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Corporate Governance, Finance, and the Real Sector

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Abstract

We present a theory of the linkages between corporate governance, corporate finance, and the real sector of an economy. Using a structural model of industry equilibrium with endogenous entry, we show that poor corporate governance leads to low levels of competition, and to firms with high insider ownership and leverage. In contrast, good corporate governance promotes the adoption of more efficient technologies and development of sectors more exposed to moral hazard. We use our model to study equity market liberalization, and we show that liberalizations facilitate entry and adoption of more productive technologies, especially in countries with good corporate governance.

I. Introduction

We study a parsimonious structural model of the codetermination of industry concentration, firms' profitability, and financial structure. In our model, differences in levels of the agency costs of debt and equity across countries and industries, together with differences in production technologies, jointly determine

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the financial and industrial structure of the economy. Our model generates cross-sectional variations in several key aspects of firms' operational performance and financial structure that fit well with empirical findings presented in the literature. Furthermore, we derive equilibrium, closed-form expressions for several endogenous observable variables, such as firms' ownership concentration, leverage, and industry concentration, that are functions of underlying structural parameters and that can be used for structural estimations.

In our economy, entry by firms into an industry is endogenous. Firms (entrepreneurs) are endowed with technologies of different efficiency, with the more efficient ones requiring less capital. Entrepreneurs have limited wealth and seek financing in competitive capital markets. In the product market, there is free entry in that all entrepreneurs who obtain financing can enter. Thus, the degree of competition is endogenous, and it is determined only by the entrepreneurs' ability to finance their firms.[1]

The entrepreneurs' ability to find financing is limited by the presence of agency costs in both the debt and the equity markets. We model the agency cost of equity as in Stulz (1990), (2005), and we assume that a firm's insiders may transform some of the cash flow to equity (that is, the firm's free cash flow, net of payments to creditors) as private benefits. The private use of the firm's resources, however, is inefficient, making outside equity costly to the entrepreneur. We model the agency cost of debt as a risk-shifting problem (see Jensen and Meckling (1976)). As it is typical in the presence of moral hazard in the debt markets, firms must maintain a certain minimum level of equity to mitigate the moral hazard problem, generating debt capacity.

We show that corporate governance concerns in the equity market interact in an essential way with the moral hazard problem in the debt market, and jointly determine an economy's industrial and financial structure. When firm insiders have a greater ability to appropriate corporate resources (i.e., when the agency costs of equity are more severe), debt becomes more desirable, since it reduces the need for outside equity financing. Firms' ability to issue debt, however, is limited by debt capacity due to the moral hazard problem in the corporate debt market. Thus, the simultaneous presence of the agency costs of debt and equity determines the overall ability of firms to raise capital, and it limits entry into potentially profitable industries.

We show that economies characterized by lower-quality corporate governance and industries more affected by the agency cost of equity are characterized by greater industry concentration (in the spirit of Rajan and Zingales (2003)). Thus, contrary to the traditional wisdom, the causality between the quality of an economy's corporate governance and its degree of competition may run in the opposite direction to the one suggested in traditional theory (see, e.g., Alchian (1950), Stigler (1958)): Lower-quality corporate governance and investor protection may in fact lead to high industry concentration (and not vice versa). In turn,

[1]The fact that financing is a major barrier to entry is reflected, for example, in the Organisation for Economic Co-Operation and Development World Competitiveness Report 2006–2007, which lists availability of financing as one of the most important barriers affecting business competitiveness in several countries.

we show that greater industry concentration leads to greater industry profits, higher debt-to-equity ratios, more insider ownership, and higher returns on assets. These results are a direct consequence of endogeneity of industry concentration in our model: Low-quality corporate governance reduces firms' ability to raise capital, which limits entry, and increases both industry profits and debt capacity, leading to greater leverage and insider ownership. Thus, by endogenizing industry concentration, our model establishes a novel link between the quality of the corporate governance system, ownership structure, industry concentration, and leverage. These predictions help to explain many stylized facts that emerge from cross-countries studies such as La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1997), (1998) and Stulz (2005), among others.[2]

We argue that corporate governance also impacts several other features of the financial and industrial structure of an economy. In Section V, we argue that corporate governance quality has an effect on the structure of the financial system because it affects the incentives to develop institutions and practices that facilitate firms' capital raising process. We first focus on the banking system, and we show the presence of specialized intermediaries that at a cost can reduce the extent of the moral hazard problem increases firms' debt capacity. In this way, by using bank financing, entrepreneurs can obtain funds in cases where they otherwise would not be able to raise capital. We find that more efficient firms use direct financing, while less efficient firms borrow from banks. Our model thus shows a novel link between the quality of corporate governance and the size of the banking sector. Second, we examine firms' incentives to invest in mechanisms that improve the quality of their governance system. We find that firms in industries more exposed to moral hazard invest more to improve the quality of their corporate governance, facilitating equity financing. This generates a negative correlation between the quality of a firm's governance system and its leverage. We also find that firms' incentives to improve firm-level corporate governance are greatest for marginal entrants, that is, for entrepreneurs who need to raise capital the most.

In Section VI, we examine the impact of governance on the industrial structure of the economy. We show that corporate governance can affect firms' technology choices by penalizing "equity-intensive" technologies where risk substitution is more of a concern (such as, e.g., the finance, high-technology, and pharmaceutical industries). We also show that in countries with poor corporate governance, less efficient and more traditional technologies may "crowd out," in equilibrium, more efficient technologies that are also more exposed to moral hazard and risk shifting. This suggests that countries endowed with low-quality corporate governance systems may be "trapped" in an equilibrium in which their industries are dominated by less profitable and less efficient firms.[3] Finally, we

[2] In addition, in the Appendix we provide empirical evidence showing that countries characterized by better corporate governance and investor protection have a more accessible local equity market and a higher degree of competition. In a similar spirit, Agrawal (2012) shows that product-market competition in a certain U.S. state increased after passage in that state of Blue Sky laws, a statute aimed at investor protection at the state level.

[3] In the Appendix we provide empirical evidence showing that countries characterized by higher-quality corporate governance and investor protection have a more developed high-technology sector.

argue that corporate governance quality also affects the channel through which firms enter a new industry: In countries with low-quality corporate governance, entry is more likely to occur through established conglomerates.

We conclude the paper by considering in Section VII the effect of financial market liberalizations on economic growth and firms' technology choices. We show that financial market liberalizations, facilitating equity financing, induce more entry and the adoption of the more productive high-quality (equity-intensive) technologies, promoting growth.

Our paper rests at the intersection of several strands of literature. The 1st strand of literature is the rapidly emerging literature on corporate governance and its effect on the real sector. Shleifer and Vishny (1997), La Porta, Lopez-de-Silanes, Shleifer, and Vishny (2000), and Becht, Bolton, and Roell (2003) provide excellent surveys of the literature. By explicitly endogenizing the market structure of an industry, our paper shows that corporate governance and capital structure considerations interact in an essential way to determine the competitive conditions in the industry, in the spirit of Rajan and Zingales (2003). Closely related also is Stulz (2005), who argues that the agency cost of equity limits a firm's ability to raise capital and, therefore, to take advantage of the benefits of globalization, and John and Kedia (2003), who discuss the costs and benefits of alternative corporate governance systems. Our paper is also related to the growth and finance literature (see, e.g., Rajan and Zingales (1998) and Levine (1997) for a comprehensive survey) in that better corporate governance can increase an economy's growth by facilitating firms' capital raising and the adoption of superior technologies. Thus, our paper provides a new channel through which financial liberalizations affect the real sector of an economy (see, e.g., Bekaert, Harvey, and Lundblad (2005), (2011), for empirical evidence on the effect of financial liberalizations on economic growth and productivity). Finally, our paper is closely related to the recent literature on structural models in corporate finance (e.g., Coles, Lemmon, and Wang (2009), Coles, Lemmon, and Meschke (2012)) and can be used as a base for structural estimation.

The 2nd strand of literature is on the interaction between financial and market structure (see, e.g., Brander and Lewis (1986), Fershtman and Judd (1987), Maksimovic (1988), Cestone and White (2003), among others). These papers show that a firms's financial structure can be used strategically to induce more aggressive behavior in the output market, or to affect investors' willingness to finance new entrants, thus deterring entry. In our paper, we rely on a different, nonstrategic connection between market structure and firms' capital structure. In this sense, our paper is close to Maksimovic and Zechner (1991) and Williams (1995), who focus on the effects of agency costs on intraindustry variation of technology choice and capital structure (see also Riordan (2003) for a discussion of this literature). The 3rd strand of literature is on industrial organization and the determinants of market structure (see, e.g., Vives, (1999), among many others). Moreover, our paper extends in a (general) market equilibrium setting earlier literature that examines the impact of capital market imperfections on product-market competition (see, e.g., Poitevin (1989), Bolton and Scharfstein (1990), and Suominen (2004)).

