THE EFFECTS OF INVESTOR PROTECTION ON THE VENTURE CAPITAL INDUSTRY*

Luis J. Sanz**

Abstract

In this model the level of investor protection shapes both the investment and exit policies of the venture capitalist. It therefore might help to explain the correlation between the development of both the venture capital industry and the stock market across countries, as well as some of the differences between the venture capital industry in Europe and in the U.S.

Keywords: corporate governance, investor, tock market

*I am Grateful to Bilge Yilmaz and Makoto Nakajima for helpful comments.
**INCAE, Apartado 2485, Managua, Nicaragua, Tel.: 505-265-8141, Fax 505-265-8617, E-mail: Luis.Sanz@incae.edu

1. Introduction

Entrepreneurial firms that are characterized by significant intangible assets, expect years of negative earnings, and have uncertain prospects, are unlikely to receive bank loans or other debt financing. Similarly, troubled firms that need to undergo restructuring may find external financing difficult to raise. Venture capital organizations finance these high-risk, potentially high-reward projects. They protect the value of their equity stakes by undertaking careful due diligence before making the investments and retaining powerful oversight rights afterwards.

Typically, venture capitalists do not primarily invest their own capital, but rather raise the bulk of their funds from institutions and individuals. Large institutional investors, such as pension funds and university endowments, are likely to want illiquid long run investments such as venture capital in their portfolio. Often, these groups have neither the staff nor the expertise to make such investments themselves.

In this paper, I consider the venture capitalist as a financial intermediary, subject to the venture capital cycle (Gompers and Lerner, 1999). Venture capital funds are usually organized as limited partnerships with predetermined, finite life spans. The venture capitalist raises money from investors, which expect a return in exchange. Given the finite life span of the partnership, eventually the venture capitalist must exit the investments, and give back the proceeds, less his own compensation, to the investors.

A variety of factors may limit access to capital for some of the most potentially profitable and exciting firms. Financial intermediaries like the venture capitalists are usually considered able to address asymmetric information problems by intensively scrutinizing firms before providing capital and then monitoring them afterwards. Here I focus on the latter role, monitoring the behavior of the entrepreneur.

Finally, venture capital investing is primarily equity investing. Thus, most of the venture capitalist's return arises in the form of capital gains. For this reason, understanding the means by which venture capitalists exit their investments is vital to an understanding of the venture capital process. Potential exit vehicles are Initial Public Offerings (or IPOs), acquisitions, secondary sales, company buybacks, and write-offs. According to Cumming and MacIntosh (2000) the most common in the U.S. and Canada are IPOs and acquisitions.

But the feasibility of these exit vehicles, particularly IPOs, depends on the development of the capital markets. Recent research on corporate governance round the world has established a number of empirical regularities. Such diverse elements of countries' financial systems as breadth and depth of their capital markets, the pace of new security issues, corporate ownership structures, dividend policies, and the efficiency of investment allocation appear to be explained both conceptually and empirically by how well the laws in these countries protect outside investors. According to this research, the protection of shareholders and creditors by the legal system is central to understanding the

patterns of corporate finance in different countries (for a survey, see La Porta, Lopez-de-Silanes, Shleifer, and Vishny, or LLSV, 2000).

In this paper I study how the level of investor protection can affect the venture capital industry. Investor protection can shape the exit policy of the venture capitalists by influencing the profitability of IPOs, relative to other exit vehicles, in particular acquisitions. But it also affects the relationship between the venture capitalists and their investors. Eventually, it can even help to determine the kind of investments that the venture capitalists will undertake.

It is usually assumed that the venture capitalist always prefers to exit his investments through an IPO. Cumming and MacIntosh (2000) suggest that IPOs appear to be the most desirable form of exit for high quality, rapid-growth firms in the U.S. and Canada. However, according to LLSV (1999) firms in countries with lower levels of investor protection are less valued than their counterparts in countries with higher levels of investor protection. Therefore, as long as other exit vehicles are not as affected by the level of investor protection as IPOs, their initial advantage can be eventually overcome by the loss due to the diversion of the firm's cash flow by the entrepreneur.

In my model startups can either be funded directly by an angel investor, or by giving the money to a venture capitalist, who in turn invests in the startup on behalf of the angel investor. If the firm is successful, it yields a small return. Given the level of investor protection, the entrepreneur can costlessly divert up to a certain fraction of the firm's return at the end of the period. Both the angel and the venture capitalist can (costly) monitor the entrepreneur if they have invested in the firm, and in this way recover at least part of the firm's cash flow diverted by the latter.

The venture capitalist has an advantage in that his monitoring cost is lower than that of the angel. However, this might not be enough, because the venture capitalist typically has a lower participation in the proceeds of the investment than the investor. Therefore, the cost advantage has to be high enough to induce the venture capitalist to monitor more than the investor.

But, even this can be short of what is required when we take into account that the venture capitalist can in turn divert part of the funds recovered through the monitoring activity. Because the angel is also able to monitor, the venture capitalist can not divert the proceeds from the investment, except for a part of what he recovers from the entrepreneur. This means that, if the investor protection is low enough, the diversion problem between the angel and the venture capitalist actually outweighs the monitoring advantage of the venture capitalist, inducing the angel to invest by himself. In consequence, the level of investor protection can affect the ability of the venture capital industry to perform its intermediation function.

When the venture capitalist is not able to raise the funds from the angel investor, I assume that he can not invest in startups. However, by raising funds from different kinds of investors, he may be able to fund the growing opportunities of successful firms. Again, his initial advantage, if any, is eventually overcome when investor protection is bad enough. Therefore, for the lowest levels of investor protection, the venture capital industry may collapse together with the capital markets. However, it is not the latter what is causing the former, but rather both are the consequence of the low level of investor protection.

