DOES BAD CORPORATE GOVERNANCE LEAD TO TOO LITTLE COMPETITION?
Corporate governance, capital structure, and industry concentration*

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October, 2005

*For helpful comments, the authors would like to thank Michel Habib, Roman Inderst, Yrjö Koskinen and seminar participants at the University of Zurich, Wharton School, the 2005 European Finance Association meetings. All errors are our own. E-mails: matti.suominen@hkkk.fi and Paolo_Fulghieri@unc.edu. Tel: +358-50-5245678 (Matti) and +1-9199623202 (Paolo).

Abstract

We examine the relationships among corporate governance, industry concentration and financial structure that emerge endogenously in an economy. We consider entrepreneurs whose ability to raise capital is limited by the presence of agency costs in both the equity and debt markets. We argue that the quality of the corporate governance system may have a significant impact on the economy's level of competition and its degree of industry concentration. Thus, the causality between the quality of an economy's corporate governance and its degree of competition may indeed run in the opposite way to the one suggested in traditional theory: poor corporate governance and low investor protection may in fact lead to high industry concentration. We also characterize the relationships between debt-ratios, market-to-book ratios of equity, ownership concentration, industry concentration and firms' profitability in such economy, and we generate predictions on the cross sectional variations that would emerge both within an economy and in cross-country comparisons. Finally, we show that the agency costs of equity interact with the moral hazard problem in debt market in a way that (contrary to previous theory) the presence of convertible debt in a firm's capital structure may increase, rather than decrease, the insiders' incentives to take excessive risks.

1. Introduction

What is the relationship between a country's corporate governance system (and level of investor protection) and the degree of industry concentration in its economy? It is often argued that product market competition, and thus low industry concentration, is a mechanism that can impose discipline on a firm's management. Competition, by reducing a firms' profit margins, would limit the opportunities available to managers for expropriating wealth from investors and would force firms run by wasteful managers out of business (see, e.g., Vives, 2000). Also, product market competition would force firms to improve their corporate governance system as part of their cost minimizing efforts (see, e.g., Alchian, 1950, and Stigler, 1958). Thus, as the economic environment becomes competitive, firms find themselves under greater pressure to eliminate inefficient governance systems and to provide better protection to their investors (see Allen and Gale, 2000). As a result, economies characterized by a high level of competition should also enjoy a better corporate governance system and a higher level of investor protection.

This paper suggests a reverse causality between an economy's degree of competitiveness and the quality of its corporate governance system. By using a stylized model, we examine the relationships among corporate governance, industry concentration and financial structure that emerge endogenously in an economy. We argue that the quality of the corporate governance system may have a significant impact on an economy's level of competition and its degree of industry concentration. Thus, the causality between the quality of an economy's corporate governance and its degree of competition may indeed run in the opposite way to the one suggested in traditional theory: poor corporate governance and low investor protection may in fact lead to high industry concentration. We also show that the quality of the governance system of an economy, by affecting the financial structure of the corporate sector in addition to the level of industry concentration, may generate certain correlations between market and financial structures in an economic system that are consistent with observed empirical regularities.

We consider an economy endowed with entrepreneurs that have limited wealth and who seek financing in competitive capital markets to fund their enterprises. In the product market there is free-entry in that all entrepreneurs that obtain financing are able to enter in the consumer goods' market. Thus, the degree of competition in the economy is endogenous and is determined only by the ability of entrepreneurs to finance their firms. Entrepreneurs are endowed with technologies of different efficiency, with the more efficient ones requiring less invested capital.

The ability of an entrepreneur to find financing is limited by the presence of agency costs in both the debt and the equity market. We model the agency cost of equity in a way similar to Jensen (1986) and Stulz (1992, 2005), and 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. As in Pagano and Roell (1998) and Stulz (2005), the private use of the firm's resources is inefficient, and generates a costly leakage (that is, the firm's insiders can transform one dollar's value of firm's cash flow in an amount of private benefits that has a value less than a dollar). The presence of this inefficiency makes rasing funds as outside equity costly to the entrepreneur, since outside investors rationally anticipate the entrepreneur's appropriation of company resources. We model the agency cost of debt as a traditional risk-shifting problem (see Jensen and Meckling 1976, and Galai and Masulis, 1976). We assume that firms have access to two technologies: a safer but costlier technology that produces superior goods, and a riskier but cheaper technology that on average produces goods that are valued less by the firms' customers. As it is typical in the presence of moral hazard in the debt markets, firms must maintain a certain minimum level of equity, to limit the potential moral hazard problem. Thus, the presence of the agency cost of debt implies that firms face debt capacity in the debt market.

We show that corporate governance problems in the equity market interact in an essential way with the moral hazard problem in the debt market. When a firm's insiders have a better ability to appropriate corporate resources (that is when the agency costs of equity are more severe) debt becomes more desirable, since it allows to reduce the inefficiencies of outside equity. The ability of the firm to be financed by debt, however, is limited by the extent of a moral hazard problem in corporate debt market. Correspondingly, when a firm faces a more severe moral hazard problem in the debt market, it will require greater equity financing to curb the risk-shifting incentives. The extent of equity financing, in turn, is limited by the quality of the corporate governance system. Thus, the simultaneous presence of the agency costs of debt and equity determines the overall ability of firms to raise capital in the financial markets, and limits the ability of new firms to enter an industry. In this way, the interaction of corporate governance and moral hazard affects industry concentration, the degree of competition and firms' capital structure.

Our model implies that the quality of corporate governance system and the severity of the moral hazard problem in the debt market affect in equilibrium both industry concentration and the financial structure of the corporate sector. We

show that economies characterized by better corporate governance systems are also characterized by lower industry concentration, lower debt to equity ratios (when equity is measured either at book or market value), less concentrated ownership, lower returns on assets and lower market to book value of equity. Within an economy, we find that sectors characterized by greater moral hazard problems have also lower debt ratios, less concentrated ownership, lower market to book value of equity but greater returns on assets and greater industry concentration.

The intuition for our results is as follows. In economies were the corporate governance system is worse, firms raising capital in the equity markets must sell shares at a discount, reflecting the inferior level of investor protection. The fair pricing of equity implies that the inefficiencies due to the agency cost of equity are ultimately born by the entrepreneur seeking financing. To minimize the deadweight loss of equity financing, entrepreneurs in economies with poor governance systems prefer (all else equal) to be financed by debt, leading to greater debt-equity ratios, more concentrated ownership and higher market to book ratio of equity (reflecting lower equity sales to outside investors). Furthermore, since the presence of the moral hazard problem in the debt market limits the amount of capital that a firm can raise as debt, worse corporate governance reduces the overall ability of firms to raise the capital necessary to enter new markets. This leads to greater industry concentration and lower competition, which in turn implies higher return on assets for individual firms.

These results are consistent with some of the stylized facts that emerge from cross countries studies. For example, La Porta, Lopez-de-Silanes, Shleifer and Vishny (1997 and 1998) find that countries with worse corporate governance have more debt relative to equity financing, lower market values of firms (compared to GDP), and larger ownership by insiders. More recently, Stulz (2005) finds that countries with worse corporate governance are characterized by a smaller fraction of widely held firms. A further implication of our paper is that country specific factors, such as the quality of its corporate governance system, have an independent impact on financial structure choices of firms residing in a country. This implication is consistent with the findings of Booth, Aivazian, Demirguc-Kunt, and Maksimovic (2001), which shows that country specific factors are as important as other firm-specific factors in determining a firm's capital structure decision. Also, our results are consistent with the findings in Klapper, Laeven and Rajan (2004). That paper documents the beneficial effect that regulation, aimed at a better development of financial markets, has on entry of new firms, especially in industries with high R&D intensity or industries that have greater

capital needs. Finally, our results are consistent with the findings of Fan, Titman and Twite (2003), documenting a negative correlation between leverage and the strength of a country's legal system. In a similar vein, that paper shows that the presence of high quality auditors (as measured by the market share of the Big-five accounting firms) is negatively related to leverage, especially in developing countries.