Our paper is organized as follows: In Section II, we present our basic model. In Section III, we present the main results of the paper. In Section IV, we discuss our model's predictions. In Section V, we study the effect of corporate governance on the structure of the financial system of an economy and, in Section VI, its impact on the industrial structure. In Section VII we analyze the impact of financial liberalizations. Section VIII concludes the paper. All proofs are available in the online Appendix (www.jfqa.org).

II. The Basic Model

We examine an economy endowed with 3 types of risk-neutral agents: entrepreneurs, consumers, and a large number of small investors. Entrepreneurs, with no initial wealth, are endowed with production technologies (described later). Production requires investment of capital, which entrepreneurs obtain from investors. Investors are endowed with 1 unit of cash each. Consumers purchase the goods produced by the entrepreneurs and are characterized by their demand functions (described later).

Entrepreneurs, indexed by i, are distributed continuously over the real line, $i \in [0, \infty)$, and have access to 2 production technologies. Technologies, indexed by $\tau \in \{H, L\}$, differ by their production costs and produce goods that can be of either "superior" or "inferior" quality. Goods of superior quality are valued more by customers and can be sold at a greater price. High-quality technology, $\tau = H$, always produces superior quality goods, but at a greater cost. Low-quality technology, $\tau = L$, produces superior quality goods only with probability ϕ, while with probability $1 - \phi$ it produces goods of inferior quality. Production is subject to moral hazard (in the form of "risk shifting") in that an entrepreneur's choice of technology is unobservable to both investors and customers.

The cost of producing q_i units of output with technology τ by entrepreneur i is

$$C_{\tau,i}(q) = F_{\tau,i} + cq_i, \tag{1}$$

where c is the (constant) marginal cost and $F_{\tau,i}$ the fixed cost, with $F_{H,i} > F_{L,i} \geq 0$. Thus, high-quality technology has greater fixed costs.[4] Entrepreneurs also differ by the efficiency of their technologies: More efficient entrepreneurs have technologies with lower fixed costs: $F_{\tau,i} = F_\tau + \theta i$, where θ is a measure of the efficiency differences among technologies. Thus, entrepreneurs with lower i are more efficient.

If a firm has produced superior quality goods, it can sell its products to consumers in the output market, where the demand for its output, x_i, is

$$x_i = \frac{\alpha}{n} - p_i + \widetilde{p}, \tag{2}$$

where α is a positive constant that reflects the size of the market, n is the total number of firms in the industry that produce superior quality goods, p_i is firm i's

[4]We can interpret the greater fixed cost of high-quality technologies as the additional research and development (R&D) expenditures required to produce goods with superior features, and thus of "superior" quality.

price, and $\widetilde{p}$ is the average price of the superior quality goods in the market.[5] This means that if the n most efficient firms produce superior quality goods, we have that $\tilde{p} \equiv (1/n) \int_0^n p_j dj$. As is customary in the case of monopolistic competition, we assume that firms are small and therefore treat n as a continuous variable (but we will still refer to n as indicating the number of firms). Note that the demand schedule (2) is similar to that in monopolistic competition, where a firm takes the other firms' prices as given and acts as a monopolist on the residual demand curve.[6]

We assume that if the firm's products are of inferior quality, consumers are willing to pay only the marginal cost c for the goods, obliging the firm to set $p = c$. This implies that only firms that produce superior quality goods can recover their fixed costs. Furthermore, throughout the paper we assume that $\phi < F_L/F_H$, which implies that high-quality technology is more efficient than low-quality technology. Thus, the parameter ϕ characterizes the severity of the moral hazard problem: A greater value of ϕ makes it more likely that a firm using low-quality technology produces superior quality goods, increasing its incentive to select the less efficient technology. Since the value of the parameter ϕ depends on the technologies availability to firms, which are presumably similar for all firms in the same industry, we interpret ϕ as representing the exposure of a particular industry to moral hazard. We will initially assume that ϕ is sufficiently small (or F_L sufficiently large) that low-quality technology is not sustainable (i.e., profitable) in equilibrium:

Assumption 1. $\phi \leq \phi_c$ (where ϕ_c is defined in the Proof of Proposition 1).

This assumption guarantees that all entrepreneurs in equilibrium choose high-quality technology. The case in which low-quality technology is also profitable (and thus sustainable) to some firms is examined in Section VI.A.

Entrepreneurs obtain capital by issuing securities to investors. For simplicity, we restrict the space of feasible contracts by assuming that firms can issue only debt and new equity.[7] In particular, firm i seeks to raise $F_{H,i}$ by selling to investors a fraction $\kappa_i \in [0, 1]$ of its shares, valued at $S_i(\kappa_i)$, and zero-coupon debt with a face value B_i and a market value D_i.[8] Financial markets operate competitively, and all agents have access to a safe storage technology that offers zero return.

[5]Note that the demand function (2) implies that, when $p_i = \widetilde{p}$ (which holds in a symmetric equilibrium), total industry demand, and thus output, is a constant and equal to α. In Section VII we will examine the case in which total industry demand is a decreasing function of the average price $\widetilde{p}$ even when $p_i = \widetilde{p}$.

[6]See, for example, Fujita, Krugman, and Venables (1999) and Ottaviano, Tabuchi, and Thisse (2002). Our demand function is also similar to that in Salop (1979), with the difference that in his "circular city" model, $\widetilde{p}_i$ is the average price of the 2 firms located "closest" to i.

[7]We rule out the possibility of addressing the risk-shifting problem by the use of optimal contracts. While we make this assumption for analytical tractability, our main results hold as long as the moral hazard problem generates an industry-specific debt capacity, even after accounting for optimal contracting.

[8]Since, when Assumption 1 holds, low-quality technology is not sustainable, entrepreneurs in equilibrium raise $F_{H,i} = S_i + D_i$ units of cash from investors to cover their fixed costs for high-quality technology, $F_{H,i}$.

Outside investors are atomistic. After issuing equity, entrepreneurs maintain control of their firms, which they manage in their own interest. Entrepreneurial control of firms generates a conflict with outside shareholders who are exposed to (partial) wealth expropriation from the entrepreneur, who is the firm's insider. We abstract from other sources of disagreement between outside shareholders and insiders managers (e.g., those due to differences in risk aversion, as in John, Litov, and Yeung (2008)).[9] In the spirit of Jensen (1986) and Shleifer and Wolfenzon (2002), we model this "agency cost of equity" by assuming that entrepreneurs may divert to themselves a fraction β of the residual cash flow of their firms, after debt is repaid.[10] Thus, we can interpret the parameter β as measuring the level of contractibility of the firm's cash flow to equity and, in this way, representing the extent of the agency cost of equity.[11]

We assume that diversion of a firm's cash flow is inefficient, and a unit of diverted cash flow is worth only $\mu < 1$ to the entrepreneur (as in Pagano and Roell (1998), Stulz (2005), and Almeida and Wolfenzon (2006)).[12] We interpret the parameters β and μ as representing the product of 2 main effects. First, at the aggregate level, we take them as characterizing the quality of the corporate governance system and the level of investor protection of the economy as they determine how efficiently entrepreneurs can divert their firms' cash flow into private benefits. Second, at the industry level, we take them as characterizing the severity of the agency costs of equity of an industry, since the ability of entrepreneurs to divert resources to themselves also depends on the specific nature of that industry.[13] For expositional simplicity, we assume that the parameter μ and the fixed cost F_H are sufficiently large that, in equilibrium, entrepreneurs' equity retention is such that $1 - \kappa_i < \mu$ for all i. This assumption implies that all entrepreneurs have an incentive to divert the fraction β of the cash flow to equity.[14]

Assumption 2. $\mu \geq \mu_c$ (where μ_c is defined in the Proof of Proposition 1).

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[9] In addition, to keep our model parsimonious, we consider only one type of agency cost of equity. In reality, several types of agency conflicts between management and shareholders can exist, not to mention various other conflicts between different types of shareholders.

[10] This implies that debt is a hard claim in the spirit of Hart and Moore (1995), (1998). This means that creditors' rights are sufficiently strong to induce entrepreneurs to use all the available cash flow to repay their creditors before engaging in any cash flow diversion. Our results continue to hold as long as creditor rights are stronger than shareholder rights.

[11] This means that, even if firm cash flow is potentially observable by investors, only a fraction $1 - \beta$ is contractible (see Hart and Moore (1995) and Aghion and Bolton (1992), where investors observe the state of the world but have limited contractibility).

[12] The assumption that diversion is inefficient, $\mu < 1$, is common in the literature. We recognize that this assumption need not hold in all instances. For instance, in some cases managers may have a preference for specific attributes of their firms (e.g., size). In this case, it would be more efficient for the shareholders to exploit specific managerial preferences and deviate from the optimal firm policy, such as scale, as a less expensive way to compensate managers than through cash.

[13] Evidence of large benefits of control and associated deadweight costs can be found in Albuquerque and Schroth (2008).

