management agency costs. Many empirical studies adopted, therefore, the prediction that a weak governance structure—i.e., allocation of more control rights to managers—will be associated with weak firm performance due to a high level of agency costs. Our model shows, however, that the relationship between the allocation of control rights and firm performance is more complex than just holding conflicted managers accountable. We show that in a competitive equilibrium, which is socially efficient, when firms do not have market power in the resources market, shareholders do not have perfect competence or market power in the ownership of firms, and managers have meaningful career concerns, the governance structure is irrelevant.

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Appendix - Proofs

We start with two auxiliary lemmas that are used in the proof of Lemma 2. The proofs of all auxiliary results are in the Online Appendix.

Lemma 3 *In any equilibrium in which the manager keeps the status quo on the path, the manager is not fired by the shareholder upon doing so.*

Lemma 4 *In any equilibrium, the disloyal manager never chooses project A and the loyal manager never chooses project B.*

Proof of Lemma 2. Suppose $c_i = SH$. Based on Lemma 4, there are two cases to consider:

1. First, suppose in equilibrium the loyal manager chooses $x_i = 0$. We argue the disloyal manager also chooses $x_i = 0$. To see why, note that according to Lemma 3, the shareholder does not fire the manager upon $x_i = 0$ in such equilibrium. Moreover, if on the contrary the disloyal manager chooses $x_i \neq 0$, then upon $x_i \neq 0$ the shareholder must infer that the manager is disloyal, and as a result, he has incentive to fire him irrespective of the realization of signal s. However, $\Gamma > \Gamma^*$ implies $b + \omega(v - R_B - p) < \omega v + \Gamma$, and therefore the disloyal manager is better off choosing $x_i = 0$ over project B (and project A, as $b/\omega > R_A + R_B$), a contradiction. Therefore, the manager chooses $x_i = 0$ regardless of his loyalty.

2. Second, suppose in equilibrium the loyal manager chooses $x_i = A$. Based on Lemma 4, the disloyal manager either chooses $x_i = 0$ or $x_i = B$. In the former case, $x_i = 0$ reveals the manager is disloyal, and $x_i \neq 0$ reveals the manager is loyal. Therefore, the shareholder fires the manager upon observing $x_i = 0$, and does not fire him, regardless of the realization of signal s, upon observing $x_i \neq 0$. However, this contradicts Lemma 3. We conclude, the disloyal manager chooses project B in this case, and $x_i = 0$ is off-equilibrium.

The arguments above suggest that there could be only two types of equilibrium (at the firm level) when $c_i = SH$. We argue that the equilibrium is as described by part 1 above. To see why, suppose to the contrary that the equilibrium is as described by part 2, that is, the loyal manager chooses $x_i = A$ and the disloyal manager chooses $x_i = B$. The shareholder has incentive to fire the manager if and only if he observes signal $s = B$. This implies that the equilibrium payoff of the loyal manager is $\omega(v + R_A - p) + \tau\Gamma$, and the equilibrium payoff of the disloyal manager is $b + \omega(v - R_B - p) + (1 - \tau)\Gamma$. The assumption $\Gamma > \Gamma^*$ implies $\frac{\omega(R_A - p)}{1-\tau} < \Gamma$ for $p > 0$, and hence, the loyal manager prefers deviating to $x_i = 0$ if upon such deviation the shareholder does not fire him. If in addition $\frac{b - \omega(R_B + p)}{\tau} < \Gamma$, then $b + \omega(v - R_B - p) + (1 - \tau)\Gamma < \omega v + \Gamma$ and conditional upon not being fired when choosing $x_i = 0$, both the loyal and the disloyal manage prefer such deviation. Moreover, upon such deviation, the shareholder will find it optimal not

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to fire the manager (since the replacement manager has the same probability of being loyal). In this case the equilibrium described by part 2 does not survive the Grossman and Perry (1986) criterion. If instead $\frac{b-\omega(R_B+p)}{\tau} \geq \Gamma$, then $b+\omega\left(v-R_B-p\right)+(1-\tau)\Gamma > \omega v+\Gamma$ and conditional upon not being fired when choosing $x_i = 0$ only the loyal manager prefers such deviation. Moreover, upon such deviation, the shareholder will indeed find it optimal not to fire the manager. Therefore, in this case as well the equilibrium described by part 2 does not survive the Grossman and Perry (1986) criterion. We conclude that the equilibrium must be as described by part 1.

Finally, we prove that the equilibrium described by part 1 (in which the manager choose $x_i = 0$ irrespective of his type) survives the Grossman and Perry (1986) criterion. Suppose that off the equilibrium path, when $x_i \neq 0$, the shareholder fires the manager regardless of the realization of signal s. Note that under the equilibrium play, the manager obtains $\omega v + \Gamma$ regardless of his type. The assumption $\Gamma > \Gamma^*$ guarantees that for any admissible price p, a deviation of either type to $x_i \neq 0$ is not profitable if they are expected to be fired. We show that these off-equilibrium beliefs are indeed credible. We consider three cases:

1. First, consider a deviation to $x_i \neq 0$ only by the disloyal manager. Then, upon such deviation, the shareholder knows that the manager is disloyal, and therefore, he has strict incentives to fire the manager. However, the assumptions $\Gamma > \Gamma^*$ and $p \geq 0$ imply that the manager's payoff under this deviation is strictly smaller than $\omega v + \Gamma$. So such deviation is not feasible.

2. Second, consider a deviation to $x_i \neq 0$ only by the loyal manager. Then, upon such deviation, the shareholder does not fire the manager with a positive probability. Since $\tau < 1$, it must be that the shareholder ignores the realization of signal s. However, if the loyal manager finds a deviation to $x_i = A$ beneficial relative to $x_i = 0$, $b/\omega - R_B > R_A$ implies that a disloyal manager also finds a deviation to $x_i = B$ beneficial relative to $x_i = 0$. So such deviation is not feasible.

3. Third, consider a deviation to $x_i \neq 0$ that includes both types. For the same reasons as in the proof of Lemma 4, if such deviation exists, it must be that the loyal manager chooses project A and the disloyal manager chooses project B. But upon such deviation the shareholder fires the manager if and only if $s = B$. The assumptions $\Gamma > \Gamma^*$ and $p > 0$ imply that the loyal manager's payoff under the equilibrium play (i.e., $x_i = 0$) will be higher. So this deviation is not feasible either.

Combined, the three cases above establish that when $c_i = SH$, an equilibrium in which all types of managers choose $x_i = 0$ survives the Grossman and Perry (1986) criterion, and therefore, it exists. ■

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Proof of Proposition 1. We start by proving that in any equilibrium there are firms $i \neq j$ such that $c_i^* = M$ and $c_j^* = SH$. Suppose to the contrary that in equilibrium all shareholders choose the same $c^* \in \{M, SH\}$. In equilibrium, the market must clear. Therefore, exactly $K(p)$ firms must change the status quo and $N - K(p)$ firms must keep it. Two cases must be considered:

1. First, suppose $c^* = SH$. According to Lemma 2, all managers keep the status quo in equilibrium. Therefore, this equilibrium requires $K(p^*) = 0$, which implies $p^* = 0$. The expected shareholder value in equilibrium is $(1-\omega)v + \lambda\Lambda$. Consider a deviation of shareholder i to $c_i = M$. Recall the assumption $0 < K(\lambda R_A - (1-\lambda)R_B)$, which implies, $0 < \lambda R_A - (1-\lambda)R_B$. Also note that $\lambda R_A - (1-\lambda)R_B < R_A < b/\omega - R_B$. Therefore, $0 < R_A < b/\omega - R_B$. According to Lemma 1, the manager of firm i chooses project A if he is loyal and chooses project B if he is disloyal. Notice that the equilibrium implied by $c_i = M$ survives the Grossman and Perry (1986) criterion since no type of manager can obtain a higher payoff by changing his strategy, no matter what the shareholders beliefs are. Under this deviation, the expected shareholder value is $(1-\omega)[v + \lambda(R_A - 0) - (1-\lambda)(R_B + 0)] + \lambda\Lambda$, which is strictly larger than $(1-\omega)v + \lambda\Lambda$ as long as $0 < \lambda R_A - (1-\lambda)R_B$, which holds. Therefore, we get a contradiction.

2. Second, suppose $c^* = M$. Three subcases must be considered:

(a) If $p^* > b/\omega - R_B$ then according to Lemma 1, the manager chooses $x_i = 0$ regardless of his loyalty. This equilibrium requires $K(p^*) = 0 \Rightarrow p^* = 0$, which implies $0 > b/\omega - R_B$. However, recall the assumption $0 < K(\lambda R_A - (1-\lambda)R_B)$ implies $0 < \lambda R_A - (1-\lambda)R_B$. Since $\lambda R_A - (1-\lambda)R_B < R_A < b/\omega - R_B$, we get a contradiction.

