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Andrei Shleifer and Daniel Wolfenzon

Harvard University and University of Michigan

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Abstract.

We present a simple model of an entrepreneur going public in an environment with poor legal protection of outside shareholders. The model incorporates elements of Becker's (1968) "crime and punishment" framework into a corporate finance environment of Jensen and Meckling (1976). We examine the entrepreneur's decision and the market equilibrium. The model is consistent with a number of empirical regularities concerning the relationship between investor protection and corporate finance.

Andrei Shleifer
Harvard University
Department of Economics
M9 Littauer Center
Cambridge, MA 02138
and NBER
Ashleifer@harvard.edu

Daniel Wolfenson
University of Michigan and
University of Chicago GSB
1101 East 58th Street
Chicago, IL 60637
Tel. (773) 834-8954
daniel.wolfenzon@gsb.uchicago.edu

1. Introduction

Recent research reveals that a number of important differences of financial systems among countries are shaped by the extent of legal protection of outside investors from expropriation by the controlling shareholders or managers. The findings show that better legal protection of outside shareholders is associated with:

(1) more valuable stock markets (La Porta et al. 1997);

(2) a larger number of listed firms (La Porta et al. 1997);

(3) larger listed firms in terms of their sales or assets (Kumar, Rajan, and Zingales 1999);

(4) higher valuation of listed firms relative to their assets (Claessens et al. 1999, La Porta et al. 1999);

(5) greater dividend payouts (La Porta et al. 2000);

(6) lower concentration of ownership and control (European Corporate Governance Network 1997; La Porta, Lopez-de-Silanes and Shleifer 1999, Claessens et al. 2000);

(7) lower private benefits of control (Zingales, 1994, Nenova 1999); and

(8) higher correlation between investment opportunities and actual investments (Wurgler 2000).

While the understanding of the empirical differences in the patterns of corporate finance has advanced considerably, the theoretical work in this area is only beginning. A number of studies model explicitly the expropriation of minority shareholders by the controlling shareholders (see, among others, Grossman and Hart 1988, Harris and Raviv 1988, Hart 1995, Burkart, Gromb and Panunzi 1997, 1998, Friedman and Johnson 2000) and the legal framework underlining such expropriation (La Porta et al. 1998, Johnson, et al. 2000). Other studies attempt to explain theoretically why control is so concentrated in countries with poor shareholder protection (Zingales 1995, La Porta et al. 1999, Bebchuk 1999), and why such organizational form as pyramids may be common (Wolfenzon 1999). Still other studies, such as Bennedsen and Wolfenzon (2000), argue that control structures with multiple large shareholders may be efficient in the environments with poor shareholder protection. La Porta et al. (1999) make the case for higher concentration of cash flow ownership (and not just control) in countries with poor shareholder protection. Each of these studies has focused on specific aspects of legal environments with weak shareholder protection. A market equilibrium model of corporate finance in such environments remains to be developed.[2]

In this paper we present one such model. The model incorporates elements of Becker's (1968) classic "crime and punishment" framework into a corporate finance environment of Jensen and Meckling (1976). We consider an entrepreneur trying to raise equity finance for a project, and deciding how much equity to sell and how big a project to undertake. We follow the literature (Zingales 1995, Bebchuk 1999) in maintaining that the entrepreneur keeps control of the project after the initial share offering. This entrepreneur operates in an environment with limited legal protection of outside shareholders, and so has an opportunity to divert some of the profits of the firm once they materialize (Burkart, Gromb, Panunzi 1998). By doing so, he risks being sued and fined for breaking the law or the shareholder agreement. The quality of investor protection in our model is given by the likelihood that the entrepreneur is caught and fined for expropriating shareholders.

In this simple model, we show how the entrepreneur's decisions on the size of the project and the amount of cash flow to sell are shaped by the legal environment. We then embed this

[2] One strand of the empirical literature not discussed in this paper deals with the implications of investor protection for economic growth. On this, see Carlin and Mayer (1999), Demirguc-Kunt and Maksimovic (1998), Levine and Zervos (1998), and Rajan and Zingales (1998).

going public decision into a market equilibrium with savers and firms, and consider the determination of the size of the capital market. We consider both the case of the world-wide capital market, and that of segmented national markets.

Under plausible conditions, this model generates a number of predictions. Firms are larger, more valuable and more plentiful, dividends are higher (and shareholder expropriation lower), ownership concentration is lower, and stock markets are more developed in countries with better protection of shareholders. In fact, the simple model delivers results corresponding to all eight findings summarized above.

The next section presents the model. Section 3 describes the demand and supply of funds. The equilibrium is described in Section 4. Proofs are relegated to the appendix.

2. The model

Consider a world with C countries, each one populated by J entrepreneurs. Each entrepreneur, $E^{j,c}$ (entrepreneur j from country c), can develop a project by setting up a firm. Entrepreneurs differ in their initial wealth, $W_1^{j,c}$, and in the productivity of their projects, $g^{j,c}$. Since the focus of the paper is on the effect of investor protection, we assume that all countries have an identical pool of entrepreneurs, i.e., for all j, and any two countries c_1 and c_2, $W_1^{j,c_1} = W_1^{j,c_2}$ and $g^{j,c_1} = g^{j,c_2}$.

The model has two dates. At date 1, entrepreneurs choose whether to set up a firm. Firms have two sources of finance. First, from his date 1 wealth, each entrepreneur, $E^{j,c}$, contributes $R_E^{j,c} \leq W_1^{j,c}$ to the firm. He invests his remaining wealth in the market. Second, $E^{j,c}$ raises $R_M^{j,c}$ from the market by selling a fraction $x^{j,c}$ of the firm's cash flow rights. We assume that entrepreneurs retain control of their firms regardless of the fraction of the cash flow rights they sell. Each firm uses the funds committed to it to invest $I^{j,c} \leq R_E^{j,c} + R_M^{j,c}$ in the project, and the remaining $R_E^{j,c} + R_M^{j,c} - I^{j,c}$ in the market.