Within an economy, we find that the correlation between leverage and firm profitability (as given by the return on assets) differs when measured across different industries or within the same industry. Specifically, we find that the correlation between leverage and profitability is positive within an industry, but it becomes negative when the comparison is made across industries. This result depends on the possible different sources of firm heterogeneity in an economy. While the quality of the governance system is presumably common to all firms in an economy, since it predominantly reflects its legal environment, different sectors in the economy are characterized by different exposures to the moral hazard problem. In our model, firms in the same sector differ only by the efficiency of their technology, that is for their capital requirements, while firms in different sectors of the economy differ also by the severity of the moral hazard problem. Within a given sector, more efficient firms require less capital and need to issue less equity than more inefficient ones. Thus, more efficient firms, have greater return on assets and issue relatively less equity, which determines a positive relationship between leverage and profitability for firms within the same sector.

The relationship between profitability and leverage is reversed when we compare averages across sectors. Sectors more exposed to moral hazard require that firms maintain a greater equity base and therefore have lower leverage. In addition, industries with greater moral hazard have in equilibrium greater industry concentration and therefore can sustain in equilibrium firms with greater profits and better return on assets. Thus, greater moral hazard leads to less levered and more profitable firms and greater industry concentration, generating a negative relationship between leverage and profitability, and between leverage and industry concentration.[1] A negative relationship between profitability and leverage is

[1] An example of a concentrated industry characterized by low leverage and potential moral hazard problems is given by the pharmaceuticals industry. In this industry, fims invest a large amount of capital for the development and production of potentially hazardous goods that expose them to product liability. Thus, the possibility of costly law suits can act as a discipline device for these firms only if they have little debt and a sufficiently large amount of equity at stake.

consistent with the findings in Titman and Wessels (1988), Rajan and Zingales (1995) and Fama and French (2002), among others.

We check the robustness of our results in two directions. First, we examine the possibility that, by exerting effort, entrepreneurs can improve the quality of the corporate governance of their firms. In this way, entrepreneurs can choose the quality of their governance system as part of their cost minimization strategy, and use corporate governance as a competitive tool. We show that allowing entrepreneurs to choose the quality of the governance of their firms competitively facilitates entry (i.e. it allows more entrepreneurs to enter a given market), but it does not restore the "perfectly competitive" outcome. This reflects the property that, as long as improving corporate governance is costly, in equilibrium marginal entrepreneurs must recover, in addition to their initial fixed costs, also the costs of improving the governance system of their firms. Thus, in equilibrium, firms must earn a "governance rent" that compensate them for their efforts to produce "good governance."

Second, we allow firms to raise capital by using also convertible debt (and possibly similar instruments produced by financial innovation) to control moral hazard and therefore to facilitate entry. The possibility of controlling risk shifting by the use of convertible debt was first suggested by Green (1986). We show that the agency costs of equity interact with the moral hazard problem in a way that the presence of convertible debt in a firm's capital structure may *increase*, rather than decrease, the insiders' incentives to take risks. This is a result of independent interest, since it shows that the interaction of the agency costs of equity and the risk shifting problem reduces the ability of convertible debt to control the excessive risk taking problem generated by debt financing. This happens because insiders hold equity *and* can divert to themselves a fraction of the cash flow to equity, the residual of the firm's cash flow after bondholders have been paid. Thus, on the one hand, insiders benefit from conversion of convertible debt, since conversion eliminates debt and increases the cash flow to equity (and allows insiders to divert more funds), but on the other hand are hurt by conversion as this dilutes their equity position. When insiders have little equity, as it happens with the less efficient marginal entrepreneurs, the first effect may dominate the second, and convertible debt can have the effect of inducing risk taking rather than discouraging it. In this case, the use of convertible (rather than straight) debt does not increase marginal firms' debt capacity and does not facilitate further entry.

Our paper rests at the intersection of three broad strands of literature. The first one is the rapidly emerging literature on corporate governance. For excellent

surveys of the literature, see Shleifer and Vishny (1997) and Becht, Bolton, and Roell (2002). By explicitly endogenizing the market structure of an industry, in this paper we argue that corporate governance and capital structure considerations interact in an essential way to determine the competitive conditions in the industry. Our paper contributes to this literature by suggesting a reverse causality between competition and corporate governance: we show that corporate governance considerations may have a direct impact on the competitive conditions in an economy. In this way, our paper is consistent with the idea that the degree of financial development in an economy may affect its competitiveness, as suggested in Rajan and Zingales (2003). Our paper is also related to Stulz (2005), which 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. The second strand of literature is the one on the interaction between financial and market structure (see e.g., Brander and Lewis, 1986, and Maksimovic, 1988, among others). These papers show that a firms's financial structure can be used strategically to induce a more aggressive behavior in the output market. In our paper, we rely on a different connection between market structure and firms' capital structure. In our model, the moral hazard problem in the debt market limits a firm's debt capacity, and thus limits the ability of firms to raise the capital necessary to enter a new industry. In this sense, our paper is close to Maksimovic and Zechner (1991) and Williams (1995), which focus on the effects of agency costs on intra-industry variation of technology choice and capital structure.[2] The third strand of literature is the one on industrial organization and the determinants of market structure (see, for example, Vives, 1999, among many others). In our paper we show that the presence of moral hazard in the debt market and imperfect corporate governance contribute to determine an industry's market structure. 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, for example, Poitevin, 1989, and Bolton and Scharfstein, 1990).

Our paper is organized as follows. In section 2, we present our basic model. In section 3 we present the main results of the paper. In section 4, we discuss the model's predictions on the correlations between industry concentration, leverage, profitability and corporate governance. In section 5 we endogenize corporate governance, by allowing firms to exert effort to improve their governance. In section 6, we discuss how convertible debt affects industry equilibrium and firms' financing. Section 7 concludes the paper. All proofs are collected in the Appendix.

[2] See also Riordan (2003) for a discussion of this literature.

2. The basic model

We consider an economy endowed with three types of agents: potential entrepreneurs, consumers and a large number of small investors. Entrepreneurs, with no initial wealth, are endowed with a production technology, described below. Production requires investment of capital, which entrepreneurs obtain from investors. Investors are each endowed with one unit of cash. Both types of agents are risk neutral and derive utility from their end-of-period wealth.

Entrepreneurs, indexed by i, are distributed continuously over the real line, that is $i \in [0, \infty)$. Entrepreneur i has access to two different production technologies. Technologies, indexed by $\tau \in \{H, L\}$, differ by their production costs and may be of either "high" quality, $\tau = H$, or "low" quality, $\tau = L$. We assume that high quality technologies produce goods of better quality, but at a greater fixed cost.[3] Goods of better quality are valued more by customers and can be sold at a greater price. The total cost of producing q units of output with technology τ, with $\tau \in \{H, L\}$, by entrepreneur i is given by

$$C_{\tau,i}(q) = F_{\tau,i} + cq, \tag{2.1}$$

where c is the (constant) marginal cost and $F_{\tau,i}$ is the fixed cost, with $F_{H,i} > F_{L,i} \geq 0$. Entrepreneurs differ by the efficiency of their technologies: more efficient entrepreneurs have technologies with lower fixed costs. For simplicity, we assume that $F_{\tau,i} = F_\tau + \theta i$, where θ is a measure of the efficiency differences among technologies. Thus, entrepreneurs with lower i are the more efficient ones.