[14] If $1 - \kappa_i > \mu$, some inframarginal entrepreneurs (the more efficient ones) would not, in equilibrium, divert resources for themselves. Allowing for this possibility would not affect our main results, however, because the properties of our equilibria depend only on the behavior of the marginal entrepreneurs, for which $\kappa_i \simeq 1$.

The timing of events is as follows: At $t = 0$, entrepreneurs arrive at the capital market and announce the target amounts of funds that they wish to raise by issuing equity and debt with values S_i and D_i, respectively, in order to raise from investors the amount $F_{H,i} = D_i + S_i$. Investors make financing offers to the entrepreneurs. The capital market closes when $n \geq 0$ firms have found financing, the investors expect to break even, no entrepreneur wishes to change the proposed financial structure, and no additional firm can raise sufficient financing to enter.

At $t = 1$, all $n \geq 0$ entrepreneurs that have been successful in raising $F_{H,i}$ of capital, $i \in [0, n]$, select their production technology, $\tau \in \{H, L\}$, and production takes place.

At $t = 2$, entrepreneurs pay back or default on their loans. Entrepreneurs divert a fraction β of the cash flow that is left after lenders have been repaid. The residual $1 - \beta$ is distributed to shareholders. Investors and entrepreneurs consume their wealth.

An *equilibrium* in our model is characterized by the number of entrepreneurs entering the market, n^*, and their optimal strategies, $\{p_i^*, \tau_i^*, S_i^*, D_i^*, \kappa_i^*, B_i^*\}$, for $i \in [0, n^*]$, such that i) the strategy of each entrepreneur maximizes his payoff given the strategies of the other players; ii) the goods markets clear, $q_i = x_i$, $\forall i$; and iii) the firms' capital structure and the number of entrepreneurs entering the market are such that no additional entry can occur with entrants earning nonnegative profits.

III. Equilibrium

We solve the model by backward induction. In period $t = 1$, entrepreneurs that have been successful in raising $F_{H,i}$ units of cash choose their pricing strategy depending on whether they have produced goods of superior or inferior quality. Taking as given the prices of the other firms producing superior quality goods, $\{p_j\}_{j \neq i}$, an entrepreneur with superior quality goods faces a residual demand curve (2) and maximizes his firm's total cash flow, X_i^T, by selecting

$$p_i^* \in \underset{p_i}{\operatorname{argmax}} X_i^T = (p_i - c)\left(\frac{\alpha}{n} - p_i + \tilde{p}\right). \tag{3}$$

If, instead, the entrepreneur has produced inferior quality goods, he has no choice other than setting a price $p_i = c$ at which he can sell a fixed quantity, $\bar{x}$.

The total cash flow accruing to a firm depends on whether it has produced goods of superior or inferior quality and, thus, on the choice of technology. Given the optimal pricing strategy, p^*, the total cash flow generated by firm i, X_i^T, is

$$X_i^T(p^*, \tau_i) = \begin{cases} (p_i^* - c)\left(\frac{\alpha}{n} - p_i^* + \tilde{p}^*\right) + I_{\tau_i}(F_H - F_L) & \text{with pr. } 1 - I_{\tau_i}(1 - \phi) \\ I_{\tau_i}(F_H - F_L) & \text{with pr. } I_{\tau_i}(1 - \phi), \end{cases} \tag{4}$$

where I_{τ_i} is an indicator function that takes the value of 1 if $\tau_i = L$, and 0 otherwise. Firm i's cash flow is divided between its creditors, $X_i^D(p^*, \tau_i)$, outside

shareholders, $X_i^S(p^*, \tau_i)$, and the entrepreneur, $X_i^E(p^*, \tau_i)$, as follows:

$$X_i^D(p^*, \tau_i) \equiv \min\{B_i; X_i^T(p^*, \tau_i)\}, \tag{5}$$

$$X_i^S(p^*, \tau_i) \equiv \kappa_i(1-\beta)\max\{X_i^T(p^*, \tau_i) - B_i; 0\}, \tag{6}$$

$$X_i^E(p^*, \tau_i) \equiv [\mu\beta + (1-\kappa_i)(1-\beta)]\max\{X_i^T(p^*, \tau_i) - B_i; 0\}. \tag{7}$$

Proceeding backward, at the beginning of period $t = 1$, after financing, entrepreneurs choose their technology by maximizing their own expected payoff, selecting

$$\tau_i^*(B_i) \in \underset{\tau_i \in \{H,L\}}{\operatorname{argmax}} \mathbf{E}_1 X_i^E(p^*, \tau_i), \tag{8}$$

where $\mathbf{E}_t$ represents the expectation at t on future cash flows. As will become apparent later, the choice of technology depends on the face value of the outstanding debt, B_i. The optimal financial structure is determined at $t = 0$ by maximizing

$$\max_{S_i, D_i, \kappa_i, B_i} V_i = \mathbf{E}_0 X_i^E(p^*, \tau_i^*(B_i)), \tag{9}$$

subject to

$$S_i \leq \mathbf{E}_0 \kappa_i(1-\beta)\max\{X_i^T(p^*, \tau_i^*(B_i)) - B_i; 0\}, \tag{10}$$

$$D_i \leq \mathbf{E}_0 \min\{B_i; X_i^T(p^*, \tau_i^*(B_i))\}, \tag{11}$$

$$S_i + D_i = F_{H,i}, \tag{12}$$

where expressions (10) and (11) are, respectively, the shareholders' and debt holders' participation constraints, and equation (12) is the entrepreneur's financing constraint.

Proposition 1 (Equilibrium). The number of entrepreneurs that enter the market in equilibrium, n^*, and their choice of financing, $\{S_i^*, D_i^*\}_{i=0}^{n^*}$ is determined as follows:

i) In equilibrium, the first $n^* > 0$ entrepreneurs enter the market, where n^* is implicitly determined by

$$n^* = \frac{\alpha}{\sqrt{F_H + \theta n^* + \eta\beta}}, \tag{13}$$

where $\eta \equiv \phi(F_H - F_L)/(1-\phi)$. All $i \leq n^*$ entrepreneurs choose high-quality technology, and produce output, q_i^*, sold at a price, p_i^*, given by

$$q_i^* = \frac{\alpha}{n^*}, \qquad p_i^* = c + \frac{\alpha}{n^*}. \tag{14}$$

ii) Entrepreneurs finance the fixed costs, $F_{H,i}$, by raising equity and debt for

$$S_i^* = F_H + \theta i - D_i^* = (1-\beta)\eta - \theta(n^* - i), \tag{15}$$

$$D_i^* = \bar{D} \equiv \left(\frac{\alpha}{n^*}\right)^2 - \eta > 0, \tag{16}$$

and issue a fraction of shares to outside investors equal to

$$\kappa_i^* = 1 - \frac{\theta(n^* - i)}{(1-\beta)\eta}. \tag{17}$$

In equilibrium, the payoff to entrepreneur $i \in [0, n^*]$, V_i^*, is

$$V_i^* = \mu\beta\eta + \theta(n^* - i). \tag{18}$$

Entry in the product market is determined by the interaction of imperfections in both the debt and the equity markets, captured by the parameters β and η, as follows.[15] Absent capital market imperfections, that is, when $\beta = \eta = 0$, entrepreneurs can raise in the capital markets all the funds necessary to finance profitable projects. In this case, entry will occur until the rents earned in equilibrium in the product market, which from expression (14) are given by $(\alpha/n)^2$, are equal to the fixed costs of the marginal entrant. This means that, absent capital market imperfections, the equilibrium number of entrepreneurs that enter the market, n^c, is determined by condition that the marginal entrepreneurs earn zero (expected) profits, that is, by

$$\left(\frac{\alpha}{n^c}\right)^2 - F_H - \theta n^c = 0. \tag{19}$$

We refer to n^c as the "perfectly competitive" outcome. From equation (13), it is easy to see $n^c > n^*$ whenever $\eta\beta > 0$.

The presence of imperfections in the capital markets reduces entry because it limits the ability of entrepreneurs to raise capital on both the equity and the debt markets. Raising funds by issuing equity is costly because the entrepreneur appropriates a fraction β of the residual cash flow, after the repayment of debt, and he enjoys only a fraction μ per dollar of diverted cash flow, while the remainder $1 - \mu$ is dissipated. Since investors rationally anticipate the cash flow diversions, entrepreneurs ultimately bear the cost of this inefficiency, making outside equity expensive for the entrepreneurs. This deadweight loss represents the agency cost of equity.

The presence of the agency costs of equity makes entrepreneurs prefer to borrow as much as possible. The amount of debt the firm can issue, however, is limited by the moral hazard problem. By choosing low-quality (rather than high-quality) technology, entrepreneurs save the amount $F_H - F_L$ in fixed costs but, with probability ϕ, nevertheless obtain superior quality goods. Therefore, low-quality technology is riskier than high-quality technology, exposing creditors to a "risk-shifting" problem.[16] Since, given Assumption 1, low-quality technology is not sustainable, entrepreneurs must in equilibrium select a capital structure whereby they have an incentive to choose high-quality technology. Thus, the

[15]Note that η is strictly increasing in ϕ, and hence also measures an industry's exposure to the moral hazard problem.