I assume here that the venture capitalist is not allowed to invest in both startups and growing firms, but instead is forced to specialize in one of them. I also assume that even for the highest feasible level of investor protection, the entrepreneur can always obtain some private benefits from diversion. As long as the venture capitalist prefers to invest in startups, we have that for the highest levels of investor protection; he invests in the firm on behalf of the angel, and exits the investment through an IPO.

However, for intermediate levels of investor protection, it is possible that the angel invests directly in the startup, and the venture capitalist in turn funds the expansion phase. I think this result can shed some light on the differences between the venture capital industries in Europe and in the U.S.

This paper contributes to the study of the venture capital industry by considering the venture capitalist as a financial intermediary subject to an agency problem similar to the one he faces when investing in entrepreneurial firms. This is similar to some of the work in Gompers and Lerner (1999). However, to my knowledge this paper is the first attempt to link the development and organization of the venture capital industry with the level of investor protection.

Black and Gilson (1999) suggest that the development of the venture capital industry is correlated with the dynamics of the stock market. And they try to explain this correlation with the idea that IPOs are an important resource for the venture capitalist because the private benefits of control the entrepreneur can enjoy afterwards induce him to work harder if the exit policy of the venture capitalists is to take public the successful firms. For the private benefits of control to play such a key role is required that the cost of both the capital provided by the venture capitalists and the cost of effort by the entrepreneur are together higher than the public returns yielded by the firm.

Only in this case private benefits of control can make a difference by allowing the venture capitalist to use them as part of the entrepreneur's

compensation. In other words, the net present value of these entrepreneurial projects is negative unless private benefits of control (which, in contrast with my model, are independent of the value of the firm) are used as a part of the compensation offered to the entrepreneur for his effort.

In the model here the correlation between the dynamics of the venture capital industry and the stock market is rather explained by the influence of investor protection in both the profitability of IPOs and the funds raised by the venture capitalist. Indeed, investor protection affects the profitability of the stock market for all kinds on investors, including venture capitalists. Then, it is possible that venture capitalists in countries different than the U.S. might prefer other exit vehicles, just like any other investors in those countries. Therefore, the results in Cumming and MacIntosh (2000) about the preference of the venture capitalist to exit rapidly-growing successful firms through IPOs can not just be simply translated to other countries. IPOs need not be the most profitable exit vehicle in all countries.

Obviously, investor protection is only one of many factors that indeed affect the venture capital industry. Moreover, the effects considered here might inter-act with some others, producing different results. However, the main message of this paper is that we can not compare the venture capital industry across different countries without taking into consideration the differences in the level of investor protection. And that policy makers interested in stimulating the development of the venture capital industry should also take a look at the level of investor protection in their respective countries.

The paper is organized as follows. The next section introduces the basic model. Section 3 starts by establishing in this context the (already known) principle of delegated monitoring: if the monitoring cost advantage of the financial intermediary is high enough, the investors delegate the monitoring activity, and the investment, on the venture capitalist. Section 4 analyzes the case when the venture capitalist can divert. It begins by assuming that he is restricted to invest in startups, and then explores what happens if we relax this assumption in a specific way: the venture capitalist can invest in later stage firms when he is not the preferred choice for the startup phase. In light of these results, section 5 reexamines some of the empirical evidence available and discusses the model. Section 6 concludes.

2. The model

There are three risk neutral agents. The first is an entrepreneur (e) with an investment project but not enough wealth to fund it. The second is an angel investor (a). The third is a venture capitalist (v). An angel is a wealthy individual who invests in entrepreneurial firms and performs many of the same functions as the venture capitalist. However, while the latter raises capital from institutional as well as other individual investors, the former invests only his own capital. Therefore, the venture capitalist is the only one that can be considered a financial intermediary.

The project of the entrepreneur has two different stages, both requiring outside financing. The first stage is the startup or development phase. At this time is not clear whether the project can be successful or not. The project is successful with probability p, and unsuccessful otherwise. When successful, the project produces a return of V1, of which the outside investor owns a fraction α. It also yields a growth opportunity. If the project is unsuccessful the return is zero. In the second (or expansion) stage successful firms invest in expanding their operations. There is no discounting.

I assume that the first stage is too risky to support funding through capital markets or other traditional intermediaries. Hence, the only two possible sources of funding are the venture capitalist and the angel investor. I assume that the angel is interested to invest only in the startup stage. In turn, the venture capitalist is constrained to invest only in one phase, he either invests on the startup stage or in the expansion phase. Furthermore, I assume that the venture capitalists have a preference for the development phase.

Therefore, he will invest in the second stage only when he can not do it in the first one. However, once the project has been shown to be successful, it is possible to raise funds from the capital markets (V1 is not enough to fund this part). This will provide both types of investor with an exit vehicle for their investments. Under this alternative, the entrepreneur will regain unsupervised control of the firm, yielding a return of V_2^e. There is also the possibility of selling the outside investor's participation in the project to an established firm, or buyer, who will fire the entrepreneur, take control of the firm, and finance its expansion. However, given that the project has already proven to be successful under the management of the entrepreneur, I assume that the second stage return under the buyer is only $V_2^b \leq V_2^e$. [1]

In each stage the entrepreneur can divert, at no cost, a fraction φ [0, 1] of the firm's cash flow, which produces the same amount of private

[1] This seems consistent with the actual returns pf the venture capital industry in the U.S. According to Gompers and Lerner (1999), by far the most profitable exit is an IPO, yielding $1.95 in excess of an initial investment of $1, with an average holding period of 4.2 years. The next bes6t alternative is an acquisition, with an average holding period of 4.2 years. The next best alternative is an acquisition, which yields a return of only 0.4 cents over a 3.7 years average holding period.

consumption for him. But expropriation of shareholders is limited by the legal system. To model legal shareholder protection I follow Burkart, Panunzi, and Shleifer (2002) and assume that the law sets and upper bound φ [0, 1] to the fraction of the firm's cash flow that can be diverted. Stronger legal protection corresponds to lower values of φ.