Production is subject to moral hazard in that an entrepreneur's choice of technology is unobservable to both investors and customers. The high quality technology always produces high quality goods. The low quality technology produces high quality goods only with probability ϕ, while with probability $(1 - \phi)$ it produces goods that are considered by customers as being of lower quality. The parameter ϕ represents the severity of the moral hazard problem for a firm: a greater value of ϕ makes it more likely that firms using the low quality technology produce high quality goods, thus increasing investors' exposure to the moral hazard problem. Since the value of the parameter ϕ depends on a firm's technology, which is presumably similar to all firms in the same industry, we interpret ϕ as representing the exposure of a particular industry to moral hazard. Furthermore,

[3] We can interpret the greater fixed cost of high quality technologis as the additional R&D expenditures required to produce goods with superior features, and thus of "better" quality.

for simplicity, we will assume that $\eta \equiv \frac{\phi(F_H - F_L)}{(1-\phi)} < F_H$, which guarantees that, under all equity financing, firms select the high quality technology.[4]

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

$$x_i = \frac{\alpha}{n} - p_i + \widetilde{p}_i, \tag{2.2}$$

where α is a positive constant that reflects the market size, and n is the total number of firms in the industry who are expected to produce high quality goods. As in the case of monopolistic competition, we assume that firms are small and therefore we treat n as a continuous variable. Here p_i is firm i's price and $\widetilde{p}_i$ the average price of the high quality producers in the market, i.e., $\frac{1}{n}\int_0^n p_j dj$. This demand schedule is similar to that in monopolistic competition: in this setup, a firm takes the other firms' prices as given and acts as a monopolist on the residual demand curve.[5]

If the firm's products are identified as low quality, consumers are willing to pay only the marginal cost c, obliging the firm to set $p = c$. This implies that only firms that produce high quality goods can recover their fixed costs. For simplicity, we assume that F_L is sufficiently large (or ϕ sufficiently small) that the low quality technology is not self-sustaining. Thus, only entrepreneurs expected to choose (in equilibrium) the high quality technology can obtain financing for their firms.[6]

Entrepreneurs (firms) obtain capital to invest in their technologies by issuing debt and new equity to outside investors. 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. Since the low quality technology is not self-sustainable, for a credible entry entrepreneur i must raise $S_i + D_i = F_{H,i}$ units of cash from investors to cover its fixed costs for using the high quality technology. Entrepreneurs are protected by limited liability, so the payoff to equity (and thus to entrepreneurs) cannot be negative. Financial markets operate competitively, and all agents have access to a safe storage technology that offers zero return.

[4] It is straightforward, although tedious, to extend the model to the case where $\eta \geq F_H$.

[5] Our demand function is also similar to that in Salop (1979). One difference, however, is that in his "circular city" model $\widetilde{p}_i$ is the average price of the two firms located "closest" to i.

[6] Alternatively, we could assume that low quality technology always produces low quality goods, but that with probability ϕ high qualility and low quality goods look like, and can be sold as high quality goods at a price $p_i > c$. In this case, equilibria where firms are expected to produce low quality could not exist.

Outside shareholders are atomistic investors. 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. In the spirit of Jensen (1986) 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. The parameter β measures the severity of the agency cost of equity, and we interpret it as characterizing the quality of the corporate governance system of the economy. Diversion of firm's cash flow is inefficient, and a unit of diverted cash flow is worth only $\mu < 1$ to the entrepreneur.

The timing of events is as follows. At $t = 0$, entrepreneurs arrive to the capital market sequentially, in the order of their index i, with the more efficient ones arriving first. Entrepreneurs announce the target amounts of funds that they wish to raise in the capital markets by issuing equity and debt with value S_i and D_i, respectively, in order to raise from investors $D_i + S_i = F_{H,i}$ units of cash. If an entrepreneur succeeds in raising its desired amount of capital, the next entrepreneur enters the capital market and seek financing for his firm. The capital market closes when a firm fails to raise the financing it requested.

At $t = 1$, all $n \geq 0$ firms that have been successful in raising $F_{H,i}$ of capital select their production technology, $\tau \in \{H, L\}$, and production takes place. If firm i's goods are of high quality, the firm produces and sells x_i units of goods to consumers at price p_i. If firm i's goods are low quality, the firm sets the price at $p = c$, and sells a fixed quantity $\bar{x}$.

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

3. Governance and Competition

3.1. 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 high quality or low quality goods. If an entrepreneur produces high quality goods, he chooses the price for its output p_i, and he

can sell a quantity x_i that is given by the residual demand function (2.2). Given the number of firms that in equilibrium are anticipated to produce high quality goods, n, an entrepreneur chooses a pricing strategy p_i that maximize his firm's total profits, that is

$$\max_{p_i} \ (p_i - c)\left(\frac{\alpha}{n} - p_i + \widetilde{p}_i\right). \tag{3.1}$$

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

Given firms' pricing strategies,$\{p_j\}_{j=0}^{n}$, the total cash flow accruing to a firm depends on whether it has produced high quality or low quality goods, and therefore, on its choice of technology. Total expected "cash flow" generated by firm i, CF_i, is thus given by

$$CF_i(\tau) = \begin{cases} (p_i - c)\left(\frac{\alpha}{n} - p_i + \tilde{p}_i\right) + I_\tau\left(F_H - F_L\right) & \textit{with pr. } 1 - I_\tau\left(1-\phi\right) \\ I_\tau\left(F_H - F_L\right) & \textit{with pr. } I_\tau\left(1-\phi\right), \end{cases} \tag{3.2}$$

where I_τ is an indicator function that takes the value of one if $\tau = L$, and zero otherwise. Firm i's cash flow is divided between its creditors, $CFD_i(\tau)$, outside shareholders, $CFS_i(\tau)$, and the entrepreneur, $CFE_i(\tau)$, as follows

$$CFD_i(\tau, B_i) \equiv \min\{B_i; CF_i(\tau)\}, \tag{3.3}$$

$$CFS_i(\tau, B_i) \equiv \kappa_i(1-\beta)\max\{CF_i(\tau) - B_i; 0\}, \tag{3.4}$$

$$CFE_i(\tau, B_i) \equiv [\mu\beta + (1-\kappa_i)(1-\beta)]\max\{CF_i(\tau) - B_i; 0\}. \tag{3.5}$$

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

$$\max_{\tau\in\{H,L\}} E_1[\mu\beta + (1-\kappa_i)(1-\beta)]\max\{CF_i(\tau) - B_i; 0\}, \tag{3.6}$$

where E_t represents the expectation at t on future cash flows. As is it will become apparent below, the optimal choice of technology depends of the face value of the outstanding debt, B_i. Let $\widehat{CF}_i(B_i)$ denote the firm's cash flow, given the technology and pricing strategy optimally chosen by the entrepreneur. The optimal capital structure is determined by entrepreneur i at $t = 0$ by maximizing:

$$\max_{S_i, D_i, \kappa_i, B_i} E_0\left[\mu\beta + (1-\kappa_i)(1-\beta)\right]\max\{\widehat{CF}_i(B_i) - B_i; 0\} \tag{3.7}$$

subject to:

$$\begin{aligned} S_i &\leq E_0\kappa_i(1-\beta)\max\{\widehat{CF}_i(B_i) - B_i; 0\}, && (3.8)\\ D_i &\leq E_0\min\{B_i; \widehat{CF}_i(B_i)\}, && (3.9)\\ S_i + D_i &\geq F_{H,i}, && (3.10) \end{aligned}$$

where (3.8) and (3.9) are, respectively, the shareholders' and debt holders' participation constraints, and (3.10) is the entrepreneur's financing constraint.

An *equilibrium* in our model is characterized by the number of entrepreneurs entering the market, n^*, and their optimal strategies, $\{p_i^*, \tau_i^*, S_i^*, D_i^*, \kappa_i^*, B_i^*\}, i \in [0, n^*]$, such that: (a) each entrepreneur maximizes (3.1), (3.6) and (3.7), given the strategies of the other players, and (b) the firms' capital structure and the number of entrepreneurs entering the market are such that no additional entry can occur with entrants and investors earning non-negative profits.

Proposition 1 *(Equilibrium): There exists an equilibrium where the first $n^* > 0$ entrepreneurs enter the market, where n^* is implicitly determined by*

$$n^* = \frac{\alpha}{\sqrt{F_H + \theta n^* + \eta\beta}} \tag{3.11}$$

and where $\eta \equiv \frac{\phi(F_H - F_L)}{(1-\phi)}$. All entrepreneurs choose the high quality technology, and produce a quantity of output

$$q_i^* = \frac{\alpha}{n^*}, \tag{3.12}$$

sold at a price

$$p_i^* = c + \frac{\alpha}{n^*}. \tag{3.13}$$

Entrepreneurs finance their fixed costs, $F_{H,i}$, by raising an amount of equity and debt equal to

$$\begin{aligned} S_i^* &= F_H + \theta i - D_i^* = (1-\beta)\eta - \theta(n^* - i), && (3.14)\\ D_i^* &= \bar{D} = F_H + \theta n^* - (1-\beta)\eta > 0, && (3.15) \end{aligned}$$

that is, by issuing a fraction

$$\kappa_i^* = 1 - \frac{\theta(n^* - i)}{(1-\beta)\eta}. \tag{3.16}$$

of their shares to outside shareholders.