The market interest rate for country c, i^c, is determined by the supply and demand for funds. Each country's demand for funds is the sum of the individual firm's demand (i.e., for country c, the demand for funds is $\sum_{j \in J} R_M^{j,c}$). Similarly, each country's supply of funds is the sum of entrepreneurs' supply of funds plus the individual firm's supply of funds (i.e., for country c, the supply of funds is $\sum_{j \in J}\left(W_1^{j,c} - R_E^{j,c}\right) + \sum_{j \in J}\left(R_E^{j,c} + R_M^{j,c} - I^{j,c}\right)$). We consider two cases. In the first, there is perfect capital mobility and the world's supply and demand schedules determine the common interest rate. In the second, there is no capital mobility and each country's interest rate is determined by its own demand and supply schedules.

Revenue is realized at date 2. The production function exhibits constant returns to scale: every dollar invested in the project generates $1 + g^j$ dollars. The date 2 revenue of the firm, $\Pi^{j,c}$, is then given by:

$$\Pi^{j,c} = (1 + g^{j,c}) I^{j,c} + (1 + i^c)(R_M^{j,c} + R_E^{j,c} - I_M^{j,c}) \; . \qquad (1)$$

The entrepreneur chooses the fraction $d^{j,c}$ of the revenue he diverts. We assume that the levels of legal protection afforded to minority shareholders vary across countries. Following Becker (1968), we assume that the entrepreneur is caught with probability $k^c \in [0,1]$, where the parameter k^c is a measure of legal protection of investors in country c. Higher values of k^c correspond to better investor protection.

If the entrepreneur is caught, he is forced to return the diverted amount to the firm and, in addition, pay a fine of $f(d^{j,c})\Pi^j$ to the authorities. In this case, the entire revenue is distributed as dividends. However, if the entrepreneur is not caught, he keeps the entire diverted amount. The fraction of the revenue not diverted, $(1-d^{j,k})\Pi^{j,k}$, is distributed as dividends. The entrepreneur's payoff at date 2 is given by:

$$k^c\left[(1-x^{j,c})\Pi^{j,c} - f(d^{j,c})\Pi^{j,c}\right] + (1-k^c)\left[(1-x^{j,c})(1-d^{j,c})\Pi^{j,c} + d^{j,c}\Pi^{j,c}\right]$$
$$+ (1+i^c)(W_1^{j,c} - R_E^{j,c})$$

Rearranging this expression yields:

$$(1-x^{j,c})\left(1-(1-k^c)d^{j,c}\right)\Pi^{j,c} + (1-k^c)d^{j,c}\Pi^{j,c} - k^c f(d^{j,c})\Pi^{j,c}$$
$$+ (1+i^c)(W_1^{j,c} - R_E^{j,c}) \qquad (2)$$

Because the entrepreneur keeps the diverted amount with probability $1-k^c$, $(1-k^c)d^{j,c}\Pi^{j,c}$ is the expected diversion and $\left(1-(1-k^c)d^{j,c}\right)\Pi^{j,c}$ is the expected dividend. The first term in equation (2) is the fraction of the dividends that the entrepreneur obtains from his cash flow holding in the firm. The second term is the expected diversion or private benefits of control (Grossman and Hart 1988). The third term is the expected fine and the fourth term is the amount the entrepreneur receives from his investment in the market.

Finally, we make the following assumption:

Assumption 1: The function $f(\cdot)$ satisfies:

a) $f(0) = 0$,

b) $f'(0) = 0$,

c) $f''(d) > 0$, and

d) $\frac{\partial}{\partial d}\left(\frac{f'(d)}{f''(d)}\right) > 0$.

No fine is incurred when diversion is zero (assumption 1a), and the fine is essentially zero for the first cent diverted (assumption 1b). Assumption 1c) implies that the marginal increase in the fine is increasing with the amount diverted. Assumption 1d) sets a bound on the speed at which $f''(d)$ increases. That is, we allow $f''(d)$ to be decreasing, constant or even increasing, as long as it does not increase too fast. As we discuss below, even though assumption 1d) seems special, it actually prevents the results from being driven too much by the shape of $f()$.[3] In particular, this assumption eliminates the "boil them in oil" results, in which expropriation is precluded entirely with sufficiently heavy penalties even when the probability of detection is low. Extremely heavy civil penalties are uncommon in most countries for reasons of fairness, wealth constraints, and the possibility of false convictions.

3. The demand and supply of funds

In this section we take the interest rate i^c as given and analyze the choices of an entrepreneur, $E^{j,c}$. To lighten notation, we suppress the superscripts in all variables.

At date 2, E chooses the level of diversion to maximize his payoff:

$$\max_d \{(1-x)(1-(1-k)d)+(1-k)d-kf(d)\}\Pi+(1+i)(W_1-R_E)$$

The optimal diversion level $d^*(x,k)$ satisfies the following first order condition[4]:

$$kf'(d^*)=(1-k)x \tag{3}$$

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[3] The results of the model are essentially the same if the fine $f(d,k)$ depends on both the amount diverted and the level of investor protection. In this case we need to add the assumption $f_{12}(d,k)>0$, that is, that the marginal fine is larger in countries with better investor protection. Assumptions 1a-1c will remain the same (i.e., $f(0,k)=0$, $f_1(0,k)=0$, and $f_{11}(d,k)>0$) and the analog of assumption 1d is $\frac{\partial}{\partial d}\left[\frac{f_1(d,k)}{f_{11}(d,k)}\right]>0$, and $\frac{\partial}{\partial d}\left[\frac{f_{12}(d,k)}{f_{11}(d,k)}\right]>0$.