(b) If $R_A < p^* \leq b/\omega - R_B$ then according to Lemma 1, the loyal manager chooses $x_i = 0$ and disloyal manager chooses $x_i = B$. The expected payoff of the shareholder in this equilibrium is $(1-\omega)(v - (1-\lambda)(R_B + p^*)) + \lambda\Lambda$. Consider a deviation of the shareholder i to $c_i = SH$. According to Lemma 2, the manager must be choosing $x_i = 0$ regardless of his type, and this equilibrium survives the Grossman and Perry (1986) criterion. Since under this equilibrium the shareholder expected payoff is $(1-\omega)v + \lambda\Lambda$, which is strictly higher than the equilibrium payoff, the deviation of the shareholder to $c_i = SH$ is strictly optimal, yielding a contradiction.

(c) If $p^* \leq R_A$ then, according to Lemma 1, $c_i^* = M$ implies that in equilibrium the manager chooses $x_i \neq 0$ regardless of his loyalty. Therefore, N firms change the status quo and the market clears only if $K(p^*) = N$. The expected shareholder value in this equilibrium is

$$(1-\omega)[v + \lambda(R_A - p^*) - (1-\lambda)(R_B + p^*)] + \lambda\Lambda.$$

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Consider a deviation of shareholder i to $c_i = SH$. According to Lemma 2, the manager chooses $x_i = 0$ regardless of his type upon such deviation, and the expected shareholder payoff is $(1-\omega)\, v + \lambda\Lambda$. Therefore, a deviation to $c_i = SH$ is not profitable if and only if $p^* \leq \lambda R_A - (1-\lambda)\, R_B$. However, the market clearing condition requires $K(p^*) = N$, which implies $N \leq K(\lambda R_A - (1-\lambda)\, R_B)$. This condition, however, contradicts the assumption $K(\lambda R_A - (1-\lambda)\, R_B) < N$. Therefore, $c_i^* = M$ for all i cannot be an equilibrium.

We have shown that in any equilibrium there are at least two firms $i \neq j$ such that $c_i^* = SH$ and $c_i^* = M$. Since firms are ex-ante identical and have no market power, shareholders must be indifferent between these different choices. According to Lemma 2, if $c_i^* = SH$ then in equilibrium the manager chooses $x_i = 0$ regardless of his type and the shareholder does not fire him. Therefore, the expected shareholder value in those firms is $(1-\omega)\, v + \lambda\Lambda$. Since shareholders are indifferent, the expected shareholder value when $c_i^* = M$ must also be $(1-\omega)\, v + \lambda\Lambda$. Consider firms with $c_i^* = M$, and note that there are three cases to consider, depending on the price of resources:

1. First, if $p^* > b/\omega - R_B$ then according to Lemma 1, the manager chooses $x_i = 0$ regardless of his loyalty. This equilibrium requires $K(p^*) = 0 \Rightarrow p^* = 0$, which implies $0 > b/\omega - R_B$. However, recall the assumption $0 < \lambda R_A - (1-\lambda)\, R_B$. Since $\lambda R_A - (1-\lambda)\, R_B < R_A < b/\omega - R_B$, we get a contradiction.

2. Second, if $R_A < p^* < b/\omega - R_B$ then according to Lemma 1, the manager chooses $x_i = 0$ if and only if he is loyal. The expected payoff of the shareholder in this equilibrium is $(1-\omega)\,(v - (1-\lambda)\,(R_B + p^*)) + \lambda\Lambda$, which is smaller than $(1-\omega)\, v + \lambda\Lambda$ as long as $R_B + p^* > 0$, which holds since $p^* > R_A$. Therefore, the shareholder cannot be indifferent, a contradiction.

3. Third, therefore, it must be $p^* \leq R_A$. In this case, the loyal manager chooses $x_i = A$, and the disloyal manager chooses $x_i = B$. The expected shareholder value is

$$(1-\omega)\,[v + \lambda\,(R_A - p^*) - (1-\lambda)\,(R_B + p^*)] + \lambda\Lambda.$$

Shareholders are indifferent between $c_i = SH$ and $c_i = M$ if and only if $p^* = \lambda R_A - (1-\lambda)\, R_B$. The market clears at this price if and only if exactly $K(\lambda R_A - (1-\lambda)\, R_B)$ firms change the status quo, which implies that $K(\lambda R_A - (1-\lambda)\, R_B)$ firms choose $c_i^* = M$, as required. Assumption (2) guarantees $K(\lambda R_A - (1-\lambda)\, R_B) \in (0, N)$. ■

The next auxiliary result, which establishes the equilibrium when the number of firms with weak governance is exogenous, is used in the proof of Proposition 2 and 3.

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Lemma 5 *Suppose the number of firms with weak governance is exogenously given by* $n \in [0, N]$*, and let the corresponding price of resources in equilibrium be* $p(n)$*. Then*

$$p(n) = \begin{cases} K^{-1}(n) & \text{if } n \leq K(R_A) \\ R_A & \text{if } K(R_A) < n \leq \frac{1}{1-\lambda} K(R_A) \\ K^{-1}(n(1-\lambda)) & \text{if } \frac{1}{1-\lambda} K(R_A) < n < \frac{1}{1-\lambda} K(b/\omega - R_B) \\ b/\omega - R_B & \text{if } \frac{1}{1-\lambda} K(b/\omega - R_B) \leq n. \end{cases} \tag{12}$$

(*i*) *The equilibrium behavior of firms with strong governance is as characterized by Lemma 2.*

(*ii*) *The equilibrium behavior of firms with weak governance is:*[33]

(*a*) *If* $n \leq K(R_A)$ *then the loyal manager chooses project A, and the disloyal manager chooses project B.*

(*b*) *If* $K(R_A) < n \leq \frac{1}{1-\lambda} K(R_A)$ *then the loyal manager chooses project A with probability* $\eta \in (0,1)$ *and the status quo with probability* $1-\eta$*, where* η *satisfies* $(\lambda\eta + 1 - \lambda) n = K(R_A)$*. The disloyal manager chooses project B.*

(*c*) *If* $\frac{1}{1-\lambda} K(R_A) < n \leq \frac{1}{1-\lambda} K(b/\omega - R_B)$ *then the loyal manager keeps the status quo and the disloyal manager chooses project B.*

(*d*) *If* $\frac{1}{1-\lambda} K(b/\omega - R_B) < n$ *then then the loyal manager keeps the status quo and the disloyal manager chooses project B with probability* $\varphi \in (0,1)$ *and the status quo with probability* $1 - \varphi$*, such that* $\varphi = \frac{1}{1-\lambda} \frac{K(b/\omega - R_B)}{n}$*.*

Proof of Proposition 2. Consider an allocation of control rights where the mass of firms with weak governance is $\hat{n}$. Based on Lemma 5, the corresponding price of resources is $p(\hat{n})$, as given by Expression (12). Recall that according to Proposition 1, the competitive allocation is $n^* = K(p^*)$ where $p^* = \lambda R_A - (1-\lambda) R_B$ is the corresponding price of resources. Note that $p^* = p(n^*)$. We consider several cases:

1. First, suppose $\hat{n} \in [0, n^*)$. Relative to the competitive allocation, $n^* - \hat{n}$ firms with weak governance switched to strong governance. Since $\hat{n} < n^* = K(\lambda R_A - (1-\lambda) R_B) < K(R_A)$, we have $\hat{n} < K(R_A)$. According to Lemma 5 part ii.a, if $\hat{n} < K(R_A)$ then $p(\hat{n}) = K^{-1}(\hat{n}) < \lambda R_A - (1-\lambda) R_B = p(n^*)$. Moreover, in this region firms with strong (weak) governance

[33] Notice that we allow for mixed strategies by the manager; doing so will not change our main results in the main text in a material way.

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under allocation $\hat{n}$ behave the same way as firms with strong (weak) governance under allocation n^*. The only difference between the allocations is that under allocation $\hat{n}$ the price of resources is lower and the number of firms with weak governance is lower. The added total social value that is created by the mass of firms that switched from weak to strong governance is $-(n^* - \hat{n})(\lambda R_A - (1-\lambda) R_B)$.[34] At the same time, there is a mass of $n^* - \hat{n}$ suppliers who sold their assets under allocation n^* but retained them under allocation $\hat{n}$. The valuations of these suppliers span the interval $[p(\hat{n}), \lambda R_A - (1-\lambda) R_B]$. Therefore, the total alternative use of their assets is smaller than the value that could have been created to the switching firms had they maintained their weak governance and bought these assets. Therefore, any allocation $\hat{n} < n^*$ has a lower social value than W^*.