[16]Our results will hold also in the case that high-quality technology produces low-quality goods with some small but positive probability.

entrepreneur can only issue an amount of debt with face value B_i^* that satisfies the incentive-compatibility condition

$$\left(\frac{\alpha}{n^*}\right)^2 - B_i^* \geq \phi\left[\left(\frac{\alpha}{n^*}\right)^2 - B_i^* + F_H - F_L\right]. \tag{20}$$

This implies that

$$D_i^* = B_i^* \leq \bar{D} \equiv \left(\frac{\alpha}{n^*}\right)^2 - \eta, \tag{21}$$

where $\bar{D}$ represents the firm's debt capacity. Note that η represents the minimum equity value that a firm must maintain to ensure that high-quality technology is optimally chosen, and it depends on the severity of the moral hazard problem. Debt capacity $\bar{D}$ is industry specific and depends both on the extent of the moral hazard problem and on the level of industry concentration, n^*. Greater exposure to moral hazard increases the minimum equity that a firm must maintain to induce insiders to choose high-quality technology, reducing debt capacity. Conversely, greater industry concentration raises a firm's economic profits, increasing its value and, thus, debt capacity.[17]

In equilibrium, entrepreneurs issue debt up to debt capacity, $\bar{D}$, and then sell equity to outside investors until $\kappa_i = 1$, for the last entrant (i.e., the marginal entrepreneur). Given that η represents the minimum equity that all firms must maintain to satisfy the incentive-compatibility condition (20), and that the entrepreneur appropriates a fraction β of it, the amount of equity that the marginal entrepreneur, n^*, issues is $S_{n^*}^* = (1-\beta)\eta$. Thus, the marginal entrepreneur that can obtain financing, n^*, is determined by

$$\bar{D} + S_{n^*}^* = \left(\frac{\alpha}{n^*}\right)^2 - \beta\eta = F_{H,n^*} = F_H + \theta n^*. \tag{22}$$

This condition requires that, for the marginal entrepreneur, the total value of the firm's cash flow, $(\alpha/n^*)^2$, after the diversion to the entrepreneur, $\beta\eta$, is equal to its fixed costs, F_{H,n^*}. Inframarginal entrepreneurs issue to outside shareholders only the amount of equity that is strictly necessary to raise $F_{H,i}$, leading to expression (15). Since firms' equity has a market value $E^{M*} \equiv (1-\beta)\eta$, the fraction of equity sold by entrepreneur i is S_i^*/E^{M*}, giving equation (17). In equilibrium, the marginal entrepreneur earns an economic profit that is equal to the value of the cash flow diversions, $\mu\beta\eta$. Inframarginal entrepreneurs benefit from their greater efficiency by issuing less equity, and thus by earning, in equilibrium, greater economic profit, given by equation (18).

Finally, from expression (16), it is easy to see that, absent moral hazard (i.e., with $\eta = 0$), all firms would be entirely debt financed and entry would occur until $n^* = n^c$. Similarly, absent the agency cost of equity (i.e., with $\beta = 0$), all firms

[17] Note that in our stylized model, debt capacity is the same for all firms in the same industry since, from the incentive-compatibility conditions, the potential gain from deviating to low-quality technology, $F_H - F_L$, is independent of i. This assumption can be easily relaxed by assuming, for example, that more efficient firms also have lower variable costs, which would lead to greater debt capacity for those firms. Our main results will hold as long as there are systematic differences in firms' debt capacity across industries, which are driven by differences in firms' moral hazard problems.

would have costless access to equity and again, from expression (22), entry would occur until $n^* = n^c$. It is precisely the interaction of the imperfections in both the equity and debt markets (i.e., when $\beta\eta > 0$) that limits the ability of entrepreneurs to raise capital, reducing the equilibrium number of firms that can enter a new market.

IV. Governance, Finance, and Industry Concentration

Our model shows that industry concentration and firm financial and ownership structures are jointly determined by the interaction of the quality of the corporate governance system of an economy (measured by β) and industry characteristics (i.e., the exposure to the moral hazard problem, measured by η). In this section we develop predictions on the cross-sectional variation that would be observed across industries within an economy (i.e., in the same legal jurisdiction) and across different countries with heterogeneous legal jurisdictions.

Proposition 2 (Corporate Governance, Industry Concentration, and Financial Structure). Economies with lower-quality corporate governance regimes are characterized by greater industry concentration, greater debt level, lower book and market value of equity, and, for the more efficient entrepreneurs, greater insider ownership (defined by $\omega_i \equiv 1 - \kappa_i$):

$$\begin{aligned} &\frac{\partial n^*}{\partial \beta} < 0, \quad \frac{\partial \bar{D}}{\partial \beta} > 0, \quad \frac{\partial S_i^*}{\partial \beta} < 0, \\ &\frac{\partial E_i^{M*}}{\partial \beta} < 0, \quad \frac{\partial \omega_i^*}{\partial \beta} > 0 \quad \text{iff} \quad i < i_c(\beta, \eta), \end{aligned} \tag{23}$$

where $i_c(\beta, \eta)$ is defined in the Proof of Proposition 2. Furthermore, defining the elasticity of entry to corporate governance as $\varepsilon(n^*, \beta|\eta) = |(\partial n^*/\partial \beta) \times (\beta/n^*)|$, we have

$$\frac{\partial \varepsilon(n^*, \beta|\eta)}{\partial \eta} > 0. \tag{24}$$

Proposition 2 shows that the quality of corporate governance and investor protection affect several critical features of the industrial and financial structure of an economy. First, economies characterized by lower-quality corporate governance (higher β) have greater industry concentration (lower n^*). This happens because corporate governance regimes of lower quality limit entrepreneurs' ability to raise equity from capital markets, which impairs entry of new firms and, thus, increases industry concentration. In addition, from expression (24), the elasticity of the number of firm entering an industry in equilibrium, n^*, is increasing in that industry's exposure to the moral hazard problem, η. This means that the effect of the quality of the corporate governance system on entry is more pronounced precisely in those sectors where equity financing is more critical.

Second, interestingly, low-quality corporate governance regimes lead to greater debt capacity. This property is a direct consequence of the endogeneity of industry concentration: A lower-quality corporate governance regime, reducing

entry, leads to greater industry concentration and to greater profits in equilibrium. In turn, greater profits relax the incentive-compatibility constraint, expression (20), and increase debt capacity.

Third, lower-quality corporate governance, increasing insiders' cash flow diversions, reduces the cash flow that can be pledged to outside investors and, thus, leads to lower book and market values of equity, given by S_i^* and E_i^{M*}, respectively. The effect of the quality of corporate governance on insider ownership, ω_i^*, depends on a firm's position within an industry. Less efficient firms (greater i) rely relatively more on equity financing. Low-quality corporate governance implies that these firms must sell a relatively greater fraction of equity to outsiders, decreasing insider ownership. Conversely, more efficient firms, $i < i_c$, sell less equity and, thus, rely relatively more on debt financing. This means that the increase in debt capacity that comes with a low-quality corporate governance regime (as discussed above) allows these firms to issue relatively less equity to outside investors, increasing insider ownership.

Proposition 3 (Moral Hazard, Industry Concentration, and Financial Structure). Sectors exposed to more severe agency costs of debt are characterized by greater industry concentration, lower corporate debt level, greater book and market value of equity, and less insider ownership:

$$(25) \qquad \frac{\partial n^*}{\partial \eta} < 0, \quad \frac{\partial \bar{D}}{\partial \eta} < 0, \quad \frac{\partial S_i^*}{\partial \eta} > 0, \quad \frac{\partial E_i^{M*}}{\partial \eta} > 0, \quad \frac{\partial \omega_i^*}{\partial \eta} < 0.$$

Industries exposed to a more severe moral hazard problem (greater η) are characterized by greater concentration. This happens because greater exposure to moral hazard reduces a firm's debt capacity. Firms, however, can only partially offset the reduction in debt financing with a corresponding increase in equity. This happens because a reduction of a dollar in cash flow paid out to creditors results only in $1 - \beta$ dollars of added "equity capacity" (since a fraction β of the firm's cash flow is diverted by the entrepreneur). Therefore, more severe moral hazard impairs firms' overall ability to raise funds, leading to less entry and greater industry concentration. Furthermore, as η increases, entrepreneurs in equilibrium substitute debt financing with equity financing, leading to greater book and market value of equity and less insider ownership.

