Angels versus Venture Capitalists: The effect of Value-adding Abilities, Fairness, Trust and the Legal System.

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ABSTRACT

We consider an entrepreneur's choice of venture capitalist or angel to finance an innovative project. Double-sided moral hazard exists in the form of effort-shirking and the financier's ex post expropriation threat. The angel has no value-adding ability, but negotiates a fair financial contract and is trustworthy. The VC has value-adding ability, but has bargaining power, and is untrustworthy. Her untrustworthiness is constrained by the legal system. The E's choice of financier is affected by a combination of the financier's value-adding ability, fairness, trustworthiness and strength of the legal system. Under a strong legal system, if the VC has low ability, the E chooses the angel, and this is value-maximising. If the VC has medium ability, the E continues to choose the angel, but this is value-minimising. If the VC has high ability, the E chooses the VC, and this is value-maximising. Under the weak legal system, the E unambiguously chooses the angel, and this is value-maximising. We conclude by considering policy implications.

Innovative, start-up companies often face difficulties in obtaining finance from traditional sources, such as banks or public stock markets. This 'equity-gap' has been filled by private investors, such as venture capitalists (VCs) and angels. Hence, the private equity sector has the potential to be a significant source of economic wealth creation and growth. However, the value-adding capabilities of this sector may be adversely affected by extreme agency problems and informational asymmetries. Furthermore, wealth creation may be critically affected by the characteristics of angel and VC-investors, and the entrepreneur's incentives to choose angel or VC-financing.

Angels tend to provide more finance than VCs to start-ups. Freear et al (1996) note that, in the US, "around 250,000 angels invest between $10 billion and $20 billion in around 30,000 firms annually. This compares with around $6.6 billion committed in the venture sector of the organized private equity market in 1995, making the angel market several times larger[1].". In a later analysis, Wong (2002) notes that "the National Venture Capital Association (2000) assesses the size of the angel market to be $100 billion in the United States while the institutional venture capital market is less than half this size at $48.3 billion."

Despite the dominance of angel financing for start-ups, existing research has focussed on the characteristics of venture capital financing. According to Chemmanur and

[1] Quoted in Chemmanur and Chen (2006).

Chen (2006), "little is known about the important economic differences between venture capital and angel financing."

In this paper, we address this issue by considering the following research questions; what are the effects of value-adding ability, fairness and trust on an entrepreneur's optimal choice of financier (VC or angel) and venture performance? How is choice and performance affected by the strength of the legal system? In order to analyse these questions, we develop a double-sided moral hazard model in which an entrepreneur chooses either an angel or a VC to provide finance. The parties then negotiate the financial contract (in terms of equity allocations). Next, they exert value-creating efforts (the entrepreneur and the financier face *double-sided moral hazard* from each other in the form of their simultaneous shirking incentives). After the project outcome has been realised, the entrepreneur faces a further moral hazard problem, as the financier may force ex post renegotiation of the contract (the *ex post hold-up threat*).

In our model, we differentiate angels and VCs according to two characteristics, which (combined with the strength of the legal system) affect the entrepreneur's choice of financier, the financial contract, and the performance of the venture.

Firstly, we assume that angels are fairer (affecting the equity-negotiation stage of the model) and more trustworthy (affecting the hold-up stage) than VCs. Specifically, we assume that the VC makes a take-it-or-leave-it equity offer to the E (reflecting the VC's bargaining power), while the A and the E negotiate an equitable and fair equity allocation (reflecting a fair and balanced partnership). Furthermore, we assume that the VC is untrustworthy, and so will force ex post re-negotiation if possible (but this hold-up threat may be constrained by the legal system), while the A is trustworthy, and will not force equity re-negotiation.

There is some evidence that, compared to VCs, angels enjoy a more informal and relational partnership with their Es. For example, Wong (2002) states that angels do not rely on the traditional control mechanisms employed by VCs. Instead, they rely on more informal methods. In relation to angel financing, "the entrepreneur appeals to sociological networks and uses local ties to generate initial funding for the venture. The angels rely on trust in lieu of formal control." Similarly, Goldfarb et al (2007) note that "angels … invest in very early stage deals but demand fewer controls (than VCs)," and state that "angels have stronger social ties to the entrepreneurs in whose companies they invest." Furthermore, Elitzur and Gavious (2003) argue that angels may be relatives of the entrepreneur, or former successful entrepreneurs from the same industry, seeking to help similar new companies. This may support our view that angels may be fairer and more trustworthy than VCs.