2. Second, suppose $\hat{n} \in (n^*, N]$. Relative to the competitive allocation, $\hat{n} - n^*$ firms with strong governance switched to weak governance. According to Lemma 5 part (i), under the new allocation, the firms that kept their strong governance will maintain the status quo under the new allocation. However, based on Lemma 5 part (ii), the demand of firms with weak governance (of firms which had weak governance under the competitive allocation and of firms which switched to weak governance under the new allocation) might change depending on the price of resources under the new allocation (notice that Lemma 5 guarantees that an equilibrium exists under allocation $\hat{n}$). There are four subcases to consider:

(a) Suppose $p(\hat{n}) < R_A$. Based on Lemma 5, it must be $\hat{n} \leq K(R_A)$, and based on part (ii.a) of this lemma, the behavior of firms with weak governance is the same as under allocation n^*. Since there are more firms with weak governance under allocation $\hat{n}$, the demand for resources is higher that under allocation n^*. Therefore, it must be $\lambda R_A - (1-\lambda) R_B < p(\hat{n})$. Notice that the added social value that is created by each firm that switched from strong to weak governance is $\lambda R_A - (1-\lambda) R_B$. At the same time, there is a mass of $\hat{n} - n^*$ suppliers who retained their assets under allocation n^* but sell them under the new allocation. The valuations of these suppliers span the interval $[\lambda R_A - (1-\lambda) R_B, p(\hat{n})]$. Therefore, the alternative use of their assets is higher than the value that is created to the firms that switched to weak governance and bought these assets. As a result, any allocation of control rights that satisfies $\hat{n} > n^*$ and $p(\hat{n}) < R_A$ produces a lower social value than W^*.

(b) Suppose $p(\hat{n}) = R_A$. Based on Lemma 5, it must be $K(R_A) < \hat{n} \leq \frac{1}{1-\lambda} K(R_A)$, and based on part (ii.b) of this lemma, under the new allocation the behavior of firms with weak governance is the following: the loyal manager chooses project A with probability

[34] Although the change in price of resources affects all firms, firms that did not change their decisions as a consequence do not affect the allocation of resources, and therefore, do not affect social welfare.

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$\eta \in (0,1)$ and the status quo with probability $1-\eta$, and the disloyal manager chooses project B. Since every instance in which a firm invests in project A creates social welfare (the firm creates a value of R_A where the alternative use of the supplier is smaller than $p(\hat{n}) = R_A$), the social welfare under this allocation is lower than it would have been had the loyal manager invested in project A with probability one rather than η. However, for the same reason as in part (a) above, the social welfare that would have been created with $\eta = 1$ is lower than the social welfare that is created by the competitive allocation.

(*c*) Suppose $R_A < p(\hat{n}) < b/\omega - R_B$. Based on Lemma 5, it must be $\frac{1}{1-\lambda}K(R_A) < \hat{n} < \frac{1}{1-\lambda}K(b/\omega - R_B)$, and based on part (ii.c) of this lemma, under the new allocation firms with weak governance change the status quo if and only if the manager is disloyal, and when they do, they choose project B. Since $R_A > -R_B$, any transaction in which the supplier's alternative use of the asset is in the interval $[R_A, p(\hat{n})]$, and the asset is sold to a firm with weak governance, is socially inefficient. Therefore, an allocation as in part (b) above generates a strictly higher social welfare, as it avoids these transactions. Moreover, in allocations in part (b) project A is sometimes chosen, which is socially efficient. Recall that the allocation in part (b) is inferior to the competitive allocation n^*. Therefore, from transitivity, it must be that any allocation that satisfies $\hat{n} > n^*$ and $R_A < p(\hat{n}) < b/\omega - R_B$ is also socially inefficient.

(*d*) Suppose $b/\omega - R_B \leq p(\hat{n})$. Based on Lemma 5, it must be $b/\omega - R_B = p(\hat{n})$ and $\frac{1}{1-\lambda}K(b/\omega - R_B) \leq \hat{n}$, and based on part (ii.d) of this lemma, under the new allocation firms with weak governance change the status quo only if the manager is disloyal, and when they do, they choose project B. Therefore, for the same reason as in part (c) above, the social welfare under this allocation is lower than the social welfare that is created by the competitive allocation.

■

Proof of Proposition 3. Denote the allocation that maximizes total shareholder value by n^*_{co}. According to Lemma 5, if $K(R_A) < n$ then $p(n) \geq R_A$, and therefore, any change to the status quo necessarily strictly decreases shareholder value (since project B is chosen with a strictly positive probability). Therefore, it must be $n^*_{co} < K(R_A)$. Moreover, if $n > K(\lambda R_A - (1-\lambda)R_B)$, then $p(n) > \lambda R_A - (1-\lambda)R_B$, which implies that a change to the status quo is a negative NPV. Therefore, it must be $n^*_{co} \leq n^*$. We argue that $n^*_{co} < n^*$. As argued in the main text, if $n = n^*$ then the expected shareholder value in firms with strong and weak governance is v. However, if $n < n^*$, then the price of resources must be strictly smaller than $\lambda R_A - (1-\lambda)R_B$, the competitive price, which implies that the expected value that is created

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for each firm with weak governance is strictly larger than v. Therefore, the total shareholder value is strictly larger than Nv, which implies $n_{co}^{*} < n^{*}$. Recall from Lemma 5 that $n < K(R_A)$ implies $p(n) = K^{-1}(n)$. Therefore,

$$n_{co}^{*} = \arg \max_{n \in [0, n^{*}]} n \left(\lambda \left(R_A - K^{-1}(n) \right) - (1 - \lambda) \left(R_B + K^{-1}(n) \right) \right),$$

or equivalently, the price that corresponds to the optimal allocation solves

$$p_{co}^{*} = \arg \max_{p \in [0, \lambda R_A - (1-\lambda) R_B]} K(p) \left(\lambda (R_A - p) - (1 - \lambda)(R_B + p) \right).$$

Let

$$\pi(p) \equiv K(p) \left(\lambda (R_A - p) - (1 - \lambda)(R_B + p) \right).$$

Since $\pi(p) = 0$ for $p \in \{0, \lambda R_A - (1 - \lambda) R_B\}$, but $\pi(p) > 0$ for $p \in (0, \lambda R_A - (1 - \lambda) R_B)$, p_{co}^{*} is well defined in the interval $(0, \lambda R_A - (1 - \lambda) R_B)$. Notice that the

$$\begin{aligned} \pi'(p) &= K'(p) (\lambda R_A - (1 - \lambda) R_B - p) - K(p) \\ \pi''(p) &= K''(p) (\lambda R_A - (1 - \lambda) R_B - p) - 2K'(p). \end{aligned}$$

The FOC implies $\pi'(p_{co}^{*}) = 0$ and the SOC implies $\pi''(p_{co}^{*}) < 0$. Explicitly, the FOC implies that p_{co}^{*} solves

$$p + \frac{K(p)}{K'(p)} = \lambda R_A - (1 - \lambda) R_B,$$

and the SOC implies that $p + \frac{K(p)}{K'(p)}$ is an increasing function of p. Therefore, p_{co}^{*} (and therefore also n_{co}^{*}) is locally increasing with $\lambda R_A - (1 - \lambda) R_B$. ■

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For Online Publication: Online Appendix for "Irrelevance of Governance Structure"

by Zohar Goshen[35] and Doron Levit[36]

A Proofs of Auxiliary Results

Proof of Lemma 3. If $c_i = M$ then the shareholder does not have the right to fire the manager and the result follows trivially. Suppose $c_i = SH$, and on the contrary that $x_i = 0$ is on the equilibrium path but the manager is fired by the shareholder upon doing so. Then, it must be that the loyal manger chooses $x_i \neq 0$. Otherwise, the replacement manager has a weakly lower probability of being loyal than a manager who chooses $x_i = 0$, and the shareholder would have no incentive to fire the manager. Therefore, $x_i = 0$ is chosen by the disloyal manager. Since $x_i \neq 0$ is chosen by the loyal manager, the shareholder does not fire the manager upon $x_i \neq 0$ irrespective of the realization of signal s. Therefore, the loyal manager must prefer project A over project B. By revealed preferences of the loyal manager, it must be $\omega(v + R_A - p) + \Gamma > \omega v$, which implies that the disloyal manager has a strictly profitable deviation to project B, thereby generating a payoff of $b + \omega(v - R_B - p) + \Gamma$. Since $b/\omega - R_B > R_A$ and $\omega(v + R_A - p) + \Gamma > \omega v$, this deviation is optimal, a contradiction. ■

Proof of Lemma 4. Suppose on the contrary the loyal manager chooses $x_i = B$ in equilibrium. Then, it must be $c_i = SH$ and that the manager is strictly more likely to be fired upon choosing $x_i = A$ than upon $x_i = B$. Therefore, and since $b/\omega - R_B > R_A$, a disloyal manager strictly prefers project B over project A. In other words, project A is never chosen by the manager on the equilibrium path. If so, and because $\tau < 1$, signal s is uninformative about the manager's type and the shareholder will ignore it when deciding whether to fire the manager. That is, from the manager's perspective, the probability of being fired is the same whether he chooses project A or project B. Therefore, the loyal manager has a strictly profitable deviation from $x_i = B$ to $x_i = A$, a contradiction.