Propositions 1–3 generate predictions on the cross-sectional variation that would be observed within a country (i.e., within the same legal jurisdiction) and across countries (i.e., in legal jurisdictions that have potentially different corporate governance and investor protection regimes).[18] We now consider the effect of the 4 parameters $\{i, \eta, \beta, \theta\}$ on several key ratios determined endogenously in the model. First, within an industry, for each individual firm $i \in [0, n^*]$ we consider the debt-to-equity ratio, D_i^*/S_i^*; the book-to-market ratio of equity, S_i^*/E_i^{M*}; the

[18]Note that in our model, firms' heterogeneity originates from 3 sources. First, within a given industry, firms differ by their level of efficiency i, with more efficient firms needing less capital. Second, across industries in the same economy, different sectors have different exposure to the moral hazard problem, and thus different values of η. Third, across countries and across industries, different economies and sectors are characterized by different quality of their corporate governance systems, and therefore have different values of β.

degree of insider ownership, $\omega_i^* = 1 - \kappa_i^*$; and the return on assets, $\text{ROA}_i^* = X_i^*/F_{H,i}$. Second, we compare these same key ratios across industries and legal jurisdictions.[19] Panels A and B of Table 1 present the sign of the partial derivatives of the ratios with respect to the relevant parameters. The proofs are available in the online Appendix.

TABLE 1

Summary of Comparative Statics Results

In Table 1, a plus (negative) sign indicates a positive (negative) partial derivative of the ratio or variable with respect to i, η, β, or θ, respectively. Parameter i represents firm efficiency, with a greater i corresponding to a less efficient firm; parameter η represents a technology's exposure to moral hazard, with a greater η corresponding to greater moral hazard. Parameter β represents the quality of a country's corporate governance framework, with a greater β corresponding to a lower level of investor protection and corporate governance quality. Parameter θ measures the degree of efficiency differences among firms in the same industry.

Panel A. Within-Industry Cross-Sectional Variations

Parameter	$\frac{D_i^*}{S_i^*}$	$\frac{S_i^*}{E_i^{M*}}$	ω_i^*	ROA_i^*
i	−	+	−	−

Panel B. Cross-Sectional Variation across Industries and Legal Jurisdictions

Parameter	$\left(\frac{D^*}{S^*}\right)^{\text{ind}}$	$\left(\frac{S^*}{E^{M*}}\right)^{\text{ind}}$	$(\omega^*)^{\text{ind}}$	$(\text{ROA}^*)^{\text{ind}}$	n^*
η	−	+	−	+	−
β	+	−	+	+	−
θ	+	−	+	+	−

By contrasting Panels A and B of Table 1, it is easy to see that the correlation between leverage and firm profitability within an economy can differ when measured within the same industry or across industries. In our model, firms in the same sector differ only by the efficiency of their technology (determined by i and θ), while firms in different sectors of an economy may differ also by the severity of the moral hazard problem or governance standards and, therefore, by their debt capacity. Within a given sector, more efficient firms require less capital and need to issue less equity than more inefficient firms. Thus, more efficient firms have greater return on assets and issue relatively less equity, generating a positive relationship between leverage and profitability. Interestingly, this result is consistent with the findings of MacKay and Phillips (2005) that, within industries, new entrants (corresponding to our marginal firms) have less leverage and are less profitable than incumbent firms.

The relationship between profitability and leverage can be reversed when we compare across sectors. Firms in sectors more exposed to moral hazard have lower debt capacity and leverage. In addition, these industries are more concentrated and, therefore, are associated with greater profits and return on assets. Thus, greater exposure to moral hazard leads at the same time to less levered, more profitable firms and to greater industry concentration, generating a negative relationship between leverage and profitability, and between leverage and industry concentration.

[19]For tractability, we consider the aggregate ratios for the industry, rather than the averages of the ratios for all firms in the industry.

This negative correlation between leverage and profitability is a direct consequence of the endogeneity of industry concentration in our model. This implies that a static trade-off model of the determination of a firm's capital structure (such as the one discussed here) can generate a negative correlation between leverage and profitability. Note that this result depends crucially on the negative correlation between debt capacity and profitability that is generated by endogenous entry. In this way, our model helps to explain the apparent puzzle of the negative relationship between profitability and leverage documented in several empirical studies such as Titman and Wessels (1988), Rajan and Zingales (1995), Fama and French (2002), Demirgüç-Kunt and Maksimovic (1998), and Booth, Aivazian, Demirgüç-Kunt, and Maksimovic (2001), among others.

Our model predicts that industries where the agency costs of equity are more severe and economies characterized by lower-quality corporate governance systems (i.e., by higher β) are characterized by greater industry concentration, higher debt-to-equity ratios (when equity is measured either at book or market value), greater insider ownership, and greater returns on assets. These results are again the direct consequence of the endogeneity of industry concentration and debt capacity: Corporate governance regimes of lower quality reduce a firm's ability to raise capital, which limits entry and, in turn, leads to greater debt capacity (and leverage) and greater insider ownership. Thus, by endogenizing industry concentration, our model establishes a novel link between the quality of the corporate governance system, ownership structure, industry concentration, and leverage.

These results are consistent with several of the stylized facts that emerge from cross-countries studies. For example, La Porta et al. (1997), (1998) find that countries with lower-quality corporate governance have more debt relative to equity financing, lower market values of firms (compared to gross domestic product), and larger ownership by insiders. More recently, Stulz (2005) finds that countries with lower-quality corporate governance are characterized by a smaller fraction of widely held firms and, thus, greater insider ownership. Demirgüç-Kunt and Maksimovic (1998) and Hail and Leuz (2006) find that countries endowed with a better legal environment are characterized by a lower return on capital. Klapper, Laeven, and Rajan (2004) document the beneficial effect of regulation that is aimed at better development of financial markets, on the entry of new firms, especially in industries with high R&D intensity or industries that have greater capital needs.[20]

A further implication of our paper is that the quality of the corporate governance system of an economy has an independent impact on the financial structure choices of firms, beyond firm-specific characteristics. Thus, our model provides an explanation for the findings of Booth et al. (2001), who show that country-specific factors (such as a country's legal framework) are as important as firm-specific factors in determining a firm's capital structure decision.

[20] In a similar vein, Fan, Titman, and Twite (2012) document a negative correlation between leverage and the strength of a country's legal system. The paper also shows that the presence of high-quality auditors (as measured by the market share of the Big 5 accounting firms) is negatively related to leverage, especially in developing countries.

Finally, note that the impact of greater differences of efficiency among firms within the same industry, captured by a higher θ, is similar to the effects of lower-quality corporate governance. Greater efficiency heterogeneity among firms within an industry generates larger capital needs for the marginal entrants which, just like greater financing costs, reduce entry, lead to greater profitability for incumbents, and increase those firms' debt capacity as well as insiders' ownership.

V. Governance and the Structure of the Financial System

The quality of the corporate governance system also affects the structure of an economy's financial system. This happens because the presence of a corporate governance system of poor quality will promote the development of institutions and practices that facilitate firms' capital-raising process and, thus, firm entry. These possibilities are explored in this section.

A. Governance and Bank Financing

Banks can reduce the agency costs of debt by monitoring firms and thus mitigating the entrepreneur's incentives to take excessive risks (see, e.g., Diamond (1991), among others). Assume now that the economy is endowed also by competitive banks and that, by incurring a fixed monitoring cost, c_b, a bank can decrease the extent of entrepreneurial moral hazard. The benefit of bank financing is to lower the minimum equity that a firm must maintain from η to, say, $\lambda\eta$, thus reducing the agency costs of equity and increasing debt capacity. The monitoring cost is charged up front to the entrepreneur when he borrows from the bank, increasing the cost of entering a market.

Firms may seek financing either from investors, in the form of publicly traded debt, or equity as before, or by borrowing from a bank. It is easy to see that bank debt is preferable to publicly traded debt when the savings in terms of lower agency cost of equity (due to the lower minimum equity that is necessary with bank financing) is greater than the monitoring cost, c_b, that is,

$$c_b \quad < \quad (1-\mu)(1-\lambda)\beta\eta. \tag{26}$$

Note also that the use of bank debt, by reducing the moral hazard problem, may allow entry of firms that otherwise would not obtain financing and would be excluded from the market. By direct examination of the entry condition (22), it is easy to see that if

$$\beta\eta \quad > \quad \lambda\beta\eta + c_b, \tag{27}$$

that is, if $c_b < (1-\lambda)\,\beta\eta$, some marginal firms will now be able to raise required capital by using bank financing and enter the market.