Secondly, we assume that VCs possess greater value-adding ability than angels. There is considerable evidence that angels tend to be unsophisticated investors, unable to add significant value to the firm (Erlich et al 1994, Prowse 1998, Wong 2001, Quindlen 2000, Hochberg 2002) in comparison to VCs.

Our model contributes to two areas of venture capital research. Firstly, we develop the emerging work on the entrepreneur's choice of financier. For instance, Landier (2001)

and Ueda (2004) have developed theoretical analyses of the entrepreneur's choice of VC or bank finance.
Our model is most closely related to that of de Bettignies and Brander[2] (dB 2007), since they also consider the effect of double-sided moral hazard (in terms of mutual shirking) on the entrepreneur's choice of VC or bank finance. However, we develop their analysis in several ways. The obvious difference is that, rather than considering the choice of VC or *bank* finance, we focus on the entrepreneur's choice of VC or *angel*-financing. This results in a major difference in our comparison of the forms of finance offered by the financiers. In dB's analysis, financial contracting with a VC involves negotiations over equity shares, while the bank offers a loan in which the entrepreneur has all of the equity. The entrepreneur makes his choice by trading off the higher value-adding abilities of the VC versus the entrepreneur's lower equity share in the outcome of the venture. In our analysis, both the value-adding VC and the non value-adding angel offer equity contracts, but the VC takes more of the equity. As a further development of dB's analysis, we consider the hold-up problem, and, further more, we consider the effects of fairness, trust and the legal system on the E's choice of financier. In terms of bargaining, dB assume the entrepreneur has the bargaining power (making an equity offer to the VC), while we assume that the VC has the bargaining power (making the equity offer to the E). Finally, dB assume that the E's and VC's value-adding efforts are substitutes, while we focus on the case where they are complements.

Related to our work, Leshchinski (2002) and Chemmanur and Chen (2006) model the E's choice of VC or angel. Leshchinski (2002) considers the E's optimal choice of VC- or angel-financing in a moral hazard model where VCs and angels compete to supply finance to innovative entrepreneurs. Chemmanur and Chen (2006) consider a dynamic model of an entrepreneur's choice between VC and angel financing. Their model incorporates asymmetric information and moral hazard.

As our second contribution, we enrich the existing double-sided moral hazard models of venture capital by considering the impact of fairness, trust and the legal system. Our model addresses two areas of double-sided moral hazard in venture capital. We consider double-sided moral hazard in relation to the parties' effort-shirking incentives (see seminal work by Houben 2002, Casamatta 2003, Schmidt 2003, Repullo and Suarez 2004)[3].

Besides double-sided shirking, our model also considers moral hazard in the form of the VC's ex post hold-up threat. That is, after the E has exerted effort, the VC can force ex post renegotiation of the equity stakes. Indeed, Smith (1998) argues that "the most prominent risk to entrepreneurs is opportunism. The potential for opportunism arises from the possibility that the VC will attempt to renegotiate with the entrepreneur at a point in the relationship when the entrepreneur has diminished bargaining power."

[2] We became aware of the paper of de Bettignies and Brander (2007) as we were completing work on this paper. Therefore, our paper is written independently of theirs. Although we both consider the effects of double-sided moral hazard (in the form of effort-shirking) on the E's choice of financier, we provide many differences and developments compared to their model, as described in our narrative.
[3] Other double-sided moral hazard models of venture capital have been developed by Casamatta and Haritchabalet 2004, Fairchild 2004, Cassiman and Ueda 2006, Bernile et al 2007.

The VCs ex post hold-up threat is receiving increasing attention in the literature (see eg; Smith 1998, Repullo and Suarez 2003, Chemla et al 2004, Skeie 2004, Gebhardt and Schmidt 2006, Bigus 2002, Utset 2002). These researchers note that certain features of the VC contract provide the VC with increasing bargaining power over time[4]. This provides the VC with leverage to force ex post renegotiation of the financial contract in her favour. The VC's ex post hold-up threat weakens the E's ex ante effort incentives.