From the viewpoint of the entrepreneur, the left-hand side of equation (3) is the marginal cost of diverting, or the marginal increase in the expected fine. For the next dollar diverted, the fine increases by *f'(d)*and he pays this fine with probability k. The right-hand side is the marginal benefit of diverting, or the marginal increase in expected dividend savings. By diverting an extra dollar, the entrepreneur avoids paying a fraction x of it to outside shareholders, however, he keeps this dollar only with probability *1-k*.

Proposition 1: Suppose that assumptions 1a)-c) hold. The solution to equation (3), $d^*(x,k)$, satisfies:

a) $d^*(0,k)=0$,

b) $d_1^*(x,k)>0$, and

c) $d_2^*(x,k)<0$.

The subscripts 1 and 2 denote the derivatives with respect to the first and second argument respectively. Part a) follows because, for $x=0$, E gets the entire dividend and, therefore, he has no reason to divert and possibly pay a fine.

Part b) follows because the higher the fraction of the cash flow rights in the hands of outside shareholders, the higher the fraction of the next dollar diverted that E avoids paying to them. That is, the marginal benefit of diverting is higher. Part b) is the well-known Jensen and Meckling's (1976) result that higher ownership concentration leads to more efficient actions. Burkart, Gromb, and Panunzi (1998) and La Porta et al. (1999) derive similar results.

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[4] Assumption 1c guarantees that the second order conditions for a maximum are satisfied.

Finally, part c) follows because better investor protection (higher k) implies that diversion is more costly (the entrepreneur pays the fine more often) and less beneficial (the entrepreneur keeps the diverted amount less often). Expected diversion, $(1-k)d^{*}\Pi$, is also lower in better investor protection environments. This is because diversion itself is lower (part c) and, in addition, the entrepreneur is forced to return the diverted amount to the firm more often.

Below, we show that the firm invests in the project the entire amount committed to it. This implies that, in this model, Tobin's Q is given by $(1-d^{*}(1-k))(1+g)$. In addition, expected dividends divided by investment are given by $(1-d^{*}(1-k))(1+g)$, and divided by pre-expropriation cash flow are $(1-d^{*}(1-k))$. Similarly, expected private benefits divided by investment are given by $d^{*}(1-k)(1+g)$, and divided by pre-theft cash flow are $d^{*}(1-k)$. The next result follows:

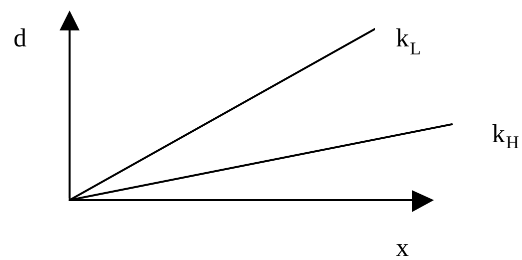
Corollary 1: Controlling for ownership concentration, Tobin's Q and dividends are higher and private benefits lower in countries with better investor protection.

These results are consistent with the findings in La Porta et al. (1999) (for Tobin's Q), La Porta et al. (2000) (for dividends) and Nenova (1999) (for private benefits)--findings (4), (5), and (7) of the introduction.

The sensitivity of diversion to ownership concentration, d_1^{*}, plays an important role in the analysis. Equation (3) shows that the change of this quantity as ownership concentration varies is determined by $f''(d)$. Assumption 1d) guarantees that $f''(d)$ does not increase too fast, and hence d_1^{*} is relatively constant throughout the ownership range. In addition, as the next proposition indicates, this sensitivity is lower in countries with better investor protection.

Proposition 2: Suppose assumptions 1a)-1d) hold, then $d_{12}^{*}(x,k)<0$.

By Proposition 1, for two different levels of investor protection $k_H > k_L$, diversion is zero at $x=0$, and is lower for k_H at all $x>0$. This is shown in the following figure:



Proposition 2 states that, at any x, in addition to being below curve k_L, curve k_H has a lower slope. Unlike Proposition 1, the proof of Proposition 2 requires assumption 1d. However, even without assumption 1d, Proposition 2 must usually hold; otherwise, it would be impossible for curve k_H to be always below curve k_L. In other words, even though we cannot derive Proposition 2 from Assumptions 1a-1c, we can guarantee with these three assumptions that "on average" the slope of curve k_H is smaller than that of curve k_L.[5] In addition, we could do the rest of the analysis with the weaker condition that the sensitivity of *expected* diversion to ownership concentration, $(1-k)d_1^{*}$, is decreasing in investor protection.

There is some empirical support for Proposition 2. La Porta et al. (1999) find that, controlling for growth opportunities (*g* in this model), Tobin's Q is more sensitive to ownership in poor investor protection countries. This translates into our model as

$$\frac{\partial}{\partial k}\left|\frac{\partial\left((1-(1-k)d^*(x,k))(1+g)\right)}{\partial x}\right|<0.$$ Since $d_1^*>0$, this inequality holds if and only if

$\frac{\partial}{\partial k}(1-k)d_1^*(x,k)<0$. This last inequality is sufficient for the proofs of the remaining results.

A natural question to ask at this point is whether, for a given x, an increase in investor protection reduces the expected fine entrepreneurs pay. At first, the answer is ambiguous since such an increase has two opposing effects on the expected fine. On the one hand, the expected fine increases since the entrepreneur is more likely to be caught (direct effect). On the other hand, however, the entrepreneur diverts less (incentive effect), and consequently, when he is caught, the fine is smaller. The following proposition establishes that the incentive effect dominates the direct effect.