These observations have several implications. Since condition (26) is more likely to be satisfied when β is large, firms operating in countries characterized by low-quality corporate governance are more likely to be bank financed. This also implies that the financial system in such countries is likely to be dominated by (or to make greater use of) banks. Similarly, firms in industries characterized

by greater moral hazard are more likely to use bank financing rather than publicly traded debt, since expressions (26) and (27) are more likely to be satisfied when η is large. Finally, when expression (26) fails but expression (27) holds, more efficient firms do not benefit from bank financing and are financed by traded debt, while less efficient firms (the marginal firms) use bank financing in order to enter the market (a prediction consistent with the findings of Robb and Robinson (2012)).[21]

B. Optimal Firm-Level Governance

Companies can use the corporate governance system as a competitive tool and choose the quality of their corporate governance as part of their cost-minimization efforts (see, e.g., Allen and Gale (2000)). In this section we examine the possibility that a firm, by sustaining additional costs, can improve the quality of its own governance system beyond the level determined by its legal environment. Examples of this type of firm-specific activities include incentive contracts for executives, improving corporate disclosures, hiring highly reputable (and, presumably, more expensive) independent directors, or changing corporate charters in ways that protect minority shareholders.[22]

Assume that entrepreneur i can, at $t = 0$, by exerting a level of effort $e_i \geq 0$, reduce the fraction of cash flow to equity that he can appropriate to $\beta(1 - e_i)$, but at a cost

$$C(k, e_i) = \frac{k e_i}{1 - e_i}, \tag{28}$$

where $k \geq 0$.[23] Thus, we can still interpret the parameter β as representing the overall quality of the corporate governance system of the legal jurisdiction where the firm operates and its industry. In addition, entrepreneurs can exert effort and improve the quality of the governance system of their firms so as to further reduce the diversion factor to $\beta(1 - e_i)$. Propositions 4 and 5 characterize the equilibrium for different values of k. In both cases, entry to an industry occurs until the marginal entrepreneur's payoff, net of the costs from improving governance, equals 0.

Proposition 4 (Endogenous Governance). If $k \leq k_1$ (defined in the Proof of Proposition 4), there exists an equilibrium where the first n^{**} entrepreneurs enter the market, with $n^* < n^{**} < n^c$. In this case, the optimal effort level exerted by each entrepreneur is

[21] Thus, our model provides an explanation for the choice between bank and publicly traded debt that is different from the one discussed, for example, in Diamond (1991) and Chemmanur and Fulghieri (1994).

[22] The effects of board independence are investigated, for example, in Linck, Netter, and Yang (2008), Coles, Daniel, and Naveen (2008), Boone, Field, Karpoff, and Raheja (2007), and Lehn, Patro, and Zhao (2009).

[23] Note that this cost function has the attractive properties that the cost is 0 if effort is 0, and that obtaining a "perfect" corporate governance system is prohibitively costly.

$$e^{**} = 1 - \sqrt{\frac{k}{\beta(1-\mu)\eta}}, \tag{29}$$

and the optimal governance that thus emerges in an industry is

$$\hat{\beta}^{*} \equiv (1 - e^{**})\beta = \sqrt{\frac{k\beta}{(1-\mu)\eta}}. \tag{30}$$

Exerting effort to improve the quality of a firm's governance system reduces the agency cost of equity and allows entrepreneurs to raise more capital in the equity market. Thus, by producing better governance, firms relax their financing constraint, promoting entry. If the cost of producing better governance is not too high, that is, when $k \leq k_1$, all entrepreneurs exert the optimal effort, e^{**}. Concentration, n^{**}, is determined by the condition that the payoff to the marginal entrant equals the cost of producing good governance.

Better governance allows marginal entrepreneurs to raise more capital, leading to more entry, $n^{**} > n^{*}$. Thus, the ability of firms to improve their own governance promotes entry, taking the equilibrium closer to the competitive one, but (since effort is costly) cannot fully restore the perfectly competitive outcome, $n^{**} < n^{c}$.[24]

In equilibrium, there is a new industry-specific level of corporate governance quality, $\hat{\beta}^{*} < \beta$. Direct examination of equation (29) reveals that effort to improve a firm's governance is greatest in industries with high moral hazard (greater η) and in industries and economies characterized by worse system-wide level of corporate governance (greater β). Because of this, assuming that the nature of moral hazard and governance problems in industries are otherwise unrelated, in our model industries more exposed to moral hazard (greater η) are likely to be characterized in equilibrium by better governance (lower, $\hat{\beta}^{*}$). Also, firms located in countries endowed with lower-quality corporate governance regimes are characterized by better corporate governance systems at the firm level. Thus, corporate governance at firm level and country level are "substitutes."[25]

Following a procedure similar to the one adopted in Section IV, and again assuming that the nature of the moral hazard and governance problems in industries are unrelated (excluding the firms' greater effort to improve governance in high moral hazard industries), it is easy to verify that better firm-level corporate governance is associated with greater industry concentration, lower leverage, and

[24]Similarly, the firm-specific effort to improve governance reduces, but does not eliminate, the differences in firms' financial structure and profitability that are induced by differences in country- and industry-level governance frameworks, β.

[25]This is consistent with Klapper and Love (2004), who find that firm-level corporate governance provisions matter more in countries with weak legal environments, which suggests that firms can partially compensate for ineffective laws and enforcement by establishing good corporate governance practices at the firm level and providing credible investor protection. In contrast, Aggarwal, Erel, Stulz, and Williamson (2009) show that firm and country levels of corporate governance are positively correlated, suggesting a degree of complementarity between firm and country levels of corporate governance. Their result can be reconciled with our model's predictions, if we assume that the cost of producing good governance, k, is negatively correlated with a country's overall corporate governance quality, as suggested by Doidge, Karolyi, and Stulz (2007).

greater profitability.[26] This implies that in our model there is a positive correlation between the quality of a firm's corporate governance and its profitability, and a negative correlation between the quality of a firm's governance system and its leverage: Firms with better governance are more profitable, with a less concentrated ownership structure and lower leverage.

If the cost of effort k is relatively large (i.e., when $k > k_1$), some marginal entrepreneurs may not be able to raise the necessary capital to enter the market if they exert the optimal level of effort e^{**}. In this case, marginal entrepreneurs are willing to increase their level of effort beyond e^{**} to relax the financing constraint and, thus, secure entry in the market.

Proposition 5 (Competitive Governance). Let $k > k_1$. There exists an equilibrium where the first $\hat{n}$, where $n^c > \hat{n} > n^*$, entrepreneurs enter the market and the marginal entrepreneur exerts greater effort level, $\hat{e}_{\hat{n}} > e^{**}$. Furthermore, $\partial \hat{e}_i / \partial \beta > 0$ and $\partial \hat{e}_i / \partial \eta > 0$, for all $i \leq \hat{n}$.

Proposition 5 suggests there are heterogeneous levels of corporate governance quality also within an industry as entrepreneurs with lower efficiency levels (higher i) exert a greater level of effort, $\hat{e}_i$. This implies that the marginal entrepreneurs, that is, those who need more capital to enter the market, will adopt a better corporate governance system than the more efficient ones. It also implies that firms with greater insider ownership are characterized by lower-quality corporate governance.[27]

VI. Governance and Industrial Structure

A. Governance and the Choice of Technology

The quality of the corporate governance system also affects firms' choice of technology and thus, through this 2nd channel, the industrial structure of an economy. We investigate this possibility in this section by considering the parameter region where Assumption 1 does not hold, so that low-quality technology is potentially profitable. We maintain the assumption that high-quality technology is more efficient.

Proposition 6 (Corporate Governance and Technology Choice). Let $\phi \in (\phi_c, F_L/F_H)$ and $\beta < \bar{\beta}$ (where $\bar{\beta} > 0$ is defined in the Proof of Proposition 6). In equilibrium, $n' > n^*$ entrepreneurs enter the market and

i) the first $n'' \in (0, n')$ of these choose high-quality technology, and raise $\bar{D}$ of debt and $F_{H,i} - \bar{D}$ of equity;

[26] This observation is consistent with Giroud and Mueller (2011), who find that firms in less competitive industries benefit more from good governance.

[27] These predictions are consistent with Bruno and Claessens (2010), who find that companies that rely more heavily on external financing have better corporate governance. Durnev and Kim (2005), on the other hand, find that better firm-level corporate governance is associated with greater growth opportunities, greater needs for external financing, and more concentrated cash flow rights. In addition, these relations are stronger in countries with poor investor protection, suggesting again that firms respond to poor legal environments by establishing efficient governance practices at the firm level.

ii) the remaining $n' - n'' > 0$ entrepreneurs choose low-quality technology and finance their fixed costs entirely with debt by borrowing $D_i^* = F_L + \theta n'$. Here n'' (n') is a decreasing (increasing) function of β.