We now describe the main properties of the equilibrium of the game. Given the number of entrepreneurs that in equilibrium enter the market, n^*, and that in equilibrium all entrepreneurs choose the high quality technology, an entrepreneur chooses a pricing strategy maximizing his firm's profit, (3.1), leading to (3.12) and (3.13). The corresponding equilibrium cash flow for firm i is

$$\widehat{CF}_i^*(\tau = H) = \left(\frac{\alpha}{n^*}\right)^2. \tag{3.17}$$

Note that, at an optimum, the financing and the investors' participation constraints, (3.8) - (3.10) will be binding. Substituting these constraints into the objective function (3.7), we obtain that the entrepreneur's objective function can also be stated as

$$\max_{B_i} E_0\left[\widehat{CF_i}^*(B_i) - F_{H,i} - \beta(1-\mu)\max\{\widehat{CF}_i^*(B_i) - B_i; 0\}\right]. \tag{3.18}$$

Inspection of (3.18) reveals the nature of the trade-offs in the entrepreneur's financing problem, as follows. Fair pricing of the securities issued by the firm implies that the entrepreneur internalizes all the costs and benefits of the alternative sources of financing. Raising funds by issuing equity allows an entrepreneur to appropriate a fraction β of the residual cash flow of the firm. The appropriation of firm's resources is, however, inefficient, since the entrepreneur enjoys only a fraction μ per dollar of diverted cash flow. Therefore, the last term in (3.18) represents the agency cost of equity. Since the entrepreneur ultimately bears the cost of this inefficiency, he will find it preferable to raise as much capital as possible in the debt market.[7]

The amount of funds that the entrepreneur can raise in the debt market is however limited by the moral hazard problem generated by the unobservable choice of technology. By choosing low quality technology, rather than the high quality one, entrepreneurs save the amount $F_H - F_L$ in fixed costs and, with probability ϕ, obtain goods that customers perceive as being of high quality. This implies that the low quality technology is riskier than the high quality one, and that creditors are exposed to a "risk shifting" problem. Since, by assumption, the low quality technology is not self-sustaining, the entrepreneur can in equilibrium obtain financing for his firm only if he has the incentive to choose the high quality technology. Thus, at the financing stage, the entrepreneur can only issue an amount of debt that induces him to choose the high quality technology, that is

[7]Note that equation (3.18) is increasing in B_i.

for which $CFE_i(H, B_i) \geq CFE_i(L, B_i)$. Hence, from (3.5), B_i^* must satisfy the incentive-compatibility condition

$$\left(\frac{\alpha}{n^*}\right)^2 - B_i^* \geq \phi \left[\left(\frac{\alpha}{n^*}\right)^2 - B_i^* + F_H - F_L\right], \tag{3.19}$$

or

$$B_i^* \leq \left(\frac{\alpha}{n^*}\right)^2 - \eta. \tag{3.20}$$

Note that condition (3.20) requires that

$$\widehat{CF}(B_i^*) - B_i^* = \left(\frac{\alpha}{n^*}\right)^2 - B_i^* \geq \eta, \tag{3.21}$$

which implies that η represents the minimum value of the residual cash flow (after debt is paid) that a firm must maintain to ensure that the high quality technology is optimally chosen. Thus, η is a measure of the severity of the moral hazard problem and therefore of the agency costs of debt. Note also that the incentive compatibility condition requires that the firm can issue debt with a face value (and, in equilibrium, also market value) at most equal to

$$D_i^* = B_i^* \leq \bar{D} = \left(\frac{\alpha}{n^*}\right)^2 - \eta, \tag{3.22}$$

which provides the firm's debt capacity.

Entrepreneurs enter the market as long as they are able to obtain financing by issuing first debt, until they reach debt capacity, and then by selling equity to outside equity holders, until $\kappa_i = 1$ for the last entrant. Given that η represents the residual cash flow that all firms must maintain to satisfy the incentive-compatibility condition (3.21) (and thus obtain financing), and that the entrepreneur appropriates a fraction β of it, the amount of equity that the marginal entrepreneur, n^*, issues is

$$S_{n^*}^* = (1 - \beta)\eta. \tag{3.23}$$

The marginal entrepreneur also issues debt until it reaches its debt capacity, obtaining

$$D_{n^*}^* = \bar{D} = \left(\frac{\alpha}{n^*}\right)^2 - \eta. \tag{3.24}$$

Thus, the total number of entrepreneurs, n^*, that can obtain financing and enter the market is determined by

$$D_{n^*}^* + S_{n^*}^* = \left(\frac{\alpha}{n^*}\right)^2 - \eta + (1 - \beta)\eta = F_{H,n^*} = F_H + \theta n^*. \tag{3.25}$$

This condition requires that, for the marginal entrepreneur n^*, the value of the total cash flow (after the diversion to the entrepreneur) is equal to its fixed costs, F_{H,n^*}. Furthermore, the marginal entrepreneur earns in equilibrium an expected profit which is equal to the value of the diversions, $\mu\beta\eta$. Inframarginal entrepreneurs issue debt up to debt capacity $\bar{D}$ as well, and issue to outside shareholders only the amount of equity that is strictly necessary to raise $F_{H,i}$, leading to (3.14) and (3.15). This also implies that each firm's book value of equity, S_i^*, is determined by the firm's level of efficiency i.

Note that all firms within the same industry issue the same amount of debt, $\overline{D}$. This depends on the fact that entrepreneurs fully internalize the inefficiencies of equity financing (and thus they prefer to finance their firm by using as little equity as possible by issuing debt up to their firm's debt capacity) and that, from the incentive compatibility condition (3.20), firms' debt capacity is the same for all firms in the same industry (since the potential gain from deviating to low quality technology is independent of i). Moreover, all firms in the same industry have the same market value of equity, which is given $E_i^{M*} \equiv (1-\beta)\left(\widehat{CF}_i^* - B_i^*\right)$. This property derives from the fact that in our simplified model firms differ only for the amount of fixed capital needed to obtain their output, $F_{H,i}$.

The equilibrium number of firms in an industry, n^*, depends on the severity of both the moral hazard problem in that industry, η, and the agency costs of equity, β. In the absence of such imperfections, the equilibrium number of firms, n^c, would be given (implicitly) by:

$$n^c = \frac{\alpha}{\sqrt{F_H + \theta n^c}}. \tag{3.26}$$

We will refer to n^c as the "perfectly competitive" outcome. The number of firms that enter in any given industry is limited by the ability of the marginal firm n^c to earn, ex post, a cash flow which just sufficient to repay its fixed cost.[8] From (3.15) it easy to see that, absent moral hazard (with $\eta = 0$), all firms would be entirely debt financed and entry would occur until $n^* = n^c$.[9] Similarly, from (3.25), it is easy to see that absent the agency cost of equity (that is, with $\beta = 0$) all firms would have costless access to a sufficient amount of equity, and again entry would occur until $n^* = n^c$. When both imperfections exist, $\beta > 0$ and $\eta > 0$, the

[8] From (3.11), we can see that the perfectly competitive outcome is obtained if either there is no moral hazard, since $lim_{\eta \to 0}\ n^* = n^c$, or if there is perfect corporate governance, since $lim_{\beta \to 0}\ n^* = n^c$.

[9] Note that, in this case, the more efficient firms would even repurchase some equity: $S_i < 0$.

equilibrium number of firms is less than in the perfectly competitive outcome: $n^* < n^c$. Thus, industry concentration is determined by the combined effect of the agency costs of equity and the moral hazard problem in the debt market that jointly limit firms' ability to raise capital and enter a potentially profitable new market.