The law is not the only determinant of the fraction of resources diverted for private benefits. The other is monitoring. Both the venture capitalist and the angel investor can monitor the entrepreneur at a cost $k_j \frac{m_j^2}{2}, k_j > 0$ for all j, j {v, a}, and recover a fraction mj [0, 1] of the firm's cash flow. The monitoring technology of the venture capitalist is superior, due to a higher expertise, to that of the angel investor, and this is reflected on a lower monitoring cost, ka > kv. Therefore, the angel must decide whether to invest by himself or give his funds to the venture capitalist, who in turn will invest on his behalf.

Investments funded through the capital markets are not subject to monitoring, probably because individual investors will have a participation too small to justify the monitoring cost.

Also, to simplify the calculations I assume that the expected value of the buyer in the second stage is independent from the level of investor protection.

Actually, for the results is enough that IPOs are more affected by the (low) level of investor protection than other exit vehicles. This might be the case if, for instance, the acquirer is a private firm with a big controlling shareholder.

3. Only the entrepreneur can divert

Here I restrict the venture capitalist to invest only in startups, and then consider whether the angel investor should give his money to the venture capitalist, or rather invest it by himself. Since the angel investor is also assumed to invest only during the development phase, both investors are required to exit their investment at the end of the first period. Hence, the only two exit vehicles.

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The next best alternative is an acquisition, which yields a return of only 0.4 cents over a 3.7 years average holding period. Available at this time are an IPO or selling the firm (acquisition)[2]. I analyze the problem backwards, starting by the exit decision at the end of the startup stage, and then exploring whether the firm is funded by either the angel investor or the venture capitalist.

3.1. Exit policy

First notice that in this simple framework the exit decision is the same for the venture capitalist and the angel investor. They both want to maximize their profits by choosing the most profitable exit vehicle. Hence, this decision is independent of the type of investor.

Although an IPO will produce a higher return for the investor in the Absence of expropriation, this advantage is reduced by diversion. As the next lemma shows, once we take into account the effect of investor protection, an IPO needs not be the preferred exit vehicle all the time.

Lemma 1 For $\varphi \le 1 - \frac{V_2^b}{V_2^e}$, *, an IPO is preferred to an acquisition. For* $\varphi > 1 - V \frac{V_2^b}{V_2^e}$, *the opposite is true.*

Proof. First, notice only that since expropriation is costless, there is no Reason for the entrepreneur to divert less than φ. Now, because of diversion, what the investor can obtain from selling the firm through an IPO is only $(1 - \varphi)V_2^e$, rather than V_2^e. And from an acquisition the investor can get V_2^b. Comparing these two results we have that the IPO is preferred as long as $(1 - \varphi)V_2^e \ge V_2^b$.After some algebra, this is equal to $\varphi \le 1 - \frac{V_2^b}{V_2^e}$

Lemma 1 tells us that for high levels of investor protection, the stock market is the preferred alternative to exit their investment for both investors. But for low levels they both favor an acquisition. Let $V_2 = \max \left\{V_2^b, (1-\phi)V_2^e\right\}$. Realize that the level of investor protection can affect the profitability of the original investment, by reducing the expected profit in the second stage.[3]

[2] These are indeed the two most common exit vehicles in the U.S. and Canada, according to Cumming and MacIntosh (2000).

[3] LLSV (1999) found evidence of higher valuation of firms in countries with better protection of minority shareholders. But clearly this affects all firms and not only those founded by venture capitalist. Therefore, in general the level of investor protection can effect the funding of new firms, as long as they depend on outside financing. Notice also that the results here are consistent with other works in that the number of listed firms is lower in countries with low levels of investor's protection(LLSV,2000).

3.2. Financial intermediation versus direct investment

We know that the participation of the outside investor in the firm is equal to α. Additionally, let δ be the participation of the venture capitalist in the venture capital fund. And let β be his participation in the firm. Hence,

$$\beta = \delta\alpha \quad (1)$$

Since V_2 V2 comes from a public transaction, I assume that the entrepreneur can not divert any fraction of it. However, consider the diversion problem in the first stage. If successful, the firm yields a return of V_2. The entrepreneur can divert up to a fraction φ of it. However, given the monitoring technology, he only controls

$$\phi_e = \max\{0, \bar{\phi} - m_j\} \quad (2)$$

for j □ {a, v}. In turn, the monitoring decision of the angel investor is determined by

$$\max_{Ma}\left\{\alpha\left(1-\bar{\phi}+m_a\right)V_1 - k_a\frac{M_a^2}{2}\right\} \quad (3)$$

However, the angel investor does not monitor more than φ. Therefore, we have that

$$m_v^* = \min\left[\bar{\phi}, \beta\frac{V_1}{k_a}\right] \quad (4)$$

Notice that in order to guarantee that $m_a^* \in [0,1]$ for all α, we require that $k_a \geq V_1$. In a similar fashion we can determine that

$$m_v^* = \min\left[\bar{\phi}, \beta\frac{V_1}{k_v}\right] \quad (5)$$

Again, we require that $k_v > V_1$. Now, when $\bar{\phi} \leq \min\left\{\left[\alpha\frac{V_1}{k_a}, \beta\frac{V_1}{k_v}\right]\right\}$, neither the venture capitalist nor the angel investor have a monitoring advantage over the other, because both $m_{vc}^* = m_{ai}^* = \phi.$. Moreover, the entrepreneur does not enjoy any private benefits at all. In order to make the model more interesting, I will consider only situations in which the entrepreneur always enjoys private benefits of control. To that effect the following assumption is made.