In equilibrium, both low- and high-quality technologies coexist when $\beta < \bar{\beta}$. Entrepreneurs that choose high-quality technology, $i \leq n''$, issue first debt up to debt capacity, and then issue all the equity necessary to cover the fixed costs, $F_{H,i}$. Their number, n'', is determined by the condition that the marginal entrepreneur is able to obtain financing, that is,

$$\left(\frac{\alpha}{n'' + \phi(n' - n'')}\right)^2 - (F_H + \theta n'') - \beta\eta \quad \geq \quad 0, \tag{31}$$

and by the condition that he prefers to raise $F_{H,n''}$ and select high-quality technology, rather than to raise $F_{L,n''}$ and select low-quality technology, that is,

$$(1 - \phi)\left(\frac{\alpha}{n'' + \phi(n' - n'')}\right)^2 - (F_H - F_L) - (1 - \mu)\beta\eta \quad \geq \quad 0. \tag{32}$$

Entrepreneurs' incentives to choose high-quality technology rather than low-quality technology can be seen by examining the 3 terms in expression (32). The 1st term reflects the fact that high-quality technology produces superior quality goods with certainty, while low-quality technology produces superior quality goods only with probability ϕ. The 2nd term represents the difference in the fixed costs of the 2 technologies, $F_H - F_L$. The 3rd term represents a governance cost and is due to the fact that high-quality technology can be adopted in equilibrium only if the entrepreneur is financed by equity in the amount of η (so that the incentive-compatibility condition is satisfied), while low-quality technology can be financed entirely by debt. Since equity financing generates an efficiency loss, the adoption of high-quality technology is costly to the entrepreneur and leads to a loss of value equal to $(1 - \mu)\beta\eta$.

Entrepreneurs that choose low-quality technology (i.e., $i \in (n'', n']$) can finance their fixed cost $F_{L,i}$ entirely by debt. This happens because their investors are not exposed to moral hazard, and the entrepreneurs optimally choose debt to avoid the dissipative cost of equity. The number of entrepreneurs that enter the market with low-quality technology is determined by the condition that the marginal entrepreneur is just able to raise the fixed cost $F_{L,n'}$.

The presence of low-quality technology limits the ability of entrepreneurs to adopt high-quality technology. From the financing constraint (31) it is easy to see that, all else being equal, an increase of the number of low-quality firms that enter the market, that is a larger n', has the effect of reducing the number of entrepreneurs with high-quality technology that can coexist in equilibrium, n''. Conversely, a decrease of the number of high-quality firms that enter the market, that is a smaller n'', has the effect of increasing the number of entrepreneurs with low-quality technology that can be sustained in equilibrium, n'. Thus, easier access to the capital markets, which facilitates entry by entrepreneurs adopting low-quality technology (e.g., by improvements in credit markets, on which

low-quality technology is relatively more dependent), displaces, in equilibrium, high-quality technology.[28]

An additional implication of Proposition 6 is that the number of firms that choose high-quality technology is lower in economies and industries where the quality of the corporate governance system is lower. This happens because an increase in β makes the incentive constraint (32) and the financing constraint (31) tighter, leading to a lower n''. Similarly, sectors more exposed to the moral hazard problem (i.e., with a greater η) are characterized by a smaller number of firms with high-quality technology. Interestingly, when the quality of the corporate governance system is sufficiently low, it is quite possible that either expression (31) or (32) is not satisfied for any $i \leq n'$. This implies that high-quality technology cannot be sustained in equilibrium; we refer to this phenomenon as one of governance crowding out.

Proposition 7 (Governance Crowding Out). High-quality technology cannot be sustained in equilibrium, that is, $n'' = 0$, in an industry with moral hazard η, if $\beta > \beta'$ (where β' is defined in the Proof of Proposition 7). Furthermore, $\lim_{\theta \to 0} \beta' = (F_L - \phi F_H)/\phi\eta$.

These observations imply that the quality of a country's corporate governance system has an impact on the choices of technology made by firms operating in its jurisdiction and thus on the industrial structure of its economy.[29] In particular, our model suggests that countries with a low quality of corporate governance system may not be able to sustain more efficient firms in capital-intensive industries that are more exposed to moral hazard (such as, e.g., high-technology and pharmaceutical sectors). Thus, these countries will be at a competitive disadvantage in developing such more advanced sectors. These are new and testable predictions.[30]

B. Corporate Structure, Cross-Border Mergers and Acquisitions, and Regulation

The quality of the corporate governance system of an economy can also have an impact on its industrial structure by affecting the channel through which firms enter a new industry. In countries with poor corporate governance, new firms find

[28]The finance industry is an example of an industry where technologies with different levels of efficiency and moral hazard coexist. First, traditional commercial banks and investment banks coexist in several overlapping market segments. In addition, online brokerage firms coexist with traditional higher-quality brokerage and advisory firms, and actively managed funds coexist with index funds. Other examples of industries where high- and low-quality technologies coexist include, for example, the airline industry, where entry of low-quality airlines has forced the higher-quality airlines to alter their business models, and media, where higher-quality news media are pressured by low-cost producers distributing news via the Internet.

[29]Note that Proposition 7 implies that when the efficiency differences between entrepreneurs are small, θ is close to 0, and the efficiency differences between high- and low-quality technologies are small, ϕ is close to F_L/F_H, high-quality technology is never chosen in equilibrium.

[30]In the Appendix, we provide evidence consistent with our model's prediction. Specifically, in Panel C of Table A1 we show that economies with higher investor protection are also characterized by a better-developed high-technology sector.

it difficult to raise the capital necessary to enter a new market. Thus, in these economies, established firms that already have sufficient capital from internal funds have an advantage in entering new markets and exploiting new profit opportunities. This implies that these economies will tend to be dominated by diversified conglomerates. Conversely, new firms operating in economies endowed with a good level of corporate governance and investor protection will find it easier to raise the necessary capital and enter a new industry. Thus, these economies are more likely to be dominated by many independent and focused firms (note that a similar prediction, but in the context of a different model, is in Almeida and Wolfenzon (2006)).

The quality of the corporate governance system will also affect the direction of a country's foreign direct investments and cross-border merger activity. Our analysis suggests that firms incorporated in countries with a better corporate governance system will have a comparative advantage in exploiting new market opportunities that emerge in countries with poor corporate governance. In these cases, firms will enter a new foreign market either by establishing local subsidiaries, that is, through foreign direct investment, or by acquiring a local company. These observations imply that in cross-border mergers, target companies are likely to be from countries with poorer corporate governance than acquirers are (a prediction consistent with the findings of Rossi and Volpin (2004)). Similarly, foreign direct investment is more likely to flow from countries with better corporate governance regimes to those with lower-quality corporate governance.

An additional implication of our model derives from the effect of entry barriers (e.g., due to regulation) on corporate financial structure. Assume that entry in an industry requires firms to sustain a regulatory cost, paid by firms upon entry. The presence of such regulatory cost is equivalent, in our model, to an increase of the fixed costs F_H, and it has the effect of reducing entry. It is easy to verify that, in our setting, a greater regulatory cost leads to a higher level of debt financing and greater debt-to-equity ratio at market values. These considerations also suggest that deregulation, by reducing regulatory costs, increases entry and leads to firms' lower reliance on debt financing.

VII. Financial Market Liberalization, Governance, and Growth

In this last section, we modify our basic model and examine explicitly the impact of financial market liberalizations on the real economy and thus, ultimately, growth. Liberalizations affect financial markets in several important ways. For example, Bekaert et al. (2011) show that equity market liberalizations affect stock market liquidity and equity prices. To capture the effect of financial liberalizations on liquidity, we assume that outside investors require a liquidity premium on their equity investments. In this spirit, we replace constraint (10) in the basic model with

$$S_i \leq \mathbf{E}_0 \kappa_i (1-\delta)(1-\beta) \max\left\{X_i^T(p^*, \tau_i^*(B_i)) - B_i\,;\,0\right\}, \tag{33}$$

where the parameter $\delta > 0$ represents a "liquidity discount" that investors require in the equity market only.[31] Inequality (33) implies that, due to the liquidity discount, \$1 of cash flow is worth only $1-\delta$ dollars to outside investors. Furthermore, to capture in a simple way the beneficial effect of competition on aggregate output, we now assume that total demand in any industry is not constant, but is a decreasing function of the average price level in the industry, that is, $\alpha = \alpha'/\tilde{p}$, where α' is a constant. For ease of exposition, we also set firms' marginal cost of production equal to 0 (i.e., $c = 0$).