Next, suppose on the contrary the disloyal manager chooses $x_i = A$ in equilibrium. By the previous argument, the loyal manager is not choosing $x_i = B$ in this equilibrium on the path. There are two cases to consider:

1. If the loyal manager chooses $x_i = 0$, then conditional on $x_i \neq 0$ the manager must be disloyal. Therefore, the realization of signal s does not affect the decision of the shareholder to fire the

[35] Columbia and ECGI. Email: zgoshen@law.columbia.edu.
[36] Wharton and ECGI. Email: dlevit@wharton.upenn.edu.

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manager; the manager is either fired with probability one or zero upon $x_i \neq 0$. Therefore, and since $b/\omega - R_B > R_A$, the disloyal manager is strictly better off choosing $x_i = B$, a contradiction.

2. Suppose the loyal manager chooses $x_i = A$. The disloyal manager chooses $x_i = A$ as well, only if $c_i = SH$ and he expects to be fired with a strictly higher probability upon choosing $x_i = B$. However, if the manager chooses project A regardless of his loyalty, signal s is uninformative about the manager loyalty, and the shareholder's decision to fire the manager cannot depend on the realization of signal s. If so, and since $b/\omega - R_B > R_A$, the disloyal manager is strictly better off choosing $x_i = B$, a contradiction. ■

Proof of Lemma 5. First note that according to Lemma 2, the behavior of firms with strong governance does not depend on the price of resources or the total number of firms with strong governance. Therefore, part (i) follows immediately. Part (ii) and the form of $p(n)$ follow from the combination of the five cases below:

1. If $p(n) < R_A$ then based on Lemma 1, the behavior of each firm with weak governance will be the same as under the competitive equilibrium described by Proposition 1. Therefore, the demand for resources will be n and market clearing implies $K(p(n)) = n$, which requires $n < K(R_A)$.

2. If $p(n) = R_A$ then based on Lemma 1, the disloyal manager chooses project B and the loyal manager is indifferent between project A and the status quo. Therefore, he can mix between the two choices. Letting η be the probability with which he chooses project A, market clearing implies $(\lambda\eta + 1 - \lambda) n = K(R_A)$, which requires $K(R_A) \leq n \leq \frac{1}{1-\lambda} K(R_A)$.

3. If $R_A < p(n) < b/\omega - R_B$ then based on Lemma 1 the loyal manager keeps the status quo and the disloyal manager chooses project B. Therefore, the demand for resources will be $n(1-\lambda)$ and market clearing implies $K(p(n)) = n(1-\lambda)$, which requires $\frac{1}{1-\lambda} K(R_A) < n < \frac{1}{1-\lambda} K(b/\omega - R_B)$.

4. If $p(n) = b/\omega - R_B$ then based to Lemmas 1, the loyal manager keeps the status quo and the disloyal manager is indifferent between project B and the status quo. Therefore, he can mix between the two choices. Letting φ be the probability with which he chooses project B, market clearing implies $\varphi(1-\lambda) n = K(b/\omega - R_B)$, which requires $\frac{1}{1-\lambda} K(b/\omega - R_B) \leq n$.

5. If $p(n) > b/\omega - R_B$ then based to Lemmas 1, the manager always keeps the status quo. Therefore, it must be $p(n) = 0$, which implies $b/\omega - R_B < 0$. However, the assumption $0 < K(\lambda R_A - (1-\lambda) R_B)$ implies $0 < \lambda R_A - (1-\lambda) R_B < R_A < b/\omega - R_B$. Therefore, this cannot be true in equilibrium. ■

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B Extensions of the baseline model

B.1 Section 4.1: Weak Managerial Career Concerns

Proposition 4 *Suppose* $\Gamma = 0$. *Then, the price of resources in equilibrium is*

$$p(N) = \begin{cases} K^{-1}(N) & \text{if } N < K(R_A) \\ R_A & \text{if } K(R_A) < N \leq \frac{1}{1-\lambda} K(R_A) \\ K^{-1}(N(1-\lambda)) & \text{if } \frac{1}{1-\lambda} K(R_A) < N < \frac{1}{1-\lambda} K(b/\omega - R_B) \\ b/\omega - R_B & \text{if } \frac{1}{1-\lambda} K(b/\omega - R_B) \leq N, \end{cases} \tag{13}$$

and all firms adopt strong governance. Moreover:

(*i*) *If* $N \leq K(R_A)$ *then the loyal manager chooses project A and the disloyal manager chooses project B. The shareholder fires the manager if the status quo changes and* $s = B$.

(*ii*) *If* $K(R_A) < N \leq \frac{1}{1-\lambda} K(R_A)$ *then the loyal manager chooses project A with probability* $\eta \in (0,1)$ *and the status quo with probability* $1-\eta$, *and the disloyal manager chooses project B. Parameter* η *satisfies* $(\lambda\eta + 1 - \lambda) N = K(R_A)$. *The shareholder fires the manager if the status quo changes and* $s = B$. *If in addition* $\eta < \frac{1-\tau}{\tau}$, *then shareholder fires the manager also when the status quo changes and* $s = A$.

(*iii*) *If* $\frac{1}{1-\lambda} K(R_A) < N \leq \frac{1}{1-\lambda} K(b/\omega - R_B)$ *then the loyal manager keeps the status quo and the disloyal manager chooses project B. Shareholder fires the manager if and only if the status quo changes.*

(*iv*) *If* $\frac{1}{1-\lambda} K(b/\omega - R_B) < N$ *then then the loyal manager keeps the status quo and the disloyal manager chooses project B with probability* $\varphi \in (0,1)$ *and the status quo with probability* $1-\varphi$, *such that* $\varphi = \frac{1}{1-\lambda} \frac{K(b/\omega - R_B)}{N}$. *Shareholder fires the manager if and only if the status quo changes.*

Proof. The behavior of managers and the level of the price of resources are determined as in the Lemma 5 where n is replaced by N everywhere. For brevity we omit these arguments. Next, we characterize the decision of shareholders to fire the managers. Recall the shareholder fires the manager if and only if he believes that he is loyal with probability strictly smaller than λ. In part (i), unless the manager changes the status quo and a signal $s = A$ is obtained, the shareholder must infer that the manager is likely to be disloyal. Therefore, the shareholder fires the manager. In parts (iii-iv), a change to the status quo is an indication that the manager is

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disloyal regardless of the realization of signal s. Consider part (ii). The probability that the manager is loyal conditional on signal $s = A$ is $\frac{\lambda\eta\tau}{(1-\lambda)(1-\tau)+\lambda\eta\tau}$ and conditional on signal $s = B$ is $\frac{\lambda\eta(1-\tau)}{(1-\lambda)\tau+\lambda\eta(1-\tau)}$. Notice that $\frac{\lambda\eta\tau}{(1-\lambda)(1-\tau)+\lambda\eta\tau} < \lambda \Leftrightarrow \eta < \frac{1-\tau}{\tau}$ and $\frac{\lambda\eta(1-\tau)}{(1-\lambda)\tau+\lambda\eta(1-\tau)} < \lambda \Leftrightarrow \eta < \frac{\tau}{1-\tau}$. Noting that $\tau > 0.5$ completes the proof. ■

B.2 Section 4.2: Shareholder Competence

Proposition 5 *Suppose $\tau = 1$ and $\Gamma > b - \omega R_B - \omega R_A$. In equilibrium, all firms choose strong governance, but managers are never fired on the equilibrium path. The manager in each firm and irrespective of his loyalty, chooses project A with probability $\min\{1, \frac{K(R_A)}{N}\}$ and the status quo otherwise. The price of resources is $p^* = \min\{K^{-1}(N), R_A\}$. The expected shareholder value of a firm with strong governance is*

$$(1-\omega)\left(v + \min\{1, K(R_A)/N\}\left(R_A - p^*\right)\right) + \lambda\Lambda,$$

and the expected shareholder value of a firm with weak governance (off-equilibrium) is

$$(1-\omega)\left(v - p^* + \lambda R_A - (1-\lambda)R_B\right) + \lambda\Lambda.$$

Proof. Since the shareholder's competence has no direct effect on firms with weak governance, their behavior is characterized by Lemma 1. Consider firms with strong governance.