Assumption 1: $\bar{\phi} \geq \max\left\{\alpha\frac{V_1}{k_a}, \beta\frac{V_1}{k_v}\right\}$

Now, this assumption implies that $m_v^* = \beta\frac{V_1}{k_v}$,, and $m_a^* = \alpha_{k_a}^{V_1}$. If $m_v^* \geq m_a^*$ the venture capitalist has a monitoring advantage, while if $m_v^* \leq m_a^*$ is the angel who has the edge. This is established in the next lemma.

Lemma 2 Suppose assumption 1 is satisfied. Then, for $\delta > \frac{k_v}{k_a}$ the angel investor gives his money to the venture capitalist, who in turn invests on his behalf. For δ $\delta \leq \frac{k_v}{k_a}$ the angel investor finances the project directly.

Proof. Since V2 is the same for both types of investor, we only have to compare their utility in the first stage. The angel investor will give his money to the venture capitalist when his share of the funds recovered by the venture capitalist through monitoring equals or exceeds the amount he will recover by himself, i.e., when

$$m_v^* \geq m_a^* \quad (6)$$

Given assumption 1 this is equivalent to

$$\beta\frac{V_1}{k_v} \geq \alpha\frac{V_1}{k_a}$$

$$\Longleftrightarrow$$

$$\delta \geq \frac{k_v}{k_a} \quad (7)$$

Lemma 2 tells us that when the difference in monitoring costs is enough to compensate for the lower participation of the venture capitalist in the firm, then the angel prefers to invest his money in the venture capital fund. In other words, for the venture capitalist to emerge as a financial intermediary a lower monitoring cost is not enough in this case. Because the venture capitalist has a lower participation in the proceeds recovered through the monitoring activity, his cost has to be low enough in order for him to be willing to monitor more than the angel investor. This is the usual result on delegated monitoring, adapted to the model considered here.

Proposition 3. Suppose assumption 1 is satisfied and that $\delta \geq \frac{k_v}{k_a}$. *Then, the venture capitalist exits the investment through an IPO if* $\bar{\phi} \leq 1 - \frac{V_2^b}{V_2^e}$, *and through an acquisition otherwise.*

Proof. It follows from lemmas 1 and 2.

Proposition 3 tell us that when the venture capitalist invest on behalf of the angel investor, an IPO is not always his preferred exit vehicle. Obviously, the case here is extreme because I assumed that the value of the successful firm for the buyer is independent of the level of investor protection. However, as long as the buyer's

valuations is less affected by the level of investor protection than the stock market's valuation of the firm, the initial advantage of taking the firm public tends to disappear. Although IPOs might indeed have advantages not considered in this paper, clearly the level of investor protection has an impact on their profitability (and even on their feasibility).

But, Allen (2001) suggests that there is an inconsistency in assuming that when you give your money to a financial institution there is no agency problem but when you give it to a firm there is. The next section deals with an extended model that allows for this possibility.

4. Allowing the venture capitalist to divert

In this section we go back to the question in Diamond (1984): who monitors the monitor? Rather than to assume the optimal contract between the intermediary and the investor, as Diamond does, I just consider the effect of the level of investor protection in the relationship between the investor and the venture capitalist, when their contract is equity-like.

I assume that the venture capitalist can divert in turn a fraction ϕ of the fraction m_v recovered through monitoring, subject to the same upper bound as the entrepreneur. This means that the venture capitalist can appropriate for himself at no cost up to a fraction $\bar{\phi} m_v$ of the firm's cash flow. The reason why the venture capitalist can divert only from the amount he recovers is that this is precisely the less visible return, presumably because it was already hidden by the entrepreneur.

In contrast, whatever the latter does not divert by himself remains open to the public and it should be easier to verify by the investors of the venture fund (given that the angel can monitor too). The question now is whether the monitoring advantage of the venture capitalist, with respect to the investment in the firm, is enough to compensate for the diversion problem between him and his own investors?

4.1. Does the venture capitalist have an initial advantage?

In this extended model the monitoring decision of the venture capitalist is given by the following problem

$$\max_{\tilde{m}_v}\left\{\beta\left(1-\bar{\phi}\right)\left(1+\tilde{m}_v\right)V_1+\bar{\phi}\tilde{m}V_1-k_v\frac{\tilde{m}_v^2}{2}\right\} \quad (8)$$

Hence, as before, we have that

$$\tilde{m}_v^* = \min\left\{\bar{\phi}, \left[\beta+\bar{\phi}(1-\beta)\right]\frac{V_1}{k_v}\right\} \quad (9)$$

Comparing conditions (5) and (9) is clear that the possibility of divert for his private use part of the proceedings from monitoring the entrepreneur increases the incentives of the venture capitalist to do so. Notice that now assumption 1 is not enough to guarantee the existence of private benefits of control for the entrepreneur. In fact, they are zero for $\bar{\phi} \in \left[\frac{\beta V_1}{Ka}, \frac{\beta V_1}{k_v-(1-\beta)V_1}\right]$. Hence, the next assumption is made to provide conditions similar to those in the previous section.