In our model, we consider the strength of the legal system in mitigating the VC's hold-up threat. Our approach is closely related to that of Ueda (2004) and Bigus (2002). In Ueda's model, the E's choice between bank- and VC-finance is partially affected by the VC's hold-up threat. Specifically, if the E chooses the VC, this reveals the project's characteristics to the VC. The VC can then threaten to steal the project and go-it-alone. The VC's ability to do so is constrained by the legal system, and in particular the protection of intellectual property rights. In Bigus' (2002) model of staged VC financing, the VC can threaten to steal the project at a later stage, forcing renegotiation of the equity allocation. However, the VC's hold-up threat is mitigated by patent law that protects intellectual property rights.

Besides considering the strength of the legal system, our model analyses the interaction of moral hazard problems, fairness and trust. Hence, we provide a formal analysis of the procedural justice literature, which recognises that the performance of venture capitalist/entrepreneur dyads may be affected by behavioural factors such as fairness and trust.[5] De Clerq and Sapienza (2001) coin the term 'relational rents,' referring to the value-creating potential of fairness and trust in venture-backed firms. However, these authors note that "no in-depth analysis has been made of how relational rents might be created for both parties in the venture capitalist-entrepreneur dyad." An important contribution of our model is that it demonstrates that venture capital performance may be enhanced by fairness, trust[6], *and* value-adding abilities.

The paper is organised as follows. In section 1, we present the model. Section 2 outlines potential extensions to the model, considers possible policy implications, and possible future research. In section 3, we consider the descriptive and normative implications of our analysis. Section 4 concludes.

[4] Smith (1998), Bigus (2002), Repullo and Suarez (2003), and Utset (2002) all note that the VC's staging of financing enables the VC to increase her bargaining power over time, resulting in the ex post hold-up threat. In Skeie's (2004) model, the VC's increased bargaining power, and the ex post threat, arises from the common feature of vesting of equity payments to the entrepreneur.

[5] For literature on the role of procedural justice in venture capital performance, see Busenitz et al 1997, Cable and Shane 1997, Lehtonen et al 2004, Sapienza and Koorsgard 1996, Sapienza et al 2000, De Clerq and Sapienza 2001, Shepherd and Zacharakis 2001, and Utset 2002, among others.

[6] Our modelling approach to trust is similar to that of Al-Najjar and Casadesus-Masanell (2001). These authors consider the effects of trust in a principal-agent model in which an agent chooses an effort level, and then the principal offers a wage from a bounded interval. A self-interested principal chooses the lowest possible wage in the interval, while a trustworthy principal chooses the lowest possible wage such that the agent's participation constraint is just satisfied.

I. The Model

We consider an economy consisting of a wealth-less risk-neutral entrepreneur (E), a risk-neutral venture capitalist (VC), and a risk-neutral angel (A). The entrepreneur has an idea for an innovative project, and chooses which financier to supply finance. That financier provides the required investment funds.
Having chosen either a VC or an A, the entrepreneur and his partner negotiate over their respective cash-flow rights. After agreeing the financial contract, the parties may exert value-creating effort (specifically, effort affects the probability of the venture's success). At this stage, we consider double-sided moral hazard in the form of effort-shirking. After a time, the venture succeeds or fails. Finally, the financier may force re-negotiation of the financial contract in her favour (the ex post hold-up threat).
The entrepreneur's choice of financier is affected by the following characteristics of the angel and the VC. The angel has no value-adding ability. However, the bargaining process is such that the A and the E negotiate an equitable (expected payoff-equalising) equity allocation. Furthermore, the A is trustworthy. This means that she will not force ex post re-negotiation of the financial contract.
In contrast, the VC possesses some value-adding ability. However, she has bargaining power, negotiating an equity share in her favour. Specifically, she makes an ultimatum offer of equity to the E. Furthermore, she is untrustworthy. That is, she will force ex post re-negotiation of the financial contract if she can. However, her ability to do so may be constrained by the legal system.

The timeline and the specific details of the model are as follows.

Date 0: *E's choice of Financier:* At date 0, the E requires investment funds $I > 0$. He chooses either the VC or an A as a supplier of finance and partner in the venture. The chosen financier makes a take-it-or-leave-it offer to provide exactly the required start-up funds I [7].

Date 1: *The financial contracting stage*: The players negotiate the financial contract, which specifies the E's and financier's respective equity stakes, $\alpha \in [0,1]$ and $1-\alpha$, as a fraction of the project's expected income.
If E has chosen the A, the parties negotiate an equitable agreement[8] (such that the A and the E have identical expected payoffs). Furthermore, A is trustworthy.
If E has chosen the VC, the VC makes a take-it-or-leave-it proposal (the VC has the bargaining power) to the E regarding $\alpha \in [0,1]$ and $1-\alpha$. Furthermore, the VC is untrustworthy.