1. Suppose in equilibrium the price of resources is $p < R_A$. We argue that the manager chooses project A irrespective of his loyalty. To see why, suppose on the contrary the loyal manager chooses $\hat{x} \neq A$ in equilibrium. Since $p < R_A$, the loyal manager will not have a strict benefit from deviating to project A only if two conditions are met: (i) the loyal manager is not fired by choosing the equilibrium play $\hat{x}$, and (ii) he will be fired by choosing project A. Consider the following cases:

(a) If $x = A$ is off-equilibrium (recall $\tau = 1$ implies the shareholder observes the choice $x \in \{0, A, B\}$) then the beliefs that lead the shareholder to fire the manager upon $x = A$ violate the Grossman and Perry (1986) criterion. Indeed, $p < R_A$ and $\Gamma > b - \omega R_B - \omega R_A$ imply that both the loyal and disloyal manager will benefit from deviating to project A, knowing that the shareholder will not fire them upon such deviation. Since such deviation does not reveal information about the loyalty of the manager, the shareholder will have no incentives to fire him upon such deviation. Therefore, a contradiction.[37]

[37] Notice that this argument does not hold when $\tau < 1$. In this case, if the shareholder believes that both types choose project A, the disloyal manager is better off choosing project B instead, knowing that the shareholder

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(*b*) If $x = A$ is on the equilibrium path, then it must also be chosen by the disloyal manager (or otherwise, the shareholder does not fire the manager upon $x = A$, as assumed). However, notice that if the disloyal manager is fired by the shareholder when choosing project A, then $b/\omega > R_B + R_A$ implies that the disloyal manager has a strictly profitable deviation to project B, even if he expects to be fired upon doing so. Therefore, a contradiction.

We conclude that the loyal manager chooses project A with probability one in equilibrium. If so, it must be that the shareholder does not fire the manager upon observing $x = A$, even if the disloyal manager also chooses project A (since the replacement does not have a higher probability of being loyal). Moreover, if the disloyal manager chooses $x \neq A$, then he must be fired by the shareholder upon doing so. The assumptions $p < R_A$ and $\Gamma > b - \omega R_B - \omega R_A$ therefore guarantee that the disloyal manager has strict incentives to choose project A as well. We conclude that if $p < R_A$ then managers in firms with strong governance choose project A irrespective of their loyalty. Moreover, the shareholder does not fire the manager on the equilibrium path.

2. Suppose in equilibrium the price of resources is $p > R_A$. We argue that the manager chooses the status quo irrespective of his loyalty. To see why, suppose on the contrary the loyal manager chooses $\hat{x} \neq 0$ in equilibrium. Since $p > R_A$, the loyal manager will not have a strict benefit from deviating to the status quo only if two conditions are met: (i) the loyal manager is not fired by choosing the equilibrium play $\hat{x}$, and (ii) he will be fired by choosing the status quo. Consider the following cases:

(*a*) If $x = 0$ is off-equilibrium then the beliefs that lead the shareholder to fire the manager upon $x = 0$ violate the Grossman and Perry (1986) criterion. Indeed, $p > R_A$ implies that the loyal manager will benefit from deviating to $x = 0$, knowing that the shareholder will not fire them upon such deviation. Since the shareholder will not fire the manager upon a deviation to $x = 0$ even if he expects both types to choose $x = 0$, we get a violation of the Grossman and Perry (1986) criterion, and therefore, a contradiction.

(*b*) If $x = 0$ is on the equilibrium path, then it must also be chosen by the disloyal manager (or otherwise, the shareholder does not fire the manager upon $x = 0$, as assumed). However, notice that if the disloyal manager is fired by the shareholder when choosing the status quo, then $b/\omega > R_B + R_A$ and the revealed preferences of the loyal manager imply that the disloyal manager has a strictly profitable deviation to the equilibrium choice of the loyal manager. Therefore, a contradiction.

will interpret $s = B$ as an error and will not fire him. However, with $\tau = 1$, the shareholder will not ascribe $s = B$ to an error, and will fire the manager in this case.

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We conclude that the loyal manager chooses the status quo with probability one in equilibrium. If so, it must be that the shareholder does not fire the manager upon observing $x = 0$, even if the disloyal manager also chooses $x = 0$. Moreover, if the disloyal manager chooses $x \neq 0$, then he must be fired by the shareholder upon doing so. The assumption $\Gamma > b - \omega R_B - \omega R_A$ and the revealed preferences of the loyal manager guarantee that the disloyal manager has strict incentives to choose $x = 0$ as well. We conclude that if $p > R_A$ then managers in firms with strong governance choose the status quo irrespective of their loyalty. Moreover, the shareholder does not fire the manager on the equilibrium path.

3. Suppose in equilibrium the price of resources is $p = R_A$. In this case, project A and the status quo are identical from the perspective of the loyal and disloyal manager. Therefore, by applying the same arguments as in parts (1-2) above, any mixed strategy where both types choose project A with probability σ and the status quo otherwise, can be supported as an equilibrium. For the same reasons as in parts (1-2) above, other strategies will not be an equilibrium.

According to parts (1-3) above, the expected shareholder value in firms with strong governance is $v + \max\{0, R_A - p\}$ and in firms with weak governance $v + \lambda \max\{0, R_A - p\} - (1 - \lambda)(R_B + p)$. Therefore, irrespective of the price of resources, shareholders are strictly better off choosing firms with strong governance. It remains to characterize the price of resources that clears the market. If $N \leq K(R_A)$ then note that even if all firms demand a change to the status quo the price will be weakly smaller than R_A. Therefore, in equilibrium, the market clearing price must also be smaller than R_A. This implies that the equilibrium play is as described by part (1) above, which implies that all firms invest in project A. Therefore, the equilibrium price of resources is $p^* = K^{-1}(N) \leq R_A$. Suppose $N > K(R_A)$. If on the contrary the equilibrium price is strictly larger than R_A, then according to part (2) above, no firm changes the status quo, which implies that the equilibrium price is $K^{-1}(0) = 0 < R_A$, a contradiction. If instead the equilibrium price is strictly smaller than R_A, then according to part (1) above, all firms change the status quo, which implies that the equilibrium price is $K^{-1}(N) > R_A$, a contradiction. Therefore, if an equilibrium exists, the price must be R_A. If the equilibrium price is R_A, it can clear the market only if the number of firms which demand a change to the status quo is $K(R_A)$. Based on part (3) above, the manager chooses project A with probability σ and the status quo otherwise. Therefore, the mixing probability σ is set such that $\sigma N = K(R_A)$, as required. ■

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B.3 Section 4.3: Heterogeneous Firms

In this Appendix we derive the equilibrium of the model when firms differ with respect to the added value of their manager. We show that in this case the governance structure is relevant. Denote by

$$m_i \equiv \lambda_i R_{A,i} - (1-\lambda_i) R_{B,i} \tag{14}$$

the added value of the manager of the firm i upon a change to the status quo. Suppose $\{m_i\}$ are independently drawn from a continuous distribution G. Recall Assumption (2) implies $K^{-1}(0) < \lambda R_A - (1-\lambda) R_B < K^{-1}(N)$, we therefore generalize it by assuming $G(K^{-1}(0)) < 1$ and $0 < G(K^{-1}(N))$. That is, the interval $[K^{-1}(0), K^{-1}(N)]$ is in the support of G. For simplicity, we assume that the replacement manager of firm i is loyal with probability λ_i, which means that shareholders cannot benefit from firing the manager at the outset. The following result holds.

Proposition 6 *A generically unique equilibrium exists.*[38] *In equilibrium, the price of resources is the unique solution of*

$$(1 - G(p^*)) N = K(p^*). \tag{15}$$

All firms with $m_i > p^*$ adopt weak governance, and all firms with $m_i < p^*$ adopt strong governance. Moreover:

(*i*) *In firms with weak governance ($c_i^* = M$), the loyal manager chooses project A and the disloyal manager chooses project B. The expected shareholder value is $(1-\omega)(v + m_i - p^*) + \lambda\Lambda$.*

(*ii*) *In firms with strong governance ($c_i^* = SH$), the actions of managers and shareholders is characterized by Lemma 2. The expected shareholder value is $(1-\omega) v + \lambda\Lambda$.*

Proof. First note that Lemmas 1 and 2 still hold in a setup with firm heterogeneity, since these lemmas condition on the governance structure and the price of resources, and the arguments therein do not depend directly characteristics of other firms.

We argue that price of resources in equilibrium is the unique solution of

$$(1 - G(p^*)) N = K(p^*). \tag{16}$$

Since $G(K^{-1}(0)) < 1$, $0 < G(K^{-1}(N))$, and $K' > 0$, it is straight forward to see that the above equation has a unique solution in $(K^{-1}(0), K^{-1}(N))$. Notice that given price p^*, the

[38] The equilibrium is generically unique in the sense that it does not pin down the identity of the firms that choose $c_i^* = M$, only their total mass. In addition, other off-equilibrium beliefs can support this equilibrium.