Assumption 2: $\bar{\phi} \geq \max\left\{\alpha\frac{V_1}{k_a}, \frac{\beta V_1}{k_v-(1-\beta)V_1}\right\}$

But now diversion also affects the amount recovered that is available to be distributed to the investors in the venture fund. For this reason, it is not clear when the venture capitalist really yields higher revenues for the investor, compared with what the angel can do by himself. In this case, the angel have to compare the value of the investment in the firm under the venture capitalist, $\left(1-\bar{\phi}\right)\left(1+\tilde{m}_v^*\right)V_1+V_2$, with the value of the investment in the firm if he invest directly, $\left(1+m_a^*\right)V_1+V_2$. As before, we can reduce this problem to the comparison of $\left(1-\bar{\phi}\right)\tilde{m}_v^*$ and m_a^*.

In the previous section $\delta \geq \frac{k_v}{k_a}$ together with assumption 1 implied that the venture capitalist had a monitoring advantage over the angel investor $\left(m_{vc}^* \geq m_{ai}^*\right)$, and therefore the latter preferred to give the funds to the former. However, this needs not be the case anymore. Even if $\tilde{m}_v^* \geq m_a^*$, still it is possible that $\left(1-\bar{\phi}\right)\tilde{m}_v^* \leq m_a^*$ under assumption 2. In words, the distortion introduced by diversion in the relationship between the venture capitalist and the investor might be high enough to overcome the venture capitalist's monitoring advantage. Then, when will the angel investor give his money to the venture capitalist? The next proposition starts to answer this question by considering if the venture capitalist is indeed the preferred choice of the investor when the level of diversion allowed is minimum, i.e., when $\bar{\phi} = \max\left\{\alpha\frac{V_1}{k_a}, \frac{\beta V_1}{k_v-(1-\beta)V_1}\right\}$

Proposition 4. Suppose that assumption 2 holds with equality. Then, when $\left(\frac{k_v-V_1}{k_v-(1-\beta)V_1}\right)\left(\frac{k_v}{k_v-(1-\beta)V1}\right)\delta \geq \frac{k_a}{k_a}$, *the angel prefers to give his funds to the venture*

capitalist $\left(\frac{k_v - V_1}{k_v - (1-\beta)V_1}\right)\left(\frac{k_v}{k_v - (1-\beta)V1}\right)\delta \geq \frac{k_a}{k_a}$, *the angel invests by himself.*

Proof. In order to establish whether the angel prefers to give the money to the venture capitalist or to invest by himself, we have to compare $(1-\bar{\phi})m_v^*$ with m_a^*, both evaluated at $\bar{\phi} = \max\left\{\alpha\frac{V_1}{k_a}, \frac{\beta V_1}{k_v - (1-\beta)V_1}\right\}$. This implies that $\tilde{m}_a^* = \left[\phi + \bar{\phi}(1-\beta)\right]\frac{V_1}{k_v}$, and that . Hence,

$$\left[(1-\bar{\phi})\left[\beta + \bar{\phi}(1-\beta)\right]\frac{V_1}{k_v}\right]_{\bar{\phi}=\beta\frac{V_1}{k_v}} \geq \alpha\frac{V_1}{k_a}$$

$$\left(\frac{k_v - V_1}{k_v - (1-\beta)V_1}\right)\left(\frac{k_v}{k_v - (1-\beta)V_1}\right)\beta\frac{V_1}{k_v} \geq \alpha\frac{V_1}{k_a}$$

or

$$\left(\frac{k_v - V_1}{k_v - (1-\beta)V_1}\right)\left(\frac{k_v}{k_v - (1-\beta)V_1}\right)\delta \geq \frac{k_v}{k_a}$$

Proposition 4 tells us that when the cost of monitoring for the angel, k_a, is high enough compared to the cost for the venture capitalist, kv , the angel investor prefers to let the venture capitalist invest on his behalf at the highest level of investor protection feasible. The problem now becomes whether this initial advantage of the venture capitalist is sustained as we let the level of investor protection decrease, i.e., as φ increases even further. This is the topic of the next section.

4.2. Is this initial advantage sustainable for lower levels of investor protection?

Once we have established the conditions for which the venture capitalist is the investment vehicle used by the angel investor at the highest feasible level of investor protection, we can turn our attention to the sustainability of this initial advantage.

As the level of investor protection decreases, it affects not only the investment in the project of the entrepreneur, but also the relationship between the angel investor and the venture capitalist. It is possible that for lower levels of investor protection, the angel prefers to invest by himself. In other words, we want to know if the initial advantage of the venture capitalist can be eroded by the level of investor protection.

This is established in the next lemma.

Lemma 5. Suppose that assumption 2 holds and that $\left(\frac{k_v - V_1}{k_v - (1-\beta)V_1}\right)\left(\frac{k_v}{k_v - (1-\beta)V}\right)\delta \geq \frac{k_v}{k_a}$. Then, the initial advantage of the venture capitalist is eroded for φ sufficiently high (but strictly less than 1).