Proposition 8 (Equity Market Liberalizations). Let $\xi \equiv \beta + \delta(1-\beta)$, $\mu \geq \mu_c^\circ$ and $\phi \leq \phi_c^\circ$ (where μ_c° and ϕ_c° are defined in the Proof of Proposition 8). There exists an equilibrium where n° firms enter the industry, where

$$n^\circ = \frac{-(F_H + \eta\xi) + \sqrt{(F_H + \eta\xi)^2 + 4\alpha'\theta}}{2\theta}. \tag{34}$$

All entrepreneurs choose high-quality technology and produce output $q_i^\circ = \sqrt{\alpha'/n^\circ}$ sold at $p_i^\circ = \sqrt{\alpha'/n^\circ}$. High-quality industry output, $n^\circ q^\circ = \sqrt{n^\circ \alpha'}$, is increasing in n°, and the equilibrium number of firms, n°, is decreasing in δ. Furthermore, defining the elasticity of entry with respect to δ, as $\varepsilon(n^\circ, \delta) \equiv |(\partial n^\circ/\partial\delta) \times (\delta/n^\circ)|$, we have that

$$\frac{\partial\varepsilon(n^\circ,\delta)}{\partial\alpha'} < 0, \quad \frac{\partial\varepsilon(n^\circ,\delta)}{\partial\eta} > 0, \quad \text{and} \quad \frac{\partial\varepsilon(n^\circ,\delta)}{\partial\beta} < 0. \tag{35}$$

Proposition 8 shows that equity market liberalizations, associated with a decline in δ, lead to entry of new firms in the economy, which in turn leads to higher output and thus greater growth. Furthermore, the elasticity of entry to the liquidity discount δ is decreasing in the size of the industry, α', and increasing in the level of industry moral hazard, η. This implies that financial liberalizations (i.e., a decrease in δ) have greater impact on entry in small industries and in industries more exposed to moral hazard. Finally, the elasticity of entry to δ is decreasing in β, which means that the effect of financial market liberalization is more pronounced in economies characterized by high levels of investor protection.

The prediction that the number of firms increases after equity market liberalizations is consistent with the findings of Rajan and Zingales (1998). This paper shows that the positive effect of equity market liberalization on growth occurs predominantly through an increase in the number of firms. Furthermore, Gupta and Yuan (2009) find that following equity market liberalization, the number of firms increases in industries that are characterized by low entry barriers. Also, closely related is Bekaert et al. (2005), who find that equity market liberalizations increase economic growth, especially in countries characterized by high levels of investor protection.

Financial market liberalization also affects the industrial structure of the economy. If low-quality technology is sustainable in equilibrium (as in

[31] We focus here on the effect of financial liberalizations on the equity markets, but our analysis can easily be extended to the case in which the credit market is affected as well.

Section VI.A), financial liberalization, by facilitating the use of equity, promotes the adoption of high-quality technology versus low-quality technology.

Proposition 9 (Corporate Governance, Technology Choice, and Liberalization). Let $\phi \in (\phi_c^\circ, F_L/F_H)$ and $\beta < \bar{\beta}^\circ$ and $\delta < \overline{\delta}^\circ$ (where $\bar{\beta}^\circ > 0$ and $\overline{\delta}^\circ > 0$ are defined in the Proof of Proposition 9). In equilibrium, $n^{\circ\prime} > n^\circ$ entrepreneurs enter the market and

i) the first $n^{\circ\prime\prime} \in (0, n^{\circ\prime})$ choose high-quality technology, and raise $\bar{D}$ of debt and $F_{H,i} - \bar{D}$ of equity;

ii) the remaining $n^{\circ\prime} - n^{\circ\prime\prime} > 0$ choose low-quality technology and finance their fixed costs only with debt by borrowing $D_i^* = F_L + \theta n'$. Furthermore, $n^{\circ\prime\prime}(n^{\circ\prime})$ is decreasing (increasing) in δ. Total industry output of high-quality goods is decreasing in δ.

Financial market liberalizations promote the adoption of high-quality technology through 2 effects. First, by relaxing the financing constraint in the equity market, given by inequality (33), liberalizations may allow additional marginal entrepreneurs to enter an industry with high-quality technology. Second, liberalizations reduce the cost of equity for incumbents and make high-quality technology more attractive relative to low-quality technology. This implies that, by promoting high-quality technologies, financial market liberalizations spur productivity and growth. Furthermore, these effects are particularly strong in equity-intensive industries, such as the high-technology sector, and in countries with high levels of investor protection. These predictions help explain the findings of Bekaert et al. (2011), who document increases in investment efficiency (and productivity) following financial market liberalizations, especially in countries endowed with more advanced financial system (and thus, presumably, a greater level of investor protection).

VIII. Conclusions

We use a structural model to make predictions on the relations among several endogenous, codetermined industry-level and firm-specific variables. In our model, the differences in the levels of agency costs of debt and equity across countries and industries, together with differences in production technologies, codetermine industry concentration, firms' technology choices, profitability, and financial structure. We show that in countries and industries characterized by poor corporate governance, industry competition is less intense, and firms rely more on inefficient technologies, have greater leverage, and have more concentrated equity ownership. In addition, we show that, within an economy, the sectors with larger moral hazard problems are also characterized by lower levels of industry competition. In addition, firms in those industries rely more on inefficient technologies, rely largely on equity or bank financing, and invest heavily in firm-specific efforts to improve corporate governance. We then use our model to study the effects of financial market policies. In particular, we show that, consistent with recent empirical research, equity market liberalizations spur growth by inducing entry

and foster productivity through the increased adoption of more efficient equity-intensive technologies.

We discuss the existing empirical evidence related to our model and present empirical support for the model in the Appendix. Nevertheless, several model predictions, for instance, how corporate governance affects entry and the choice of technology, clearly call for further empirical research.

Appendix

In Table A1, we provide empirical evidence on the relationship between the level of investor protection in an economy (a measure of corporate governance) and its industrial and financial structure. The main source of our data is *The Global Competitiveness Report 2007–2008* by Michael Porter, Xavier Sala-i-Martin, and Klaus Schwab. The report provides an index of the strength of investor protection for a large sample of countries, which was earlier introduced by World Bank (*Doing Business 2007: How to Reform* (2006)). In addition, it contains country-level indicators, based on executive surveys, related to the ease of equity financing from local markets and the intensity of local competition. To supplement this data, we collect from Thomson Financial Database country-level data on the

TABLE A1

Industrial Structure, Finance, and Investor Protection

Sources: *The Global Competitiveness Report 2007–2008* by Porter et al. (2008), Thomson Datastream, IMF Global Financial Stability Reports, and Allen et al. (2007). i) Investor protection is a measure based on a combination of the extent of disclosure index (transparency of transactions), the extent of director liability index (liability of self-dealing), and the ease of shareholder suit index (shareholders' ability to sue officers and directors for misconduct). The original source is World Bank's *Doing Business 2007: How to Reform* (2006). ii) The ease of financing through local equity markets measure is based on an executive survey, where the respondents evaluated raising money through local equity markets (1 = nearly impossible, 7 = quite possible for a good company). iii) The intensity of local competition measure is based on an executive survey, where the respondents evaluated competition in the local market (1 = limited in most industries and price-cutting is rare, 7 = intensive in most industries as market leadership changes over time). iv) The definition of high-technology sector was created using the sector descriptions in Thompson Datastream. From 47 industries, we selected the industries that belong to our definition of the high-technology sector on the basis of the industry average R&D-to-sales ratios in the U.S. data. High-technology sector includes the industries with the highest ratios, which form roughly 25% of the firms and market capitalization in the United States. The firms in the industries selected correspond to 22% in terms of amount and 21% in terms of market value in the United States. Our high-technology industries are Alternative Energy, Electronic & Electrical Equipment, Health Care Equipment & Service, Industrial Transportation, Software & Computer Services, and Pharmaceuticals & Biotechnology. Our country figures are the proportions of total market capitalization of the firms belonging to the high-technology sector. Our sample is based on more than 46,000 companies for which we obtained the relevant data. In order to minimize the effect of errors in the data and to eliminate from our sample international firms whose primary listing is outside their home country, we required that the indicated primary market matches with the currency in which the data were reported. v) Bank credit/market capitalization figures are from Allen et al. and correspond to averages over 1976–2004. *, **, and *** indicate significance at the 10%, 5%, and 1% confidence levels, respectively.

		Investor Protection Categories					
	Sample Size	(best) I	II	III	(worst) IV	Difference I − IV	*t*-Statistic
Panel A. Ease of Financing from Local Equity Markets							
Average	123	5.12	4.69	4.04	3.89	1.23	5.12***
Median		5.30	4.90	3.95	3.80	1.50	
Panel B. Intensity of Local Competition							
Average	123	5.21	4.93	4.70	4.55	0.65	3.83***
Median		5.40	5.10	4.60	4.50	0.90	
Panel C. Percentage of Market Capitalization of High-Technology Firms							
Average	60	17.7%	15.8%	10.0%	9.2%	8.46%	1.84*
Median		14.3%	10.1%	7.5%	5.8%	8.47%	
Panel D. Bank-Credit-to-Market-Capitalization Ratio							
Average	84	1.85	8.62	7.01	4.90	(3.05)	−2.87***
Median		1.37	2.87	2.84	3.63	(2.26)	

percentage of high-technology firms, calculated using equity market capitalizations. Finally, we obtain from Allen, Bartiloro, and Kowalewski (2007) data on the importance of bank debt financing. The table is constructed as follows: We first rank the sample of countries into quartiles based on the levels of investor protection, with I = best and IV = worst. Then, we present the averages and medians for i) ease of financing from local equity markets, ii) intensity of local competition, iii) percentage of market capitalization of high-technology firms, and iv) bank-credit-to-market-capitalization ratio.

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