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supply is $K(p^*)$. We argue the demand is $(1-G(p^*))N$. If true, then the market clears only if the demand equals supply. To see why the demand is $(1-G(p^*))N$, we argue that if $m_i < p^*$ then firm i adopt strong governance, and if $m_i > p^*$ then firm i adopt weak governance and the manager changes the status quo regardless of his loyalty. Notice that if firm i adopts weak governance, then based on Lemma 1 the expected shareholder value is

$$\begin{cases} (1-\omega)(v+m_i-p^*)+\lambda\Lambda & \text{if } m_i < p^* < R_{A,i} \\ (1-\omega)(v-(1-\lambda)(R_{B,i}+p^*))+\lambda\Lambda & \text{if } R_{A,i} < p^* < b/\omega - R_{B,i} \\ (1-\omega)v+\lambda\Lambda & \text{if } b/\omega - R_{B,i} < p^*. \end{cases} \tag{17}$$

If firm i adopts strong governance, then based on Lemma 2 the expected shareholder value is $(1-\omega)v+\lambda\Lambda$. If $p^* < m_i$ then shareholder of firm i strictly prefers weak governance (notice $m_i < R_{A,i}$ implies $p^* < R_{A,i}$), and in this case, the manager changes the status quo regardless of his loyalty. The expected shareholder value is $(1-\omega)(v+m_i-p^*)+\lambda\Lambda$. If $p^* > m_i$ then the shareholder strictly prefers strong governance if in addition $p^* < b/\omega - R_{B,i}$, and otherwise, the shareholder is indifferent. The expected shareholder value is $(1-\omega)v+\lambda\Lambda$. Either way, the demand for resources stems from all the firms with $p^* < m_i$, of which there are $(1-G(p^*))N$.[39]

■

B.4 Section 5.6: Rich Governance Structure and Investment Technology

In this Appendix we consider the following variant of the baseline model. First, we let the governance structure of firm i be $c_i > 0$, which is the cost the shareholder of firm i must incur in order to fire the manager. Second, we assume that each manager chooses the scale of investment in projects A and B, which we denote by $\delta_i \in [0,1]$. As in the baseline model, projects A and B are mutually exclusive. The shareholder observes δ_i, but not the type of project (i.e., A or B). The scale of investment has two effects. First, larger investment activity (i.e., a larger δ_i) generates more precise information about the type of the project. Formally, the precision of the shareholder's signal, which we denote by $\tau(\delta)$, is an increasing and continuous function of δ, with $\tau(0) = 0.5$ and $\tau(1) < 1$. The signal structure is given by (3), with the exception that τ is replaced by $\tau(\delta_i)$. Second, larger investment activity is weakly less profitable. Formally, the expected return from investment in project A and B is $v+\pi(\delta, p, R_A)$

[39] Implicitly, we assume that if $p^* > b/\omega - R_{B,i}$ then the shareholder of firm i chooses strong governance even though he is indifferent. This assumption does not change the result about the market clearing price in equilibrium, but it eases the exposition.

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and $v + \pi(\delta, p, -R_B)$, respectively, where

$$\pi(\delta, p, R) \equiv \delta(R - 0.5\delta r - p) - \mathbf{1}_{\delta>0} \cdot F, \tag{18}$$

$r \geq 0$, and $F > 0$. If $r = 0$ ($r > 0$) investment exhibits a constant (decreasing) return to scale. The private benefits of a disloyal manager are also proportional to the investment scale δ. Parameter $F > 0$ is the fixed cost from investment. The baseline model is a special case where $r = F = 0$ and $\delta \in \{0, 1\}$. We maintain the assumption $\Gamma > \Gamma^*$, with the exception that τ in (4) is replaced by $\tau(1)$.

The next result characterizes the equilibrium under different assumptions about the governance structure and investment technology.

Proposition 7 *In equilibrium the following holds:*

1. *If the price of resources is p and the governance structure is $c_i \geq \lambda\Lambda$ then the loyal manager chooses*

$$\delta^*_{loyal,weak}(p) = \begin{cases} \min\{1, \frac{\max\{0, R_A - p\}}{r}\} & \text{if } \pi(\min\{1, \frac{\max\{0, R_A - p\}}{r}\}, p, R_A) \geq 0 \\ 0 & \text{else,} \end{cases} \tag{19}$$

and the disloyal manager chooses

$$\delta^*_{disloyal,weak}(p) = \begin{cases} \min\{1, \frac{\max\{0, b/\omega - R_B - p\}}{r}\} & \text{if } \pi(\min\{1, \frac{\max\{0, b/\omega - R_B - p\}}{r}\}, p, R_A) \geq 0 \\ 0 & \text{else.} \end{cases} \tag{20}$$

2. *If the price of resources is p and the governance structure is $c_i < \lambda\Lambda$ then the loyal and disloyal manager choose the same level of investment given by*

$$\delta_{pool}(c, p) = \begin{cases} \delta^*_{loyal,weak}(p) & \text{if } c \geq (\lambda - \mu(\delta^*_{loyal,weak}(p)))\Lambda \\ \text{unique solution of } (\lambda - \mu(\delta))\Lambda = c & \text{if } c < (\lambda - \mu(\delta^*_{loyal,weak}(p)))\Lambda. \end{cases} \tag{21}$$

where

$$\mu(\delta) = \frac{\lambda(1 - \tau(\delta))}{\lambda(1 - \tau(\delta)) + (1 - \lambda)\tau(\delta)}. \tag{22}$$

3. *The manager is not fired on the equilibrium path.*

4. *If shareholders are restricted to choose between two governance structures, $c \in \{0, \infty\}$, then the equilibrium is characterized as in Proposition 1, with the following exceptions:*

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(i) the price of resources is $p^* < \lambda R_A - (1-\lambda) R_B - F$ *and (ii) if* $c = \infty$ *then the loyal manager chooses* $\delta^*_{loyal,weak}(p^*)$ *and the disloyal manager chooses* $\delta^*_{disloyal,weak}(p^*)$.

5. *If shareholders can choose from the entire spectrum of governance structures* ($c \geq 0$) *and the investment technology exhibits a constant return to scale* ($r = 0$)*, then the equilibrium has the following properties: (i) the price of resources is* $p^* = \lambda R_A - (1-\lambda) R_B - F$*, (ii) shareholders are indifferent between any governance structure, and (iii) the governance structures in equilibrium are decided such that the aggregate level of investment is equal to* $K(\lambda R_A - (1-\lambda) R_B - F)$.

6. *Suppose shareholders can choose from the entire spectrum of governance structures* ($c \geq 0$) *and the investment technology exhibits a decreasing return to scale* ($r > 0$)*. Let*

$$\delta^*_{SH}(p) = \begin{cases} \min\{1, \frac{\max\{0, \lambda R_A - (1-\lambda) R_B - p\}}{r}\} & \text{if } \pi(\frac{\max\{0, \lambda R_A - (1-\lambda) R_B - p\}}{r}, p, \lambda R_A - (1-\lambda) R_B) \geq 0 \\ 0 & \text{else,} \end{cases} \tag{23}$$

and suppose:

   (a) $\delta^*_{SH}(0) > 0$,

   (b) $\pi(\frac{\max\{0, \lambda R_A - (1-\lambda) R_B\}}{r}, 0, \lambda R_A - (1-\lambda) R_B) > 0$,

   (c) $K(p_{\min}) < N \delta^*_{SH}(p_{\min})$ *where* $p_{\min} \in (0, \lambda R_A - (1-\lambda) R_B)$ *be the unique price that satisfies*

$$\pi(\delta^*_{SH}(p_{\min}), p_{\min}, \lambda R_A - (1-\lambda) R_B) = 0.$$

Then, in equilibrium, the price of resources is $p_{\min}$*,* $n^* = \frac{K(p_{\min})}{\delta^*_{SH}(p_{\min})}$ *firms choose governance structure* $c^* > 0$ *such that both the loyal and disloyal manager choose investment level* $\delta^*_{SH}(p_{\min})$*, and* $N - n^*$ *firms choose governance structure* $c = 0$ *and their manager chooses investment level* $\delta = 0$*. In this equilibrium, the shareholders are indifferent between* $c = c^*$ *and* $c = 0$*, and strictly prefer these two choices over any other governance structure.*

Proof. Similar to Auxiliary Lemma 4 in the Appendix, the loyal manager never chooses project B and the disloyal manager never chooses project A in equilibrium (for brevity, the proof adjusted to this setup is omitted). Therefore, if $\delta > 0$ then the loyal manager chooses project A and disloyal manager chooses project B.

Next, we let the c_i be the cost of firing the manager. In the baseline model, with only two governance structures, $c_i \in \{0, \infty\}$, and in Section 5.6, $c_i \geq 0$.