Proof. Assumption 2 implies that $\tilde{m}_v^* = \left[\beta + \bar{\phi}(1-\beta)\right]\frac{V_1}{k_v}$. To check if the initial advantage of the venture capitalist is lost we need to solve for ϕ in

$$(1-\tilde{\phi})\left[\beta + \bar{\phi}(1-\beta)\right]\frac{V_1}{k_v} = \alpha\frac{V_1}{k_a} \quad (10)$$

The roots in equation (10) are given by

$$\tilde{\phi} = \frac{-(1-2\beta) \pm \sqrt{(1-2\beta)^2 - 4(1-\beta)\left(\alpha\frac{k_v}{k_a} - \beta\right)}}{-2(1-\beta)} \quad (11)$$

$\delta \geq \frac{k_v}{k_a}$ guarantees that both roots are real. But, if the venture capitalist has indeed an initial advantage, we are only interested in the highest root, or

$$\tilde{\phi}_- = \frac{-(1-2\beta) - \sqrt{(1-2\beta)^2 - 4(1-\beta)\left(\alpha\frac{k_v}{k_a} - \beta\right)}}{-2(1-\beta)} \quad (12)$$

and we want to show that $\tilde{\phi}_- \leq 1$, i.e.,

$$\frac{-(1-2\beta)^2 - \sqrt{(1-2\beta)^2 - 4(1-\beta)\left(\alpha\frac{k_v}{k_a} - \beta\right)}}{-2(1-\beta)} \leq 1$$

$$(1-2\beta) + \sqrt{(1-2\beta)^2 - 4(1-\beta)\left(\alpha\frac{k_v}{k_a} - \beta\right)} \leq 2(1-\beta)$$

$$\sqrt{(1-2\beta)^2 - 4(1-\beta)\left(\alpha\frac{k_v}{k_a} - \beta\right)} \leq 2(1-\beta)$$

$$(1-2\beta)^2 - 4(1-\beta)\left(\alpha\frac{k_v}{k_a} - \beta\right) \leq 1$$

$$\beta - \alpha\frac{k_v}{k_a} \leq \frac{1-(1-2\beta)^2}{4(1-\beta)}$$

$$-\alpha\frac{k_v}{k_a} \leq \frac{1-(1-2\beta)^2 - 4(1-\beta)\beta}{4(1-\beta)} = 0$$

Lemma 5 tells us that, under similar conditions as in lemma 2, the optimality of the venture capitalist

is not absolute: for lower levels of investor protection the angel prefers to invest by himself. This is one of the effects of the level of investor protection in the venture capital industry. The other, stated in lemma 1, is on the exit policy. Also, realize that if $1-\frac{V_2^b}{V_2^e} \le \alpha \frac{V_1}{k_v}$, then IPOs never happen. The exit policy is therefore restricted to acquisitions, and lemma 5 applies directly. The next proposition puts both effects together.

Proposition 6. Suppose that assumption 2 holds, that $1-\frac{V_2^b}{V_2^e} \ge \alpha \frac{V_1}{k_v}$, *and that* $\left(\frac{k_v - V_1}{k_v-(1-\beta)V_1}\right)\left(\frac{k_v}{k_v-(1-\beta)V_1}\right)\delta \ge \frac{k_v}{k_a}$. *Then, when* $\alpha \frac{V_1}{K_v} \le 1-\frac{V_2^b}{V_2^e} \le \phi\_$ *we have that: (i) for* $\alpha \frac{V_1}{k_v} \le \bar{\phi} \le 1-\frac{V_2^b}{V_2^e}$ *the venture capitalist invests on behalf of the angel, and exits through an IPO; (ii) for* $1-\frac{V_2^b}{V_2^e} \le \bar{\phi} \le \tilde{\phi}\_$ *the venture capitalist invests on behalf of the angel but exits through an acquisition; (iii) for* $\bar{\phi}\_ \le \phi$ *the angel invests directly and exits through an acquisition. And, when* $\alpha \frac{V_1}{k_v} \le \tilde{\phi}\_ \le 1-\frac{V_2^b}{V_2^e}$ we have that: (i) for $\alpha \frac{V_1}{K_v} \le \bar{\phi} \le \tilde{\phi}\_$ the venture capitalist invests on behalf of the angel and exits through an IPO; (ii) for $\tilde{\phi}\_ \le 1-\frac{V_2^b}{V_2^e}$ the angel invests by himself and exits through an IPO; (iii) $1-\frac{V_2^b}{V_2^e} \le \bar{\phi}$ the angel invests directly but exits through and acquisition.

Proof. It follows from lemmas 1 and 5, and proposition 4.

The results in proposition 6 are clear cut for both high and low levels of investor protection: for the former the venture capitalist is the outside investor and IPOs are the preferred exit mechanism, while for the latter the angel finances the startups directly and sells the successful ones to the buyer.

However, the results for intermediate levels of investor protection depend on the value of some of the parameters. In one case the investor finances the firm directly, while in the other he gives his money to the venture capitalist. What it is interesting is that when the latter happens, the venture capitalist prefers to exit by selling the successful firms to the buyer, even though he could have taken them public. This result is again at odds with the common supposition that the venture capitalist always prefers IPOs.

Hitherto I restricted the venture capitalist to invest only in startups. The next section explores what happens if he is allowed to invest in later stages when the angel invests by himself during the development phase.

5. Allowing the venture capitalist to invest in the growing phase

Assume now that the venture capitalist can invest in the expansion phase as long as the angel investor invests by himself in the startup stage. Since the angel investor is funding the firm at its start, it must be that the venture capitalist raises his funds from other investors. Also, I assume that the value of the firm, absent any diversion, remains the same when taken public, i.e., V_2^e.

Given the monitoring technology of the venture capitalist, the exit choice at the end of the startup stage is restricted again to two alternatives: the venture capitalist or an acquisition.[4] Denote the venture capitalist participation in the firm in the second stage as γ. Then, his monitoring choice is given by

$$\tilde{m}_v = \max\left\{\bar{\phi}, \left[\gamma + \bar{\phi}(1-\gamma)\right]\frac{V_2^e}{k_v}\right\} \qquad (13)$$

Notice that the entrepreneur might or might not enjoy private benefits in the second period, since I will no assume here anything about φ. The next lemma shows what the optimal exit policy is in this case.