Proposition 3: $\frac{\partial}{\partial k}kf(d^*(x,k))<0$.

Proposition 3 states that in the equilibrium where diversion is determined endogenously, the expected fine is larger in countries with poorer investor protection. To understand this result, compare the *increase* in the expected fine (not the total expected fine) as more shares are sold, i.e., $\frac{\partial}{\partial x}kf(d^*)$. This increase is given by the change in expected fine due to an increase in diversion times the change in the level of diversion $kf'(d^*)\cdot d_1^*$. In choosing the optimal

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[5] More formally, $\int_0^x d_1(h,k_H)dh<\int_0^x (d_1(h,k_L)dh$.

diversion level at date 2, the entrepreneur equates the increase in the expected fine, $kf'(d)$, and the increase in expected dividend savings, *(1-k)x*. In a country with poorer investor protection, both the increase in expected dividend savings is higher (the entrepreneur is less likely to be caught) and also the increase in diversion is higher (by Proposition 2). For a given increase in the fraction of shares sold, then, the expected fine increases by more in the country with poorer investor protection. Since this is true at all levels of ownership concentration, the total expected fine is higher as well.

At date 1, E chooses the size of the project, I, the amount of funds he contributes to the firm, R_E, and the fraction of the firm's cash flows he sells, x, by solving the following maximization problem:

$$\max_{I,R_E,x} \left\{(1-x)\left(1-(1-k)d^*\right)+(1-k)d^* - kf(d^*)\right\}\Pi + (1+i)(W_1 - R_E)$$

such that (4)

$R_E \leq W_1$, and

$I \leq R_E + R_M$,

Letting $r(x,k) = x(1-(1-k)d^*(x,k))$ be the fraction of the total revenue that outside shareholders expect to receive, R_M can be written as

$$R_M = \frac{r(x,k)}{1+i}\Pi.$$

If the solution to the above problem is not to invest in the project ($I^* = 0$) and not to raise funds ($R_M^* = 0$), we say that the firm is not set up.

Proposition 4: At the solution the following holds:

a) If $g < i$, the firm is not set up.

b) If $g = i$ the entrepreneur is indifferent between not setting up the firm, and setting up the firm with no outside shareholders ($x^* = 0$) and investing any fraction of his wealth in the project.

c) If $g > i$, the firm is set up and the solution can be of two types:

1) If $\max_x r(x,k)\frac{1+g}{1+i} \geq 1$, the optimal x^* is any of the (potentially) many x's that satisfy $r(x^*,k)\frac{1+g}{1+i} \geq 1$, and $I^* = +\infty$.

2) If $\max_x r(x,k)\frac{1+g}{1+i} < 1$, the entrepreneur invests all his wealth in the project and sets $R_E^* + R_M^* = I^*$. The optimal x^* satisfies

$$\frac{\partial}{\partial x}\left(kf(d^*(x,k))\right) = r_1(x,k)\frac{\frac{1+g}{1+i} - 1 - kf(d^*(x,k))\frac{1+g}{1+i}}{1 - r(x,k)\frac{1+g}{1+i}}, \qquad (5)$$

and $I^* = W_1 \Big/ \left(1 - r(x^*,k)\frac{1+g}{1+i}\right)$.

When $g < i$, the entrepreneur does not invest in the project since the market yields a higher rate of return. In addition, he does not raise funds from the market. At first, it seems that raising funds from the market, reinvesting them in the market and then diverting a fraction of them is a beneficial action for the entrepreneur. However, with rational investors, an entrepreneur who raises funds pays for these funds in full and also incurs an additional cost due to the expected fine he pays. It is only beneficial to raise funds when they can be invested at a higher rate than they are raised.

When $g = i$, the entrepreneur is indifferent between investing in the project or in the market and, as explained above, it is not beneficial for him to raise funds.

When $g > i$, the entrepreneur invests all his wealth in the project since it yields a higher return than the market. In addition, in this case, it pays to raise some funds from the market to invest them at this higher rate. However, for the reason explained above, the funds raised are always invested in the project and never reinvested in the market ($R_E^* + R_M^* = I^*$).

For each dollar invested, the entrepreneur collects $r(x,k)\frac{1+g}{1+i}$. In case c1) there is an x for which this expression is larger than 1. The entrepreneur sets x to such a value and raises more than one dollar per dollar invested. This allows him to invest any amount he wants. To maximize his wealth, he sets $I = +\infty$ and demands an infinite amount of funds. Obviously, the equilibrium never lies in this region. The interest rate rises to equate demand and supply.

However, when for all x, $r(x,k)\frac{1+g}{1+i}$ is less than 1 (case c2), the entrepreneur has to contribute a fraction of each dollar invested and the size of the project is limited by his personal wealth. Using the fact that $R_E^* + R_M^* = I^*$, the objective function in equation (4) can be rewritten as:

$$\max_{x,I}\left[\frac{1+g}{1+i} - 1 - kf(d^*(x,k))\frac{1+g}{1+i}\right]I + W_1 \qquad (6)$$

The expression $\frac{1+g}{1+i} - 1$ is the NPV per dollar invested. Since investors demand the market interest rate *i*, the entrepreneur receives the entire NPV that the project generates. In addition, the entrepreneur pays the expected fine. The expression $kf(d^*)\frac{1+g}{1+i}$ is the present value of the expected fine per dollar invested. The entrepreneur faces the following trade-off when choosing x. A higher x leads to higher diversion and, therefore, a higher fine, but also allows E to raise more funds and expand the size of the project. At the solution (equation (5)), the marginal cost (left-hand side) and the marginal benefit (right-hand side) of increasing x are the same.