3.2. Implications for Industry Concentration and Financial Structure

The equilibrium presented in Proposition 1 is further characterized in the following propositions.

Proposition 2. *(Corporate governance, industry concentration and corporate borrowing). Economies with worse corporate governance are characterized by greater industry concentration*

$$\frac{\partial n^*}{\partial \beta} < 0, \tag{3.27}$$

greater debt level, lower book value of equity and lower market value of equity

$$\frac{\partial \bar{D}}{\partial \beta} > 0, \frac{\partial S_i^*}{\partial \beta} < 0, \frac{\partial E_i^{M*}}{\partial \beta} < 0. \tag{3.28}$$

Furthermore, defining the (corporate governance) elasticity of entry as

$$\varepsilon(\beta, \eta) = \frac{\beta}{n^*} \frac{\partial n^*}{\partial \beta} < 0,$$

we have that

$$\frac{\partial \varepsilon(\beta, \eta)}{\partial \eta} < 0. \tag{3.29}$$

In our model industry concentration is endogenous and it depends on the quality of the corporate governance system of the economy. We find that economies characterized by a lower level of investor protection and worse corporate governance (that is, in our model, by a higher value of β) have greater industry concentration. This property reflects the fact that a low level of investor protection and bad corporate governance reduce the cash-flow that an entrepreneur can (credibly) pledge to outside shareholders and, thus, his ability to raise equity from outside shareholders, limiting entry. Note that this happens even if, as discussed below, lower quality of corporate governance leads to less entry and thus to greater debt capacity. Conversely, an improvement of the corporate governance environment in the economy, allows entrepreneurs to raise more equity, leading

to more entry and lower industry concentration. In addition, (3.29) implies that the quality of the corporate governance system matters most in sectors with high moral hazard. In these industries, the limits imposed by moral hazard on debt capacity and on the firms' ability to raise capital in the debt market are particularly severe. Thus, firms in these industries must rely more than others on the equity market to raise funds, making corporate governance considerations particularly important to them.

The effect of corporate governance on debt capacity, given by (3.28), is the direct consequence of the endogeneity of industry concentration in our model. We know from (3.27) that a lower level of investor protection and worse corporate governance lead to greater industry concentration and thus, from (3.17), to greater industry's profits. In turn, greater industry's profits relax the incentive compatibility constraint (3.21) and increase a firm's debt capacity, allowing firms to borrow more. Thus, our model shows that corporate governance in the equity market interacts in a subtle way with moral hazard in the debt market: poorer corporate governance leads to more industry concentration and thus to greater debt capacity. Finally, worse corporate governance induces firms to use less equity, reducing the book and the market value of equity.

Proposition 3. *(Moral hazard, industry concentration, and corporate borrowing). Sectors exposed to more severe agency costs of debt are characterized by greater industry concentration*

$$\frac{\partial n^*}{\partial \eta} < 0, \tag{3.30}$$

lower corporate debt level, greater book value of equity, and market value of equity

$$\frac{\partial \bar{D}}{\partial \eta} < 0, \frac{\partial S_i^*}{\partial \eta} > 0, \frac{\partial E_i^{M*}}{\partial \eta} > 0. \tag{3.31}$$

Industries exposed to more severe moral hazard, and thus to greater agency costs of debt, have lower debt capacity. This property depends on the interaction of two competing effects. One the one hand, more severe moral hazard leads, all else equal, to a tighter incentive compatibility constraint, (3.21). On the other hand, more severe moral hazard leads to greater industry concentration, which in itself increases a firm's debt capacity. The net effect, however, is negative, and greater moral hazard leads to lower debt capacity.

Moral hazard in the debt market affects industry concentration because it reduces a firm's ability to raise funds in the debt markets, and therefore hinders entry. As we discussed above, a more severe moral hazard problem decreases a

firm's debt capacity, and increases the amount of equity required to finance the project. This also implies that greater moral hazard leads to greater book and market value of equity. Firms, however, can only partially offset the reduction in debt financing with a corresponding increase of equity. This happens because a reduction of a dollar in cash flow paid out to creditors results in only $(1-\beta)$ of added "equity capacity," since a fraction β of the firm's cash flow is diverted to the entrepreneur. Therefore, a reduction in debt capacity impairs the firm's overall ability to raise funds, leading to less entry and greater industry concentration.

4. Leverage, Industry Concentration, and Profitability

We now examine the predictions of our model for the cross sectional variation of leverage, industry concentration, and profitability that would be observed within an industry, across industries within the same corporate governance jurisdiction, and across economies with different corporate governance jurisdictions.

In our model, firms' heterogeneity may come from three different 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, where different sectors have different exposure to the moral hazard problem, and thus different values of the parameter η. Third, across countries, where different economic regimes are characterized by different quality of their corporate governance system, and therefore have different values of the parameter β.

In this section we consider the effect of the parameters $\{i, \eta, \beta\}$ on some key ratios that are determined endogenously in the model. The ratios we focus on can be determined both at firm and at industry level, as follows. Our results are summarized in Table 1.

4.1. Cross sectional variation within industries.

First, for each individual firm $i \in [0, n^*]$ within an industry, we can define the following ratios:

i) The *debt-to-equity* ratio:

$$\frac{D_i^*}{S_i^*} = \frac{F_H + \theta n^* - (1-\beta)\eta}{(1-\beta)\,\eta - (n^* - i)\,\theta}, \tag{4.1}$$

$$\frac{D_i^*}{E_i^{M*}} = \frac{F_H + \theta n^* - (1-\beta)\eta}{(1-\beta)\,\eta}, \tag{4.2}$$

where the value of debt, D_i^*, is given by (3.15), and the value of equity can be expressed either at its book value, S_i^*, given by the value of equity issued (3.14), or at its market value, E_i^{M*}.

ii) The *market-to-book* ratio of equity:

$$\frac{E_i^{M*}}{S_i^*} = \frac{(1-\beta)\eta}{(1-\beta)\eta - \theta(n^* - i)}. \tag{4.3}$$

iii) The *return on assets*:

$$ROA_i^* = \frac{\left(\frac{\alpha}{n^*}\right)^2}{F + \theta i}. \tag{4.4}$$

It is easy to verify that the debt-to-equity ratio at book value (4.1) is a decreasing function of i, which reflects the fact that less efficient firms (higher i) must issue more equity to finance their greater needs of capital, while all firms issue (in equilibrium) the same amount of debt, $\bar{D}$ given in (3.15). In contrast, the debt-to-equity ratio using market values, (4.2), is constant for all firms. This property reflects the fact that, in our model, firm efficiency is characterized by the amount of capital necessary to generate the same cash flow. Therefore, firms in the same sector have different invested capital, but have the same cash-flow to equity and thus the same market value of equity.

The market-to-book ratio of equity (4.3) is a decreasing function of i, which again reflects the fact that less efficient firms (higher i) must issue more equity to finance their greater needs of capital, while all firms have the same market value of equity. Finally, the return on assets is, rather intuitively, a decreasing function of i, which reflects the fact that less efficient firms (higher i) must employ more capital to produce output.

Combining these results, we obtain that more efficient firms (characterized by lower i) have greater debt-to-equity ratios and greater profitability, leading to a positive correlation between leverage and profitability for firms within the same industry. Note also that less efficient firms sell more equity to outside investors; this reduces ownership concentration and generates a positive correlation between ownership concentration, leverage and profitability.