Lemma 7. When the exit choice at the end of the startup phase is between a venture capitalist and a buyer, we have that: (i) for $\bar{\phi} \le 1-\frac{V_2^b}{(1+m_v)V_2^e}$ the venture capitalist is preferred; (ii) while for $\bar{\phi} \ge 1-\frac{V_2^b}{(1+m_v)V_2^e}$ the buyer is preferred.

Proof. The proof is trivial and follows from the fact that the venture capitalist is preferred to the buyer if

$$(1-\bar{\phi})(1+\tilde{m}_v)V_2^e \ge V_2^b.$$

Now, from proposition 6 we know that there are two different cases in which the venture capitalist is not the preferred investor at the startup stage. The next proposition analyzes when, if any, the venture capitalist would be the chosen mechanism to fund the expansion stage.

Proposition 8. Suppose proposition 6 holds and $\tilde{\phi}\_ \le \bar{\phi}$. When $\bar{\phi}\_ \ge 1-\frac{V_2^b}{(1+\tilde{m}_v)V_2^e}$

[4] In fact, this will remain true even of the value of the firm in the second period under the venture capitalist were $V_2^v \le V_2^e$. All that is requires is $(1-\bar{\phi})(1+m_v)V_2^v \ge (1-\bar{\phi})V_2^e, i.e, m_v \ge \left(\frac{V_2^e}{V_2^v}-1\right)$

the venture capitalist is never preferred. When $\overline{\phi}\_ \leq 1 - \frac{V_2^b}{(1+\tilde{m}_v)V_2^e}$ the venture capitalist is preferred only if $\overline{\phi}\_ \leq \phi \leq 1 - \frac{V_2^b}{(1+\tilde{m}_v)V_2^e}$.

Proof. From proposition 6 we know that when $\tilde{\phi}\_ \leq \overline{\phi}$ the angel investor finances the startup stage directly. Hence, the venture capitalist is then allowed to invest in the expansion stage. When $\overline{\phi}\_ \geq 1 - \frac{V_2^b}{(1+\tilde{m}_v)V_2^e}$, lemma 7 implies that the venture capitalist is not chosen to fund the expansion phase either.

Now, when $\overline{\phi}\_ \leq 1 - \frac{V_2^b}{(1+\tilde{m}_v)V_2^e}$ it follows directly from lemma 7 that the venture capitalist is preferred as long as $\overline{\phi}\_ \leq \phi \leq 1 - \frac{V_2^b}{(1+\tilde{m}_v)V_2^e}$.

If we put together the results in propositions 6 and 8 we get again that for high levels of investor protection the venture capitalist funds the startup phase and exits through an IPO. This case follows directly from proposition 6.

While for low levels of investor protection the venture capital industry collapses, and the venture capitalist is not able to invest neither at the startup phase nor at the expansion one (propositions 6 and 8).

Again, the results for the intermediate levels of investor protection are not clear cut and depend on the value of some of the parameters.

However, now it is possible to have the startup phase funded by the angel investor, and the expansion phase funded by the venture capitalist. In this way, the venture capitalist is able to extend the scope of his participation in the process of financial intermediation.

Finally, notice that I did not specify how the venture capitalist exits his investment in the expansion phase.

However, we can still apply lemma 1 with the corresponding modifications. Moreover, at the end of the expansion phase the entrepreneur might be able to buyback all outside participation in the firm. Clearly, in such a case the diversion problem disappears.

The model in here has so far yielded some testable implications. Although an empirical test of these might be interesting, I decided to postpone it for a later work. Instead, the next section gives discusses the model and some of the empirical evidence available.

6. Discussion

The venture capital industry varies greatly across nations, not only in size but also in the type of investors, institutional agreements, and firms funded. The following table shows the size of the venture capital industry in 20 countries in 1995, as reported by Gompers and Lerner (1999, p. 16).

Table 1. Venture capital investments Million of Dollars[5]

Country Total	*Total venture capital invested*
Australia	54
Austria	0.4
Belgium	8
Canada	182
Denmark	4
Finland	1
France	35
Germany	116
Ireland	1
Italy	60
Japan	11
Netherlands	100
New Zealand	1
Norway	7
Portugal	9
Spain	24
Sweden	9
Switzerland	1
United Kingdom	36
United States	3,374

It is clear from table 1 that the dynamism of the venture capitalist industry in the U.S. is much greater than in any other country. In fact, the size of the funds invested in the U.S. is more than 18 times that in Canada, the country with he second largest industry.

However, these figures are obviously affected by the size of the economies. In fact, Black and Gilson (1999) reported that, after adjusting using the GDP for each country, by 1994 Canada has a similar figure to the U.S. Also, United Kingdom and Ireland have figures close to the U.S. in new capital committed to venture capital funds in 1993-1994 as a percentage of GDP, while other European countries fall far behind.

The latter is shown in the next table, taken from Black and Gilson (1999, p. 20). Notice that while Canada has a relative open market for domestic IPOs as well as for IPOs into the nearby U.S. market, Ireland has easy access to the London stock market.

[5] All figures in 1997 U.S. dollars. Gompers and Lerner used figures for early stage funds in each country outside the U.S. I decided to exclude the information for Israel, which was an estimate.