Finally, the reason why the solution to equation (5) is a maximum (as opposed to a minimum) is closely related to Assumption 1d. Although the technical proof is in the appendix, we explain here why the marginal cost is increasing and the marginal benefit decreasing, a sufficient condition for the solution of (5) to be a maximum. The marginal cost is the increase in expected fine as a result of an increase in the cash flows sold, x. As explained after Proposition 3, this increase is given by the change in the expected fine due to an change in diversion times the increase in diversion, $kf'(d^*)\cdot d_1^*$. Recall that, at date 2, the entrepreneur equates the increase in the expected fine due to a change in diversion, $kf'(d^*)$, with the increase in expected dividend savings *(1-k)x*, which is increasing in x. Therefore, as long as the increase in diversion, d_1^*, is relatively constant throughout the ownership range, the marginal cost is increasing in x. But, this is precisely what assumption 1d ensures.

The marginal benefit of increasing x is given by the higher than the market rate at which the additional revenue raised can be invested. Here we explain why the additional revenue raised is decreasing in x. This additional revenue is given by $r_1(x,k)=[1-(1-k)d^*]+[-x(1-k)d_1^*]$. The first bracket is the quantity effect. This is the price the market pays for the additional unit sold. Note that for high values of x, the market expects higher diversion and hence pays a lower price for the additional unit sold. That is, the quantity effect is decreasing in x. The second bracket is the price effect. As a result of the additional cash flows the firm sells, the price decreases. The price effect is the negative effect on revenue that this price decline has on all the units sold. Thus the magnitude of the price effect is given by the number of units sold (i.e., x) and by the decline in the price or, equivalently, by the increase in diversion. If the increase in diversion is relatively constant, then the higher the x, the higher the price effect. But this is precisely what Assumption 1d ensures. In sum, as x is increases, the positive quantity effect decreases and the negative price effect increases. Therefore, the additional revenue is decreasing in x. This discussion illustrates that the role of Assumption 1d is to prevent the results from being driven solely by the shape of the *f()* function.

The demand and supply of funds are derived directly from Proposition 4. Firm demand is downward sloping in the interest rate *i*. For a sufficiently large $i(> g)$, the firm is not set up and therefore demand is zero. For intermediate value of i, the firm is set up and its demand for funds is given by $R_M = \frac{r(x^*, k)}{1+i}(1+g)I^*$. Over a range, as i decreases, demand increases. Finally, for i sufficiently low, the demand for funds is infinite. Since individual firm's demand is downward sloping, so is aggregate demand.

The supply of funds from an entrepreneur is as follows. If the interest rate is higher than the productivity of his project ($i>g$), the entrepreneur does not set up a firm and supplies his entire wealth to the market. If, however, the interest rate is below his project's productivity ($i<g$), the entrepreneur invests his entire wealth in the project and does not supply funds to the market. In the case where $i=g$, the entrepreneur is indifferent between supplying any fraction of his wealth to the market and investing the rest in a wholly-owned firm. Note that investor protection does not affect the supply of funds. Finally, aggregate supply of funds is upward sloping. As the interest rate rises, more entrepreneurs find it profitable to supply their wealth to the market rather than setting up their own firms.

4. Equilibrium

We consider two cases. In Section 4.1, we assume perfect capital mobility across countries, and in Section 4.2 we assume no capital mobility.

4.1. Perfect capital mobility

In this case, world interest rate i^* equates world demand and supply for funds:

$$\sum_{c\in C}\sum_{j\in J} R_M^{j,c} = \sum_{c\in C}\sum_{j\in J}\left(W_1^{j,c} - R_E^{j,c}\right)$$

It can be shown that an equilibrium interest rate exists. At i^*, no entrepreneur will be in case (c1) of Proposition 4 because, in that case, the demand for funds is infinite.

Proposition 5: Consider two countries (H and L) that differ in the level of investor protection, with $k^H > k^L$. Country H will have:

a) Lower ownership concentration (for all j, $x^{*j,H} > x^{*j,L}$),

b) Larger external capital markets ($\sum_j R^{*j,H}_M > \sum_j R^{*j,L}_M$), and

c) Higher investment level, i.e., larger firms (for all j, $I^{*j,H} > I^{*j,L}$).

These results correspond to findings (6), (1) and (3) from the introduction. Part a) of this proposition follows from the first order condition in equation (5), which we re-write here as:

$$\frac{\partial}{\partial x}\left[kf(d^*)\right] = r_1 \underbrace{\frac{\frac{1+g}{1+i} - 1 - kf(d^*)\frac{1+g}{1+i}}{1 - r\frac{1+g}{1+i}}}_{q} \qquad (8)$$

This expression equates the marginal cost and the marginal benefit of selling an additional fraction of the cash flow rights (increasing x). The marginal cost (left-hand side) derives from the increase in the expected fine. The fine increases since diversion is higher for lower ownership concentration levels. The marginal benefit (right-hand side) derives from the higher than market return at which the additional funds raised can be invested.

Suppose, for the sake of explanation, that the fraction on the right-hand side is a constant q. This variable can be interpreted as the opportunity cost of funds. Recall that, with better investor protection, any increase in x translates into a smaller increase in d^*, that is, diversion is less sensitive to ownership concentration. First, marginal cost decreases with an increase in investor protection. The reason is that a smaller increase in diversion translates into a smaller increase in the fine.

Second, with better investor protection, more funds are raised when x is increased, that is, the marginal benefit is higher. An increase in x has two effects on the amount raised: it increases the fraction of cash flow rights sold (quantity effect), but it reduces share prices (price effect) due to the increase in diversion. In better investor protection countries, the effect of x on diversion is lower, and hence the price reaction is smaller. Thus, more funds are raised.

Summing up, holding the opportunity cost of funds constant, x^* increases with investor protection because the marginal cost schedule shifts down and the marginal benefit schedule shifts up.