4.2. Cross sectional variation across industries and legal jurisdictions.

We can make comparisons across industries and legal jurisdictions by calculating at the industry level the same key ratios we have identified above.

i) industry debt-to-equity ratios:

$$\left(\frac{D^*}{S^*}\right)^{ind} = \frac{F_H + \theta n^* - (1-\beta)\eta}{(1-\beta)\,\eta - \frac{\theta n^*}{2}}, \tag{4.5}$$

$$\left(\frac{D^*}{E^{M*}}\right)^{ind} = \frac{F_H + \theta n^* - (1-\beta)\eta}{(1-\beta)\,\eta}, \tag{4.6}$$

where D^* is the total amount of corporate debt issued by all firms in the same industry, and the total amount of equity issued by all firms in the same industry is measured, again, using either book values, giving (4.5), or using market values, E^{M*}, giving (4.6).

ii) industry market-to-book ratio of equity:

$$\left(\frac{E^{M*}}{S^*}\right)^{ind} = \frac{(1-\beta)\,\eta}{(1-\beta)\,\eta - \frac{\theta n^*}{2}}. \tag{4.7}$$

iii) industry return on assets:

$$ROA^{*\,ind} = \frac{\left(\frac{\alpha}{n^*}\right)^2}{F_H + \frac{\theta n^*}{2}}. \tag{4.8}$$

Both measures of the industry's debt-to-equity ratios, (4.5) and (4.6), are decreasing functions of η, since (from Proposition 3) n^* is a decreasing function of η. These results reflect the fact that industries that are more exposed to the moral hazard problem (greater η) have lower debt capacity and therefore must raise more equity. On the contrary, the industry's market-to-book ratio of equity is a decreasing function of η. This (counterintuitive) result is explained by noting that an increase in the severity of the moral hazard problem (that is greater value of η) reduces a firm's debt capacity requiring firms to sell in equilibrium a greater amount of equity, increasing the book value of equity more than the market value of equity. Finally, the industry's return on assets, (4.8), is an increasing function of η. Again, this (counterintuitive) result depends on the fact that an increase in the severity of the moral hazard problem reduces debt capacity and reduces entry by the marginal, less efficient firms. Thus, only the more efficient firms can enter the market, leading to greater profits and return on assets.

Note that industries characterized by greater moral hazard have greater return on assets and lower leverage. Thus, contrary to what we obtained within

an industry, when we compare results across industries we obtain that leverage is negatively related to profitability. Note also that leverage is also negatively correlated with industry concentration (since n^* is a decreasing function of η).

We can now consider the effect of the quality of the corporate governance system, β, on the measures of leverage and profitability. We find that both measures of the industry's debt-to-equity ratios, (4.5) and (4.6), are increasing functions of β.[10] This result depends on the fact that, in corporate governance environments of low quality (high β), firms find that equity becomes relatively more expensive, reducing entry. Greater industry concentration, in turn, increases industry's profits, which raises firms' debt capacity (from the incentive compatibility constraint, 3.20), and allows firms to borrow more. Also, as is shown in the Appendix, the average market-to-book value of equity is an increasing function of β. Again, higher value of β implies less equity issued (smaller average κ_i and thus smaller book value of equity) and therefore a higher market-to-book ratio. Finally, the industry's return on assets (4.8) is an increasing function of β. This result is, again, an implication of the fact that in our model an increase of β leads to less entry, more concentration and therefore greater industry's profits.

These results imply that, in our model, economies characterized by better corporate governance systems will have, all else equal, industries with lower concentration, smaller debt-to-equity ratios, lower market-to-book value of equity and smaller return on assets. This implies that in cross country comparisons we would observe a positive correlation between leverage, on the one hand, and average profitability and industry concentration, on the other hand. Table 1 summarizes the predictions on firms' financial performance, as we vary either i, η or β, with a plus (negative) sign indicating a positive (negative) partial derivative.

Table 1

	$\frac{D_i^*}{S_i^*}$	$\frac{D_i^*}{E_i^{M*}}$	$\frac{E_i^{M*}}{S_i^*}$	ROA_i^*	$\left(\frac{D^*}{S^*}\right)^{ind.}$	$\left(\frac{D^*}{E^{M*}}\right)^{ind.}$	$\left(\frac{E^{M*}}{S^*}\right)^{ind.}$	$(ROA^*)^{ind}$
i	$-$	0	$-$	$-$	$n.a.$	$n.a.$	$n.a.$	$n.a.$
η	$-$	$-$	$-$	$+$	$-$	$-$	$-$	$+$
β	$+$	$+$	$+/-^a$	$+$	$+$	$+$	$+^b$	$+$

a. Note that the effect of β on individual firms' market-to-book ratio is indeterminate. The market and the book value of equity are both decreasing functions of β, reflecting the fact that firms substitute away from equity financing into debt financing as the level of investor

[10] To see this note that by equation (3.11) $\theta n^* + \eta\beta$ increases in β.

protection deteriorates. For the less efficient firms (large i) the negative effect on the market value dominates, and the market-to-book ratio is a decreasing function of β. In contrast, for the more efficient firms (small i) the negative effect on the book value of equity dominates and the market-to-book ratio is an increasing function of β.

b. This result depends on the assumption that $\eta < F_H$. More generally it holds for all η, such that $\bar{D} > 0$.

5. Competitive Governance

We have so far assumed that the quality of the corporate governance system is exogenously determined by a firm's legal environment, that is its legal jurisdiction. It is often argued that companies compete to improve their corporate governance systems as part of their cost minimization efforts, and that they may use their choice of corporate governance as a competitive tool (see, for example, Allen and Gale, 2000).

In this section we examine the possibility that a firm, by exerting some effort, is able to improve the quality of its governance system. Such activities may either affect the corporate governance system of the individual firm, or it may have an effect also on the overall quality of the governance system of the legal jurisdiction where the firm operates. Examples of the first type of activities include improving corporate disclosures, hiring highly reputable (and expensive) independent directors, changing corporate charters in ways that protect minority shareholders, and so on. Examples of the second type of activities include lobbying to regulators for an improved general legal environment, for a better supervisory activity of monitoring agencies, and so on. We show that, if effort is costly, the ability of firms to improve their corporate governance does promote entry, and thus take the equilibrium closer to the competitive one, but it cannot fully restore the perfectly competitive outcome. This happens because, in equilibrium, entrepreneurs must be compensated for their effort to improve their corporate governance system. Thus, entrepreneurs enter the market until the additional rents they expect to earn in equilibrium exactly compensate for their effort to improve their governance system. We also show that the incentives to exert effort to improve corporate governance are greater in industries with high moral hazard and in economies with poor overall corporate governance.

Assume now that the 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 then must sustain a cost of effort equal to

$$C\left(k,e_i\right)=\frac{ke_i}{1-e_i},$$

where $k\geq 0$. Note that this cost function has the attractive properties that the cost is zero if effort is zero, and that obtaining a "perfect" corporate governance system is prohibitively costly. In this setting, we can interpret the parameter β as reflecting the overall quality of the corporate governance system of the legal jurisdiction where the firm operates. In addition to that, entrepreneurs can exert effort and improve the quality of the governance system of their firms so as to reduce the diversion factor to $\beta(1-e_i)$.

The main results of our paper are modified as follows.

Proposition 4. *(Competitive governance): Assume that entrepreneurs can improve the quality of their governance system by exerting effort, e_i, at a cost $C\left(k,e_i\right)$. If $k<\beta\eta\mu$, there exists an equilibrium where the first $n^{**}>n^{*}$ entrepreneurs enter the market, where n^{**} is implicitly determined by*

$$n^{**}=\frac{\alpha}{\sqrt{F_H+\theta n^{**}+2\sqrt{k\beta(1-\mu)\eta}-k}}.$$

In this case, the optimal effort level exerted by each entrepreneur is

$$e_i^{**}=\left(1-\sqrt{\frac{k}{\beta(1-\mu)\eta}}\right). \tag{5.1}$$

*All results stated in Propositions 2 - 3 remain valid in this new equilibrium (with n** replacing n* when relevant).*

The proposition shows that entrepreneurs exert sufficient effort to generate a corporate governance system with no diversion if reducing β is costless, *i.e.*, if $k=0$. The proposition also shows that effort is largest in industries with high moral hazard and in economies with bad corporate governance. These results follow from the fact that e_i^{**} is an increasing function of β and η. Also, allowing for improvements in corporate governance produces additional entry, $n^{**}>n^{*}$, when k is small enough, but it does not change the main results of our paper.