Suppose $c_i \geq \lambda \Lambda$, that is, the governance structure is such that the shareholder does not fire the manager even if he learns the manager is disloyal for sure. The loyal manager solves

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$\max_{\delta\in[0,1]} \pi(\delta, p, R_A)$ and chooses $\delta^*_{loyal,weak}(p)$ as in the statement of the proposition. The disloyal manager solves $\max_{\delta\in[0,1]} \pi(\delta, p, b/\omega - R_B)$ and chooses $\delta^*_{disloyal,weak}(p)$.

Suppose $c_i < \lambda\Lambda$. We argue that, in equilibrium, both the disloyal and the loyal manager choose the same $\delta^* \in [0,1]$. Suppose to the contrary they choose different amounts in equilibrium, denoted by $\delta_{loyal} \neq \delta_{disloyal}$. Since the choice of δ is fully reveling of the manager's loyalty, the shareholder ignores the realization of signal s in his decision to fire the manager. Specifically, the shareholder never fires the manager upon observing δ_{loyal}. Upon observing $\delta_{disloyal}$, the shareholder infers the manager is disloyal, and since $c_i < \lambda\Lambda$, the shareholder has strict incentives to fire the manager in those cases. There are two cases to consider:

1. First, suppose $\delta_{disloyal} > \delta_{loyal}$. The disloyal manager's payoff from choosing $\delta_{disloyal}$ and project B is $\omega(v + \pi(\delta_{disloyal}, p, b/\omega - R_B))$ and his payoff from choosing δ_{loyal} and project B is $\omega(v + \pi(\delta_{loyal}, p, b/\omega - R_B)) + \Gamma$. The former is smaller than the latter if and only if

$$\Gamma/\omega > (\delta_{disloyal} - \delta_{loyal})\left[b/\omega - R_B - p - 0.5r(\delta_{disloyal} + \delta_{loyal})\right] - (\mathbf{1}_{\delta_{disloyal}>0} - \mathbf{1}_{\delta_{loyal}>0}) \cdot F. \tag{24}$$

   The inequality above follows from the fact that $1 \geq \delta_{disloyal} > \delta_{loyal} \geq 0$, $p > 0$, $r \geq 0$, and $\Gamma > \Gamma^*$ as defined in (24). Therefore, the disloyal manager has a strictly profitable deviation to δ_{loyal}, a contradiction.

2. Second, suppose $\delta_{disloyal} < \delta_{loyal}$. If Condition (24) holds then the disloyal manager has a strictly profitable deviation to δ_{loyal} and project A, a contradiction. Suppose Condition (24) does not hold, that is,

$$\Gamma/\omega < (\delta_{disloyal} - \delta_{loyal})\left[b/\omega - R_B - p - 0.5r(\delta_{disloyal} + \delta_{loyal})\right] - (\mathbf{1}_{\delta_{disloyal}>0} - \mathbf{1}_{\delta_{loyal}>0}) \cdot F$$

   Suppose on the contrary the loyal manager does not have incentives to deviate to $\delta_{disloyal}$ and project A, then it must be

$$\Gamma/\omega > (\delta_{disloyal} - \delta_{loyal})\left[R_A - p - 0.5r(\delta_{disloyal} + \delta_{loyal})\right] - (\mathbf{1}_{\delta_{disloyal}>0} - \mathbf{1}_{\delta_{loyal}>0}) \cdot F.$$

   Combined, these conditions imply

$$\begin{aligned} & \omega(\delta_{disloyal} - \delta_{loyal})\left[R_A - p - 0.5r(\delta_{disloyal} + \delta_{loyal})\right] \\ < \; & \omega(\delta_{disloyal} - \delta_{loyal})\left[b/\omega - R_B - p - 0.5r(\delta_{disloyal} + \delta_{loyal})\right]. \end{aligned}$$

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Since $\delta_{disloyal} - \delta_{loyal} < 0$, they imply

$$\begin{aligned} R_A - p - 0.5r\left(\delta_{disloyal} + \delta_{loyal}\right) &> b/\omega - R_B - p - 0.5r\left(\delta_{disloyal} + \delta_{loyal}\right) \Leftrightarrow \\ R_A &> b/\omega - R_B, \end{aligned}$$

a contradiction. Thus, it means that the loyal manager has a profitable deviation to $\delta_{disloyal}$, again, we get a contradiction.

Overall, if $c_i < \lambda\Lambda$ then in equilibrium the disloyal and the loyal manager choose the same $\delta^* \in [0,1]$. Define

$$\mu\left(\delta\right) = \frac{\lambda\left(1-\tau\left(\delta\right)\right)}{\lambda\left(1-\tau\left(\delta\right)\right) + \left(1-\lambda\right)\tau\left(\delta\right)}, \tag{25}$$

which is the posterior belief of the shareholder the manager is disloyal upon observing signal $s = B$, if the loyal manager is expected to choose δ and project A, and the disloyal manager is expected to choose δ and project B. Notice that $\mu\left(0\right) = \lambda$, and $\tau'\left(\delta\right) > 0$ implies $\mu'\left(\delta\right) < 0$. Define $\delta_{pool}\left(c,p\right)$ as in the statement of the proposition, and notice that $\delta_{pool}\left(c\right)$ is a well-defined increasing and continuous function of c, where $\delta_{pool}\left(0\right) = 0$ and $\lim_{c\to\lambda\Lambda}\delta_{pool}\left(c,p\right) = \delta^*_{loyal,weak}\left(p\right)$.

We argue that $\delta^* = \delta_{pool}\left(c,p\right)$. Notice that by definition $c \geq (\lambda - \mu(\delta_{pool}\left(c,p\right)))\Lambda$, and therefore, upon choosing $\delta^* = \delta_{pool}\left(c,p\right)$ the manager is not fired. To ease the exposition, we omit the argument p from $\delta_{pool}\left(c,p\right)$ and $\delta^*_{loyal,weak}\left(p\right)$.

1. Suppose to the contrary that in equilibrium $c < (\lambda - \mu(\delta^*))\Lambda$. That is, the shareholder fires the manager upon observing signal $s = B$. Similar to the proof of Lemma 2, Assumption (4) guarantees that both the loyal and the disloyal manager are better off deviating to $\delta = 0$ if they believe that upon such deviation the shareholders will not fire them. Since upon such deviation the shareholder has no information about their loyalty, indeed, he has no incentives to fire them. Therefore, the equilibrium cannot survive the Grossman and Perry (1986) criterion, a contradiction.

2. Suppose to the contrary that in equilibrium $\delta^*_{loyal,weak} \geq \delta^* > \delta_{pool}\left(c\right)$ and $c \geq (\lambda - \mu(\delta^*))\Lambda$. Then, $\delta^*_{loyal,weak} > \delta_{pool}\left(c\right)$ implies $c = (\lambda - \mu(\delta_{pool}\left(c\right)))\Lambda$ and $\delta^* > \delta_{pool}\left(c\right)$ implies $(\lambda - \mu(\delta_{pool}\left(c\right)))\Lambda < (\lambda - \mu(\delta^*))\Lambda$, contradicting $c \geq (\lambda - \mu(\delta^*))\Lambda$.

3. Suppose to the contrary that in equilibrium $\delta^* > \delta^*_{loyal,weak}$ and $c \geq (\lambda - \mu(\delta^*))\Lambda$. Since $c \geq (\lambda - \mu(\delta^*))\Lambda$, $\delta^* > \delta^*_{loyal,weak} \geq \delta_{pool}\left(c\right)$, it must be $c > (\lambda - \mu(\delta^*_{loyal,weak}))\Lambda$. Consider a deviation of the loyal manager from δ^* to $\delta^*_{loyal,weak}$. If the loyal manager does not expect to be fired upon such deviation, then by definition of $\delta^*_{loyal,weak}$, which is a global maximizer,

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it has strict incentives to deviate to $\delta^*_{loyal,weak}$. However, since $c > (\lambda - \mu(\delta^*_{loyal,weak}))\Lambda$, whether or not the disloyal manager also benefits from a deviation to $\delta^*_{loyal,weak}$, upon observing $\delta^*_{loyal,weak}$ and signal $s = B$ the shareholder's beliefs that the manager is disloyal are smaller than $\mu(\delta^*_{loyal,weak})$, and hence, he will not fire the manager. Therefore, the loyal manager has a strictly profitable deviation to $\delta^*_{loyal,weak}$, and the equilibrium cannot survive the Grossman and Perry (1986) criterion, a contradiction.