Finally, we consider the effect of investor protection on the opportunity cost of funds, q. By Proposition 3, for a given x, the expected fine is smaller in better investor protection countries. Also, the amount of funds raised is larger. These two facts imply that the opportunity cost of funds is higher in better investor protection countries. This result only strengthens the result that x^* is higher in better investor protection countries, since the marginal benefit increases not only because E raises more funds but also because those funds yield a higher return. This result is consistent with previous empirical literature, such as La Porta, Lopez-de-

Silanes and Shleifer (1999) and Claessens et al. (2000).

Part b) is not as straightforward as it first appears. It is true that, in better investor protection countries, firms sell more shares. But the size of the capital market is measured in dollars. Since lower concentration leads to lower prices, it is not a priori clear that better investor protection countries have larger capital markets. The intuition for the result is as follows. As explained above, an increase in x has two opposite effects on the amount raised: the quantity and the price effect. At the solution, it must be the case that the quantity effect dominates the price effect, that is, the solution is in a region where the amount raised increases with x. If this were not the case, E could increase his payoff by reducing x because by doing so, he would reduce the fine and also increase the amount raised. Higher equilibrium x's therefore do imply larger capital markets. This result is consistent with La Porta et al. (1997).

Part c) follows directly from the previous result. E invests the sum of his own funds plus the amount he raises. The more he raises, the more he invests. This result is consistent with the findings of Kumar, Rajan and Zingales (1999).

We now analyze the number of firms going public. In this model, an entrepreneur goes public (i.e., in this model, sells shares) as long as the return on assets, *g*, is larger than the interest rate, *i*. The reason is that no matter how bad minority shareholders are protected, the costs due to diversion are initially very small and it always pays to sell at least a small fraction of the firm's cash flows. However, the situation changes if there is a small cost of going public, c, that the firm incurs. This cost can be interpreted as the listing costs, such as investment banking fees.

Proposition 6: More firms go public in better investor protection countries.

Because the benefit of going public is larger in better investor protection countries, there are more projects there for which it is profitable to pay the cost to go public. This result is consistent with the evidence in La Porta et al. (1997)--finding (2) in the introduction.

This result reinforces those of Proposition 5. As a consequence of the direct cost of going public, some firms in poor investor protection countries that would have gone public absent this cost, stay private. They remain wholly owned by the entrepreneur and do not raise funds. The variation among countries in ownership concentration and the size of the capital markets is larger than without this direct cost.

Finally, we analyze Tobin's Q, dividends, and private benefits of control under different levels of investor protection. In Corollary 1, we found that, controlling for ownership, Tobin's Q and dividends are higher and private benefits lower in countries with better investor protection. This result was driven by the fact that, controlling for ownership, expected diversion is higher in countries with inferior investor protection (recall that Tobin's Q and dividends divided by investment are both given by $(1-(1-k)d^*)(1+g)$ and private benefits by $(1-k)d^*(1+g)$). Without controlling for ownership, the result is not as straightforward. The change in expected diversion, $(1-k)d^*$, when investor protection improves is given by

$$\frac{\partial}{\partial k}\left[(1-k)d^*\right] = -d^* + (1-k)(d_1^*\frac{\partial x^*}{\partial k} + d_2^*) \, .$$

An increase in investor protection implies that the entrepreneur keeps the diverted amount less often, thereby reducing expected diversion. This effect is captured by the first term. The rest of the expression represents the change in actual diversion. Recall that an increase in investor protection reduces ownership concentration. The second term represents the increase in diversion due to the decline in ownership concentration. Finally, an increase in investor protection discourages diversion (Proposition 1c) and this effect is captured by the third term.

For high levels of investor protection diversion is low. At the extreme, when $k=1$, the entrepreneur never keeps the diverted amount since he is always caught. In addition, he pays the fine. Therefore, he does not divert regardless of the ownership structure. Thus around $k=1$ diversion is low.

However, what happens at intermediate levels of investor protection is given by the magnitude of the three effects discussed above. The first effect (the increase in the probability of returning the diverting amount) is always negative and therefore a sufficient condition for the total effect to be negative is that actual diversion be decreasing in k. The following proposition lays out this sufficient condition.

Proposition 7: If $\frac{\partial}{\partial k}\left(\frac{1-k}{k}x^{*}\right)>0$ then $\frac{d}{dk}(1-k)d^{*}(x^{*},k)<0$.

The condition implies that the equilibrium level of x changes slowly with investor protection. When this is the case, the increase in diversion due to the decline in ownership concentration is small compared to the decrease in diversion due to the disincentive effect of investor protection.

When Proposition 7 holds, countries with better investor protection have higher Tobin's Q, higher dividends, and lower private benefits of control, even though they have lower ownership concentration. These results correspond to findings (4), (5) and (7) of the introduction.

4.2. No capital mobility

In this case, each country has its interest rate determined by its own supply and demand of funds. That is, for country c, the interest rate, i^c, is given by:

$$\sum_{j\in J} R_M^{j,c} = \sum_{j\in J}\left(W_1^{j,c} - R_E^{j,c}\right).$$

The following result can be established:

Proposition 8: Consider two countries with different levels of investor protection. The country with better investor protection will have a higher market interest rate.

The supply schedule of funds in these two countries is the same (see Section 3), but demand is higher in the country with better investor protection. Consequently, the interest rate is higher in this country. This result yields a counterintuitive – but standard -- prediction that, when capital markets in emerging countries open up, capital flows from them to developed countries, which have better investor protection. One possible reason that we observe the opposite is that the growth prospects in the opening markets (as measured by g in the model) improve, which leads to capital flows from developed countries. Another possible reason is risk sharing and diversification.