6. Financial Innovation and Industry Concentration

It has been argued in the literature that a firm's incentives to take excessive risks that arise from debt financing can be curbed by the use of convertible securities,

such as convertible debt or warrants (see, e.g., Green, 1986). The argument is that, by issuing a convertible instrument, the firm issues a call option on the firm's assets that curbs the original risk taking incentives generated by the default option that shareholders have when their firm is debt financed. Thus, the possibility of using innovative financial instruments, i.e., by clever design of financial instruments with embedded options, firms may limit the extent of the risk shifting problem.[11] In this case, financial innovation, by facilitating a firm's ability to raise capital, would allow more entry, reducing industry's concentration and spurring competition.

In this section we argue that the interaction of the agency costs of equity with the risk shifting problem limits the ability of convertible securities to curb the risk shifting problem. In fact, we show that the use of convertible instruments may exacerbate both the risk shifting problem and the agency cost of equity. Recall that in our paper debt is a vehicle of corporate governance in that it allows a reduction of the wealth expropriation by the manager, who is also entrepreneur, at the expense of outside shareholders. In our model, corporate insiders capture a fraction of their firm's cash flow, net of payments to bondholders. Thus, conversion of debt into equity, by increasing the cash flow to equity, eliminates the original restrain offered by debt against insider's looting their company. In this case, convertible debt may in fact *increase*, rather than decrease, the insider's incentives to take risks, exacerbating the risk shifting problem. Thus, the interaction of the risk shifting problem and the agency cost of equity may make the use of convertible securities ineffective, if not counterproductive.

Proposition 5. *(Convertible debt): Assume again the basic model, with the modification that, at $t = 0$, firms can also issue convertible debt, in addition to equity and straight debt. There exists a $\underline{\beta}$ such that if $\underline{\beta} < \beta \leq 1$ in equilibrium the high quality technology is chosen by all firms and the number of firms entering the industry is n^*. In this equilibrium, the least efficient firms, with indices close enough to n^*, use only straight debt.*

The proposition states that if β is sufficiently large, the number of firms, and thus market concentration, is unaffected by this financial innovation. The effectiveness of convertible debt as a tool to deter insiders from excessive risk taking depends on the fraction of equity owned by insiders. In our model, firms insiders first appropriate a fraction β of the cash flow to equity, that is the firm's cash flow net of payments to creditors, and then receive a fraction of the residual cash flow

[11] In a similar vein, convertible securities may be used to limit the effects of adverse selection in the capital markets giving, again, firms a better access to the capital markets (see e.g., Brennan and Kraus, 1987).

in proportion to the fraction of equity they own. The possibility of conversion of the convertible bonds affects insiders incentives as follows. On the one hand, conversion eliminates debt, increases the cash flow to equity, and allows the insiders to appropriate a greater fraction of the firms' cash flow. Therefore, conversion of convertible debt voids the disciplinary role of debt. On the other hand, conversion of the bonds requires the firm to issue new shares and dilutes existing shareholders, including the insiders, providing the usual deterrent to excessive risk taking (see, again, Green 1986). Thus, if the cash flow effect dominates the dilution effect, the presence of convertible debt in a firm's capital structure promotes risk taking, if instead the dilution effect dominates the cash flow effect, convertible debt discourages risk taking (as traditionally suggested).

In our model, very efficient entrepreneurs sell very little equity to outside investors, retaining a large fraction of equity, and therefore are exposed to the potential of dilution from convertible debt. For these entrepreneurs, convertible debt is an effective tool to reduce the potential of risk shifting, and it allows them to increase debt capacity, substitute debt financing for equity financing, and thus reduce the agency cost of equity they incur into. In contrast, the most inefficient entrepreneurs obtaining entry must issue a large amount of equity and insiders retain very little equity. Thus, for these entrepreneurs, when β is sufficiently large the cash flow effect dominates the dilution effect and for them convertible debt is worthless as a tool to reduce or eliminate the risk shifting problem. On the contrary, the use of convertible debt would induce them to take more risk. Thus, in equilibrium, entrepreneurs with sufficiently inefficient technologies (large i) do not issue any convertible debt, but use only straight debt. These observations imply that, at the industry level, availability of convertible debt (and other option like instruments) does not induce additional entry in countries with poor corporate governance regimes (high β).[12]

7. Conclusions

The main message of our paper is that the quality of the corporate governance system of an economy may be an important determinant of its competitive conditions. Thus, we suggest the existence of a reverse causality between corporate governance and competition. Our paper also generates several predictions regarding

[12]It is easy to show that in this case issuing warrants does not allow more entry either. It therefore seems that to a large extent our earlier results are robust to introduction of new securities, such as warrants and convertibles.

the relationships between debt-ratios, market-to-book ratios of equity, ownership concentration, market concentration and firms' profitability. Our model shows that the variations in capital structure across industries differ from the ones within industries and across countries. Thus, our results suggest that empirical research should control for such variables when examining capital structure variations in large cross sectional data sets. We have also examined the role of competition in the production of good corporate governance. We have argued that, in equilibrium, marginal entrepreneurs must earn sufficient rents that compensate them for their effort of producing good governance, limiting competition. Finally, we have shown that the moral hazard problem may interact with the agency cost of equity in a way to make convertible debt ineffective as a tool to control excessive risk taking by potential entrants into the industry. According to our results, the use of convertible debt, or of other similar products of financial innovation, increase the debt capacity for the more efficient firms, where the managers are also owners. For less efficient firms, whose financing opportunities determine the industry structure, convertible debt may not be an attractive option.

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Appendix

Proof of Proposition 1: This proof is outlined in the text, and is therefore omitted.

Proof of Proposition 2: (3.27) and (3.28) follow immediately from Proposition 1 and implicit function differentiation (3.11). Equation (3.29) is obtained similarly by implicit function differentiation of (3.11), obtaining

$$\frac{\partial n^*}{\partial \beta} = \frac{-\eta}{\frac{2\alpha^2}{n^{*3}} + \theta},$$

which gives

$$\varepsilon = \frac{\beta}{n^*}\frac{\partial n^*}{\partial \beta} = \frac{-\eta\beta}{\frac{2\alpha^2}{n^{*2}} + \theta n^*} = \frac{-\eta\beta}{2\left(F_H + \theta n^* + \eta\beta\right) + \theta n^*} = \frac{-1}{\frac{2F_H + 3\theta n^*}{\eta\beta} + 2},$$

which is decreasing in η.

Proof of Proposition 3: (3.30) and (3.31) follow immediately from Proposition 1 and implicit function differentiation.

Proof that $\left(\frac{E^{M*}}{S^*}\right)^{ind}$ is an increasing function of β. To show this property, we need to show that

$$f\left(\beta\right) \equiv \left(\frac{n^*}{1-\beta}\right)^2 = \frac{\alpha^2}{\left(1-\beta\right)^2\left(F_H + \theta n^* + \eta\beta\right)}$$

is an increasing function of β, and thus that $g(\beta) \equiv \left(1-\beta\right)^2\left(F_H + \theta n^* + \eta\beta\right)$ is a decreasing function of β. By differentiation with respect to β, we obtain:

$$\frac{\partial g(\beta)}{\partial \beta} = -2\left(1-\beta\right)\left(F_H + \theta n^* + \eta\beta\right) + \left(1-\beta\right)^2\left(\eta + \theta\frac{\partial n^*}{\partial \beta}\right),$$

which is negative if

$$2\left(F_H + \theta n^* + \eta\beta\right) > \left(1-\beta\right)\eta.$$

This, on the other hand holds under the assumption that there is no moral hazard under all equity financing, $F_H > \eta$.