4. Suppose to the contrary that in equilibrium $\delta^* < \delta_{pool}(c)$ and $c \geq (\lambda - \mu(\delta^*))\Lambda$. Since $\delta_{pool}(c) \leq \delta^*_{loyal,weak}$, it follows that $\delta^* < \delta^*_{loyal,weak}$. We argue that both types have a strictly profitable deviation to $\delta_{pool}(c)$. Notice that by definition of $\delta_{pool}(c)$, $c \geq (\lambda - \mu(\delta_{pool}(c)))\Lambda$. Thus, if both types deviate to $\delta_{pool}(c)$, the shareholders will not fire them. Recall $R_A < b/\omega - R_B$, it follows that $\delta^*_{loyal,weak} < \delta^*_{disloyal,weak}$, and hence, $\delta^* < \delta^*_{disloyal,weak}$. Since $\delta^*_{loyal,weak}$ and $\delta^*_{disloyal,weak}$ are the global maximizers of the loyal and disloyal managers, respectively, they will profit from such deviation, if they don't expect to be fired upon doing so. Therefore, the equilibrium does not survive the Grossman and Perry (1986) criterion, a contradiction.

Next, we prove that if $c < \lambda\Lambda$ then the equilibrium with $\delta^* = \delta_{pool}(c)$ survives the Grossman and Perry (1986) criterion. Suppose that off the equilibrium path, when $\delta_i \neq \delta_{pool}(c)$, the shareholder fires the manager regardless of the realization of signal s. Note that under the equilibrium play, the manager is not fired. The loyal manager obtains a payoff of $\omega(v + \pi(\delta^*, p, R_A)) + \Gamma$, and the disloyal manager obtains a payoff of $\omega(v + \pi(\delta^*, p, b/\omega - R_B)) + \Gamma$. Similar to the arguments in the proof of Lemma 2, the assumption $\Gamma > \Gamma^*$ guarantees that for any admissible price p, a deviation of either type to $\delta_i > \delta^*$ is not profitable if they are expected to be fired. For brevity, the arguments are omitted. In addition, a deviation of either type to $\delta_i < \delta^*$ is not profitable even if they are not expected to be fired. Indeed, $\delta^* \leq \delta^*_{loyal,weak} < \delta^*_{disloyal,weak}$ implies that a deviation to $\delta_i < \delta^*$ increases the distance of both managers from their global maximizers, and hence, suboptimal.

We now consider three cases:

1. Suppose shareholders have only two choices, $c \in \{0, \infty\}$. Since $\delta_{pool}(0) = 0$, if $c = 0$ then the expected shareholder value is $(1 - \omega)v + \lambda\Lambda$ and if $c = \infty$ then it is $(1 - \omega)(v + \Pi_\infty(p)) + \lambda\Lambda$ where

$$\Pi_\infty(p) \equiv \lambda\pi(\delta^*_{loyal,weak}(p), p, R_A) + (1 - \lambda)\pi(\delta^*_{disloyal,weak}(p), p, -R_B).$$

Notice that $\delta^*_{loyal,weak}$ and $\delta^*_{disloyal,weak}$ are themselves functions of p. We assume r and F are small enough such that $\Pi_\infty(0) > 0$. Also, since $\delta^*_{disloyal,weak} \geq \delta^*_{loyal,weak}$ notice

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that $\Pi_\infty(\lambda R_A - (1-\lambda) R_B - F) \leq 0$. Again, we assume r and F small enough such that $\Pi_\infty(\lambda R_A - (1-\lambda) R_B - F) < 0$ (that is, $\delta^*_{loyal,weak}(p) > 0$). Thus, as in the baseline model, the market clears when the shareholders are be indifferent between the two choices in equilibrium, that is, the price of resources must satisfy $\Pi_\infty(p^*) = 0$. Thus, the irrelevance of governance structure holds in this setup as well.

2. Suppose shareholders can choose any $c \geq 0$ but $r = 0$. Then,

$$\delta^*_{loyal,weak} = \mathbf{1}_{R_A - p \geq F} \text{ and } \delta^*_{disloyal,weak} = \mathbf{1}_{b/\omega - R_B - p \geq F},$$

and we argue that the price of resources in equilibrium must be $\lambda R_A - (1-\lambda) R_B - F$. Indeed, suppose on the contrary that $p > \lambda R_A - (1-\lambda) R_B - F$. Recall that in equilibrium, for any c the disloyal manager chooses weakly larger investment than the loyal manager. Therefore, if the manager chooses $\delta > 0$ with a positive probability then the shareholder loses from investment and he strictly prefers choosing $c = 0$, thereby guaranteeing $\delta^* = 0$. Either way, no investment is taken in. Therefore and the market cannot clear, a contradiction. Suppose instead that in equilibrium $p < \lambda R_A - (1-\lambda) R_B - F$. In this case, $\delta^*_{loyal,weak} = \delta^*_{disloyal,weak} = 1$. Then, each shareholder is strictly better-off by increasing investment as much as possible, which is achieved by choosing $c_i > \lambda\Lambda$. In this case, $\delta_i = 1$ for all i, and the demand for resources is N. The market clearing condition requires $K(p^*) = N$, which implies $N < K(\lambda R_A - (1-\lambda) R_B - F)$. This condition, however, contradicts the assumption $K(\lambda R_A - (1-\lambda) R_B - F) < N$. Therefore, we get a contradiction.

We conclude that the price of resources in equilibrium must be $p^* = \lambda R_A - (1-\lambda) R_B - F$. Under this condition, the expected shareholder payoff is $(1-\omega) v + \lambda\Lambda$, which is invariant to c_i. Since shareholders are indifferent, they can choose any level of governance. However, the market can clear as long as

$$\int_0^N \delta_i di = K(\lambda R_A - (1-\lambda) R_B - F), \tag{26}$$

as required.

3. Suppose shareholders can choose any $c \geq 0$ and $r > 0$. The expected shareholder value in equilibrium as a function of c and p is

$$\Pi(c,p) = \lambda\Lambda + (1-\omega) \times \begin{cases} v + \Pi_\infty(p) & \text{if } c \geq \lambda\Lambda \\ v + \pi(\delta_{pool}(c,p), p, \lambda R_A - (1-\lambda) R_B) & \text{if } c < \lambda\Lambda. \end{cases}$$

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Assuming the loyal and the disloyal manager choose the same investment policy, the shareholder prefers c such that the investment policy implemented by both managers is:

$$\delta_{SH}^{*}(p)=\begin{cases}\min\{1,\frac{\max\{0,\lambda R_A-(1-\lambda)R_B-p\}}{r}\} & \textit{if } \pi(\frac{\max\{0,\lambda R_A-(1-\lambda)R_B-p\}}{r},p,\lambda R_A-(1-\lambda)R_B)\geq 0\\ 0 & \textit{else.}\end{cases}$$

Notice that $\delta_{SH}^{*}(p)$ is decreasing in p. We assume $\delta_{SH}^{*}(0)>0$. That is, if the price is the lowest possible, the shareholders prefers some positive investment (which requires r and F to be sufficiently small): $\pi(\frac{\max\{0,\lambda R_A-(1-\lambda)R_B\}}{r},0,\lambda R_A-(1-\lambda)R_B)>0$. Moreover, since $\delta_{SH}^{*}(p)<\delta_{loyal,weak}^{*}(p)<\delta_{disloyal,weak}^{*}(p)$, there exists a unique $c\in[0,\lambda\Lambda)$, denoted by $c^{*}(p)$, such that $\delta_{SH}^{*}(p)=\delta_{pool}(c^{*}(p),p)$. Moreover, it is never in the best interest of the shareholder to choose $c\geq\lambda\Lambda$. Next, if $\pi(\delta_{SH}^{*}(p),p,\lambda R_A-(1-\lambda)R_B)>0$ then it must be $\delta_{SH}^{*}(p)>0$ and all shareholders choose $c^{*}(p)$. The total demand will be $N\delta_{SH}^{*}(p)$, and recall that $\delta_{SH}^{*}(p)$ decreases in p where $\delta_{SH}^{*}(0)>0$ and $\pi(\delta_{SH}^{*}(0),0,\lambda R_A-(1-\lambda)R_B)>0$. Since $\pi(\delta_{SH}^{*}(p),p,\lambda R_A-(1-\lambda)R_B)$ is a decreasing function of p, there is $p_{\min}>0$ such that $\delta_{SH}^{*}(p_{\min})>0$ and $\pi(\delta_{SH}^{*}(p_{\min}),p_{\min},\lambda R_A-(1-\lambda)R_B)=0$. We assume $K(p_{\min})<N\delta_{SH}^{*}(p_{\min})$, which means that if all firms choose the same policy $\delta_{SH}^{*}(p)$, then the market clearing price must be strictly greater than $p_{\min}$, which will result with a negative profit. Under this condition, the market can equilibrate only if $n^{*}=\frac{K(p_{\min})}{\delta_{SH}^{*}(p_{\min})}$ firms choose $c>0$ such that their investment policy is $\delta_{SH}^{*}(p_{\min})$, and $N-n^{*}$ firms choose $c=0$ and the investment policy of their firms is $\delta=0$. The price of resources is $p_{\min}$ and the expected profit of shareholders is $(1-\omega)v+\lambda\Lambda$.

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