Regarding the other results in this setting, capital markets are larger and there is more investment in better investor protection countries, but the difference is smaller than in the previous section due to the effect of a higher interest rate. Also, ownership concentration is lower in better investor protection countries, provided the supply of funds is not too steep. An interesting corollary of Proposition 8 is the following:

Corollary 2: In countries with better investor protection, not only are more funds raised by firms, but also these funds are channeled to higher productivity projects.

This result is consistent with the empirical results of Wurgler (2000) and corresponds to finding (8) of the introduction. This result holds since better investor protection leads high productivity firms to demand more funds. This increased demand raises the country's interest rate. As a result, entrepreneurs with moderately productive projects supply their funds to the market in good investor protection countries, but set up their own projects in poor investor protection countries. As a consequence, in good investor protection countries funds concentrate in the high productivity projects.

5. Conclusion

In this paper, we have presented a very basic model of an entrepreneur going public in an environment with poor legal protection of outside shareholders. We examined this entrepreneur's decisions and the market equilibrium. We found that this model is consistent with the basic empirical regularities concerning the relationship between investor protection and corporate finance. It does not appear to us that a simpler model can explain all the existing findings. It remains to be seen whether a more complicated model, particularly one that considers the allocation of resources across sectors and internal as well as external finance, can account for some of the additional differences of financial structures across countries.

Appendix

Proof of Proposition 1

Part a) follows because by Assumption 1b), $f'(0)=0$. Part b) follows by completely differentiating equation (3) with respect to *x* to obtain $d_1^*(x,k)=\dfrac{1}{\frac{k}{1-k}f''(d^*)}>0$. Similarly, part c) follows by completely differentiating equation (3) with respect to *k* to obtain $d_2^*(x,k)=-\dfrac{x}{k^2 f''(d^*)}<0$.ÿ

Proof of Proposition 2

Note that $\dfrac{\partial}{\partial d}\left(\dfrac{f'(d)}{f''(d)}\right)=1-\dfrac{f'''(d)f'(d)}{(f''(d))^2}$, and therefore $d_{12}^*=\dfrac{-1}{k^2 f''(d)}\left[1-\dfrac{f'''(d)f'(d)}{(f''(d))^2}\right]<0$. Note that $d_{12}^*<0$ implies $\dfrac{\partial}{\partial k}\left[(1-k)d_1^*(x,k)\right]<0$. That is, the sensitivity of expected diversion to ownership concentration is decreasing in investor protection This last (weaker) condition is sufficient to prove the following propositions.

Proof of Proposition 3

$$\frac{\partial}{\partial k}kf(d^*(x,k))=\frac{\partial}{\partial k}k\left[f(d^*(0,k))+\int_0^x f'(d^*(h,k))d_1^*(h,k)dh\right]$$

$$=\frac{\partial}{\partial k}\int_0^x h(1-k)d_1^*(h,k)dh$$

$$=\int_0^x h\frac{\partial}{\partial k}\left[(1-k)d_1^*(h,k)\right]dh<0.$$

The second line follows from $d^*(0,k)=0$ (Proposition 1a), $f(0)=0$ (Assumption 1a), and by the replacing $f'(d^*(h,k))$ from the FOC in equation (3). The last inequality follows from Proposition 2. ÿ

Proof of Proposition 4

We first solve for Π and R_M (note that, in the text, each one is defined as a function of the other) to obtain:

$$\Pi = \frac{(g-i)I+(1+i)R_E}{1-r(x,k)}, \text{ and}$$

$$R_M = \frac{r(x,k)}{1+i}\cdot\frac{(g-i)I+(1+i)R_E}{1-r(x,k)}.$$

Using these expressions, the entrepreneur's problem in equation (4) can be written as

$$\max_{I,R_E,x} \{1-r(x,k)-kf(d^*)\}\frac{(g-i)I+(1+i)R_E}{1-r(x,k)}+(1+i)(W_1-R_E) \qquad \text{(A1)}$$

subject to:

$$R_E \le W_1, \text{ and} \qquad \text{(A2)}$$

$$R_E \ge I\left[1-r(x,k)\frac{1+g}{1+i}\right], \qquad \text{(A3)}$$

where the last inequality is equivalent to $R_E + R_M \ge I$.

First, consider the case where $g<i$. Since $g-i<0$, the objective function is decreasing in *I*. Since (A3) is satisfied for $I^*=0$, it is optimal to set $I^*=0$. Now, if $x^*=0$, then $R_M^*=0$. So suppose $x^*>0$. This implies that $kf(d^*)>0$ and hence $\frac{1-r-kf}{1-r}<1$. Therefore setting $R_E^*=0$ maximizes the objective function. In addition, both (A2) and (A3) are satisfied for

$R_E^* = 0$ and $I^* = 0$. Finally, for these values, $R_M^* = 0$.

Second, consider the case where $g = i$. If $x = 0$, the objective function reduces to $(1+i)W_1$, and $R_M = 0$. In this case R_E and I can be set to any value that satisfy the constraint. If, however, $x > 0$, then $\frac{1-r-kf}{1-r} < 1$ and therefore $R_E = 0$ maximizes the objective function. Since I does not affect the objective function, it can be set to any value that satisfy (A3), in this case, the only possible value is $I = 0$. Note that, in this case, the objective function also reduces to $(1+i)W_1$, and that $R_M = 0$.

Finally, consider the case where $g > i$. In this case, the objective function is increasing in *I*. Therefore, in sub-case 1), x^* is such that $r(x^*, k)\frac{1+g}{1+i} \geq 1$ and $I^* = +\infty$. For these values, the constraints are satisfied and the objective function is maximized.