Proof of Proposition 4 : With the given cost function for effort, we can rewrite the entrepreneurs objective function, (3.18), as:

$$\max_{B_i, e_i \in [0,1]} E_0\left[\widehat{CF}_i(B_i) - F_{H,i} - (1-e_i)\beta(1-\mu)\max\{\widehat{CF}_i(B_i) - B_i; 0\}\right] - C(k, e_i). \tag{7.1}$$

Using our previous results, regarding B_i, we can rewrite (7.1) as:

$$\max_{e_i} E_0 \left[\left(\frac{\alpha}{n}\right)^2 - F_H - \theta i - (1-e_i)\beta(1-\mu)\eta \right] - ke\,(1-e_i)^{-1}. \tag{7.2}$$

Under our assumption that $k < \beta\eta\,(1-\mu)$, the first order condition with respect to e_i gives:

$$e_i^{**} = 1 - \sqrt{\frac{k}{\beta(1-\mu)\eta}}. \tag{7.3}$$

Entry to an industry occurs until the inframarginal entrepreneur's payoff equals zero. Hence, n^{**} satisfies:

$$\left(\frac{\alpha}{n^{**}}\right)^2 - F_H - \theta n^{**} - (1-e_i^{**})\beta(1-\mu)\eta - ke_i^{**}\,(1-e_i^{**})^{-1} = 0. \tag{7.4}$$

or

$$\left(\frac{\alpha}{n^{**}}\right)^2 - F_H - \theta n^{**} - 2\sqrt{k\beta(1-\mu)\eta} + k = 0,$$

implying that n^{**} is implicitly determined by

$$n^{**} = \frac{\alpha}{\sqrt{F_H + \theta n^{**} + 2\sqrt{k\beta(1-\mu)\eta} - k}} > n^*.$$

To see that $n^{**} > n^*$, note that

$$\beta\eta > 2\sqrt{k\beta\eta} - k > 2\sqrt{k\beta(1-\mu)\eta} - k$$

as

$$\beta\eta - 2\sqrt{k\beta\eta} + k = \left(\sqrt{k} - \sqrt{\beta\eta}\right)^2 > 0.$$

Proof of Proposition 5: To maximize incentives to select the safe technology, convertible debt should be structured so that it is converted if and only if the entrepreneur chooses the risky technology, and the output is of high quality. Below we show that if β is large enough such convertible debt will not be adopted by the marginal entrepreneur. With convertible debt the incentive compatibility constraint for entrepreneur i can be written as

$$\mu\beta \left[\left(\frac{\alpha}{n^*}\right)^2 - B_i \right] + (1-\kappa_i)\,(1-\beta) \left[\left(\frac{\alpha}{n^*}\right)^2 - B_i \right] \geq$$

$$\phi\left(\mu\beta+\left(1-\kappa_i\right)\left(1-\gamma_i\right)\left(1-\beta\right)\right)\left[\left(\frac{\alpha}{n^*}\right)^2+F_H-F_L\right], \tag{7.5}$$

where $\gamma_i \in [0,1]$ is the fraction of shares obtained by convertible debt holders through conversion.

Next, we show that the maximal incentives to select the safe, high quality technology, are obtained if $\kappa_i = 0$ and $B_i = F_{H,i}$. First, note that the incentives are maximized by making γ_i as large as possible. To prevent debt holders from converting, if safe technology is chosen, and selecting γ_i as large as possible (given B_i), gives

$$\gamma_i^* = \min\left(1, \frac{B_i}{\left(\frac{\alpha}{n^*}\right)^2\left(1-\beta\right)}\right) > 0.$$

Next note that firms' financing constraint gives

$$\kappa_i = \frac{F_{H,i}-B_i}{\left[\left(\frac{\alpha}{n^*}\right)^2-B_i\right]\left(1-\beta\right)}. \tag{7.6}$$

Now, substituting for κ_i, the left hand side of equation (7.5) becomes

$$\mu\beta\left[\left(\frac{\alpha}{n^*}\right)^2-B_i\right]+\left(1-\beta\right)\left[\left(\frac{\alpha}{n^*}\right)^2-B_i\right]-\kappa_i\left(1-\beta\right)\left[\left(\frac{\alpha}{n^*}\right)^2-B_i\right]=$$

$$\left[\mu\beta+\left(1-\beta\right)\right]\left(\frac{\alpha}{n^*}\right)^2-F_{H,i}+B_i\beta\left(1-\mu\right),$$

which is an increasing function of B_i. Consider next the right hand side of equation (7.5). First, if $\gamma_i^* = 1$, it is independent of B_i. Second, if $\gamma_i^* < 1$, it can be written as

$$\phi\left[\mu\beta+\left(1-\kappa_i\right)\left(1-\frac{B_i}{\left(\frac{\alpha}{n^*}\right)^2\left(1-\beta\right)}\right)\left(1-\beta\right)\right]\left[\left(\frac{\alpha}{n^*}\right)^2+F_H-F_L\right]=$$

$$\left(\mu\beta+\frac{\left(1-\kappa_i\right)\left(\left(\frac{\alpha}{n^*}\right)^2\left(1-\beta\right)-B_i\right)}{\left(\frac{\alpha}{n^*}\right)^2}\right)\phi\left[\left(\frac{\alpha}{n^*}\right)^2+F_H-F_L\right].$$

This reaches its minimum at $B_i = F_{H,i}$ as, substituting for κ_i, we have that

$$\left(1-\kappa_i\right)\left(\left(\frac{\alpha}{n^*}\right)^2\left(1-\beta\right)-B_i\right)= \tag{7.7}$$

$$\frac{\left(\frac{\alpha}{n^*}\right)^2(1-\beta)-F_{H,i}+\beta B_i}{\left(\left(\frac{\alpha}{n^*}\right)^2-B_i\right)(1-\beta)}\left(\left(\frac{\alpha}{n^*}\right)^2(1-\beta)-(1-\beta)B_i-\beta B_i\right)$$
$$=\left(\frac{\alpha}{n^*}\right)^2(1-\beta)-F_{H,i}+\beta B_i\frac{F_{H,i}-B_i}{\left(\left(\frac{\alpha}{n^*}\right)^2-B_i\right)(1-\beta)}.$$

Now, we only have to consider the case where $B_i = F_{H,i}$ and $\kappa_i = 0$. Assuming this, firm i's incentive to select safe technology with convertible debt is satisfied when

$$(\mu\beta+(1-\beta))\left[\left(\frac{\alpha}{n^*}\right)^2-F_{H,i}\right]\geq$$
$$\phi\left(\mu\beta+(1-\boldsymbol{\gamma}_i)(1-\beta)\right)\left[\left(\frac{\alpha}{n^*}\right)^2+F_H-F_L\right].$$

Substituting for $\gamma_i^* = \min\left(1, \frac{F_{H,i}}{\left(\frac{\alpha}{n^*}\right)^2(1-\beta)}\right)$ gives

$$(\mu\beta+(1-\beta))\left[\left(\frac{\alpha}{n^*}\right)^2-F_{H,i}\right]\geq$$
$$\geq\left[\mu\beta+(1-\beta)\max\left(0,\frac{\left(\frac{\alpha}{n^*}\right)^2(1-\beta)-F_{H,i}}{\left(\frac{\alpha}{n^*}\right)^2(1-\beta)}\right)\right]\phi\left[\left(\frac{\alpha}{n^*}\right)^2+F_H-F_L\right]. \quad (7.8)$$

We now show that for the n^*th firm this condition cannot hold for large β. Note that for the n^*th firm, from (3.25), we have that $\left(\frac{\alpha}{n^*}\right)^2 - F_{H,n^*} = \beta\eta$, and, from (3.19) and (3.22), we have

$$\phi\left[\left(\frac{\alpha}{n^*}\right)^2+F_H-F_L\right]>\phi\left[\left(\frac{\alpha}{n^*}\right)^2-\overline{D}+F_H-F_L\right]=\eta. \quad (7.9)$$

Using again (3.25) and the assumption that $F_H > \eta$, noting that $\gamma_{n^*} = 1$, the incentive compatibility constraint (7.8) for the marginal entrepreneur n^* becomes

$$\left[\mu\beta+(1-\beta)\right]\beta\eta\geq\mu\beta\phi\left[\left(\frac{\alpha}{n^*}\right)^2+F_H-F_L\right]$$

or

$$\beta\leq\underline{\beta}\equiv\frac{1-\mu\frac{\phi\left[\left(\frac{\alpha}{n^*}\right)^2+F_H-F_L\right]}{\eta}}{1-\mu}=\frac{1-\mu\left(\frac{\eta+\phi\overline{D}}{\eta}\right)}{1-\mu}<1.$$

By continuity of i, if $\beta > \underline{\beta}$, the incentive compatibility condition (7.8) fails also for firms with indices close enough to n^*.