Table 2. New capital committed to European venture capital funds, 1993-1994 as a percentage of GDP

Country	*Average 1993-1994*
United Kingdom	0.18
Ireland	0.15
France	0.06
Sweden	0.06
Portugal	0.06
Netherlands	0.05
Belgium	0.04
Denmark	0.04
Norway	0.04
Switzerland	0.03
Iceland	0.03
Finland	0.02
Italy	0.02
Spain	0.02
Germany	0.01
Austria	0.00

But size is not the only difference between the U.S. and the European venture capital industries. According to Lerner (2000, p. 144): "over 90% of European private equity funds are devoted to buyouts or other later-stage investments." Black and Gilson (1999) also compared the allocation of funds by venture capitalists, by type of investment, between the U.S. and Germany in 1994, and found that while in the former 37% of the funds were allocated to early stage investments, in the latter only 10% of the funds were invested in this category. Finally, realize that although the private equity activity has recently seen a boom in developing nations, the nature of the investments differs radically from that in developed countries. Private equity funds in developing nations usually invest in privatizations, corporate restructurings, strategic alliances, and infrastructure (Lerner, 1999). Therefore, venture capital as understood in the U.S. or even Europe is extremely rare.

Now, according to propositions 6 and 8, the level of investor protection should shed some light on some of the differences mentioned above. LLSV (1998,p. 1151) concluded that "in particular, countries whose legal rules originate in the common-law tradition tend to protect investors considerably more than the countries whose laws originate in the civil-law, and specifically, the French-civil law, tradition. The German-civil-law and the Scandinavian countries take an intermediate stance toward investor protections." The next table, extracted from LLSV (1998, p. 1130-1131) shows their anti-director rights index for some of the countries mentioned above (the higher the index the higher the level of investor protection).

Table 3. Shareholder rights in selected countries

Country	*Index*
United States	5
Canada	5
United Kingdom	5
Ireland	5
France	3
Sweden	3
Portugal	3
Netherlands	2
Belgium	0
Denmark	2
Norway	4
Switzerland	2
Finland	3
Italy	1
Spain	4
Germany	1
Austria	2
Total sample average	3

The correlation that Black and Gilson (1998) found between the dynamism of the capital market and the size of the venture capital industry led them to suggest that in fact an active capital market is required in order for the venture capital industry to develop. However, the results here imply that this correlation might be caused by the influence of investor protection in the development of both the capital markets and the venture capital industry. If we compare tables 2 and 3, we find indeed that countries with the higher levels of investor protection are precisely the countries that have a more developed venture capital industry. Moreover, according to proposition 6, venture capitalists investing in startup in countries with intermediate levels of investor protection might not even find IPOs the most profitable exit choice, casting more doubts over the meaning of the correlation mentioned before.

Lemma 1 also implies that in countries with high levels of investor protection the preferred exit vehicle will be IPOs. Cumming and MacIntosh (2000) found indeed that in both Canada and the U.S. the preferred choice of venture capitalists is to take successful firms public. Therefore, the funding of startups in both countries seems to follow the pattern indicated by proposition 6: venture capitalists finance new ventures and exit the successful ones through IPOs.

As I said before, the results here are less clear with respect to the intermediate levels of investor protection such as some of the European countries above. However, proposition 8 suggests that in these countries we should expect (at least some of) the

venture capitalists to invest more in firms on the expansion stage. And this is indeed what seems to happen in the European venture capital industry.

However, there are some countries that do not quite follow the suggested path. In particular, England and Ireland, with their higher level of investor protection should behave more like the North American industry, while in fact they are more similar to their European counterparts. This might be due at least in part to the fact that most private equity funds in England are offshoots from financial institutions. Also, it is worth noting that the United Kingdom was the cradle of European private equity, and most of the top-tier players are of British origin (Lerner, 1999).

Obviously, there are other factors affecting the development and organization of the venture capital industry than just the degree of investor protection (see, for instance, Gompers and Lerner, 1999, for an excellent account of some of the main forces behind the venture capital cycle). It is also evident that venture capitalists are capable of adapting to different business environments, as their incursion in developing countries shows. In those countries they do not finance startups or later-stage firms, but rather other kinds of investments in which their financial expertise allows them to be competitive.

However, I think that the empirical evidence presented in this section points at least to some influence of the level on investor protection in the venture capital industry. Therefore, policy makers trying to develop the venture capital industry should take into account how the level of investor protection in their country will affect its development and organization.

As well, venture capitalists usually perform other functions beyond monitoring, some of which can help the development of capital markets. For instance, Megginson and Weiss (1991) argue that the venture capitalist can certify to investors that the firms they bring to market are not overvalued. This should improve the growth of the stock market by eliminating the under pricing of IPOs due to asymmetries of information. Hence, the level of investor protection not only affects the valuation of publicly traded firms directly, but also indirectly because the absence of a venture capital industry accentuates the inefficiencies caused by asymmetric information. This is an example of the symbiotic relationship between markets and financial intermediaries, as stated in Allen and Gale (2000).

7. Conclusion

In this paper I showed how the level of investor protection can influence not only the exit policy of the venture capitalist, but his investment policy as well. The venture capital industry collapses for the lowest levels of investor protection. Although this is correlated with the stock market, the reason behind both is the poor protection granted to minority investors. For the highest levels of investor protection, the venture capitalist invests in startups and takes public the successful ones. This resembles the U.S.-Canada industry.

For the intermediate levels of investor protection it is possible that the venture capitalist invests rather in expansion firms (later-stage firms). Moreover, his preferred exit vehicle might not be an IPO. I think this might explain some of the differences between the venture capital industries in Europe and the U.S. But, the cases of the venture capitalists in England and Ireland, who according to this model should behave more like their counterparts in the U.S., and instead follow the same strategies as their European cousins, suggest that there may be still some other forces shaping the venture capital industry. The latter, as well as a more formal empirical test of the results in this paper, are suitable topics for future research.

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