Consider sub-case 2). We show that both constraints bind. First, suppose that, at the solution, $R_E^* > I^*\left[1 - r(x^*, k)\frac{1+g}{1+i}\right]$ or equivalently $R_E^* + R_M > I^*$. Since the constrain is not binding, *I* can be increased, thereby increasing the objective function (contradiction). Since in this sub-case the expression in brackets is positive, (A3) binds at the solution.

Now, since (A3) binds, equation (A1) can be written as:

$$\max_{x,I}\left[\frac{1+g}{1+i} - 1 - kf(d^*(x,k))\frac{1+g}{1+i}\right]I + W_1 \qquad \text{(A1')}$$

and, constraint (A2) as

$$I \leq \frac{W_1}{1 - r(x,k)\frac{1+g}{1+i}}. \qquad \text{(A2')}$$

At the solution, the entrepreneur sets x such that the expression in brackets in (A1') is positive (this expression is positive for $x=0$, and therefore, it must be positive at the solution) and therefore, he sets *I* as high as possible. That is, constraint (A2) binds, which means that the entrepreneur invests his entire wealth in the project. Plugging the value of I into equation (A1') and letting $G(x,k)=\dfrac{\frac{1+g}{1+i}-1-kf(d^*(x,k))\frac{1+g}{1+i}}{1-r(x,k)\frac{1+g}{1+i}}$, the problem reduces to $\max_x G(x,k)$. The FOC of this problem, $G_1(x^*,k)=0$, is equation (5). Finally, we show that the SOC for a maximum hold. Letting $M=\dfrac{\frac{1+g}{1+i}}{1-\frac{1+g}{1+i}r(x^*,k)}>0$,

$$G_{11}(x^*,k)=M\left(-(1-k)d_1^*(x^*,k)-(1-k)x^*d_{11}^*(x^*,k)+r_{11}(x^*,k)G(x^*,k)\right)$$

$$G_{11}(x^*,k)=-M(1-k)d_1^*\left[\left(2-\frac{f'(d)f'''(d)}{(f''(d))^2}\right)G(x^*,k)+\left(1-\frac{f'(d)f'''(d)}{(f''(d))^2}\right)\right]<0$$, where both parenthesis are positive by assumption 1d.ÿ

Proof of Proposition 5

Part a) Suppose $g>i$. Completely differentiating the FOC with respect to k leads to:

$$\frac{\partial x^*}{\partial k}=-\frac{G_{12}(x^*,k)}{G_{11}(x^*,k)}=-\left.\frac{M(-x\frac{\partial}{\partial k}((1-k)d_1)+r_{12}G+r_1G_2)}{G_{11}}\right|_{x=x^*}. \qquad \text{(A4)}$$

We need to show that the above expression is positive. By the SOC, $G_{11}(x^*,k)<0$. As stated above $M>0$. The first term in the numerator is positive since, by Proposition 2, $\frac{\partial}{\partial k}\left((1-k)d_1(x^*,k)\right)<0$. The second term is the product of two positive expressions. First,

$G(0,k) > 0$, and therefore, at the optimal $G(x^*,k) > 0$. Second,

$r_{12} = -\frac{\partial}{\partial k}[(1-k)d] - x\frac{\partial}{\partial k}[(1-k)d_1] > 0$ because the two terms in the first bracket decrease with *k*, and, by Proposition 2, the second term is negative. Finally, the third term in the numerator is also the product of two positive numbers. At the solution, $r_1(x^*,k) > 0$, otherwise equation (5) would not hold. Also $G_k(x^*,k) = M(r_2 G - \frac{\partial}{\partial k}(kf(d^*))) > 0$ because $r_2 = x(d-(1-k)d_2) > 0$ ($d_2 < 0$ by Proposition 1c) and the second term is negative by Proposition 3.

Part b). Each firm raises

$$R_M = \frac{r(x^*,k)}{1+i}(1+g)I^* = \frac{r(x^*,k)}{1+i}(1+g)\frac{W_1}{1-r(x^*,k)\frac{1+g}{1+i}}.$$

This expression is increasing in $r(x^*,k)$. And $\frac{dr(x^*,k)}{dk} = r_1(x^*,k)\frac{\partial x^*}{\partial k} + r_2(x^*,k) > 0$, because 1) $\frac{\partial x^*}{\partial k} > 0$ by part a), 2) $r_1(x^*,k) > 0$ and $r_2(x^*,k) > 0$ as explained in the proof of part a). Since this is true for every firm j, it is also true for the aggregate.

Part c). E invests in assets the amount he raises in the market plus his entire wealth. Since he raises more for higher k, the result follows.ÿ

<u>Proof of Proposition 6</u>

By going public, E gets $G(x^*,k)W_1 + W_1 - c$, and by staying private, E gets $\frac{1+g}{1+i}W_1$. By the envelope theorem, $\frac{dG(x^*,k)}{dk} = G_2(x^*,k)$. This expression is positive as explained in part a) of the proof of Proposition 5. Therefore, the difference between going public and staying private is increasing in k. That is, in good investor protection countries, the g required for the gains of going public to outweigh the cost c is lower. ÿ

Proof of Proposition 7

Let $x(k)$ be the equilibrium level of x for any firm j when the country's level of investor protection is k. By equation (3), the equilibrium level of diversion solves: $f'(d^*) = \frac{1-k}{k} x(k)$. Since $f'' > 0$, the higher the right hand side, the higher the level of diversion. Therefore, diversion is decreasing in k if and only if $\frac{\partial}{\partial k}\left(\frac{1-k}{k} x(k)\right) < 0$.

Proof of Proposition 8

As explained in Section 3, the supply of funds is independent of the degree of investor protection. In addition, as explained in part b) of the proof of Proposition 5, for a given *i*, demand is higher in good investor protection countries. The result follows.

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