[7] Hence, we do not consider the effect of competition amongst financiers on the provision of financing. In some models, bidding amongst competitive VCs drives the amount of financing provided to the E above that required, with the E gaining the excess funding. We do not consider this here. Once the E has chosen a financier, it is assumed that the other 'disappears' (investing elsewhere). This simplifies the analysis, since the E's choice of financier depends purely on the expected value of the E's equity stake, without consideration of the financier's excess funding due to bidding.
[8] Note that we do not provide a specific model of bargaining between the E and the A. We have in mind a bargaining process that reflects a fair and balanced partnership between the E and the A (such as cooperative Nash bargaining), such that the outcome is a payoff-equalising equity allocation.

Date 2: The players exert respective effort levels e_E and e_i, $i \in \{A, VC\}$ in creating value for the venture. Following Repullo and Suarez (RS 2004), we assume that the partners' efforts are complementary. Specifically, the project succeeds with probability $p = \theta^{\omega(1+\gamma)} e_E^{1-\gamma} e_i^{\gamma} \in [0,1]$, in which case it provides income $R > 0$, or it fails with probability $1 - p$, in which case it provides income zero. Following RS (2004), γ represents the financier's ability *relative* to the E.

Note that our functional form for success probability differs from that of RS by a multiplicative parameter $\theta^{\omega(1+\gamma)}$. We include this parameter, because RS's functional form does not allow us to consider increasing the financier's ability while holding the E's ability fixed. In RS's analysis, $p = e_E^{1-\gamma} e_i^{\gamma}$ implies that an increase in VC's relative ability results from an increase in VC's absolute ability together with a decrease in E's absolute ability. Hence, we include our multiplicative parameter, which can be thought of as a 'synergistic' effect. (This is discussed in more detail in the appendix).

In our model, the VC's relative value-adding ability can take two possible values; $\gamma \in \{0, \frac{1}{2}\}$ with respective probabilities $1 - q$ and q (that is, the VC either has no ability (she is a pure financier), or she has the same ability as the E). In contrast to RS, this enables us to obtain tractable closed-form solutions for the equilibrium equity allocation, effort levels, and performance. Furthermore, we assume that the A has no value-adding ability $(\gamma = 0)$.

Define q as the VC's *expected* ability. We note that, although we only allow VC-ability to take two possible values, we can, by varying q in the interval 0 and 1, effectively consider a continuum of expected abilities (when $q = 0$, the VC is a pure financier for sure; and when $q = 1$, the VC has the same ability as the E for sure; when $q \in [0,1]$, the VC's expected ability lies somewhere between these two extremes). Furthermore, following Casamatta (2003), we do not allow the VC to have more ability than the E[9].

Given our functional form for the probability of success, the expected value of the project is $V = pR = \theta^{\omega(1+\gamma)} e_E^{1-\gamma} e_i^{\gamma} R$.
Furthermore, the E and the financier face cost-of-effort functions, $\beta e_E^2, \beta e_i^2$.

Date 3: The project either succeeds or fails. If the E had chosen the A at date 0, since this financier is trustworthy, she does not force re-negotiation of the contract. Hence, the E and the A receive a fraction $\alpha \in [0,1]$ and $1 - \alpha$ of the project outcome (as agreed at date 1) and the game ends. If the E had chosen the VC at date 0, since this financier is untrustworthy, the game proceeds to the ex post re-negotiation game at date 4.

[9] Indeed, Casamatta (2003) argues that her approach captures the idea that "the entrepreneur's contribution is more important for success than the managerial expertise of the adviser".

Date 4: If the game has proceeded to this stage, we consider the following re-negotiation sub-game. The VC chooses whether to make a new equity proposal $\hat{\alpha},1-\hat{\alpha}$ to the E, or whether to retain the original agreement $\alpha,1-\alpha$. If she retains the original agreement, the game ends with the allocation agreed at date 1. If she makes the new proposal $\hat{\alpha},1-\hat{\alpha}$, the E decides whether to accept this proposal or reject.

If the E accepts, the game ends with the allocation $\hat{\alpha},1-\hat{\alpha}$. If the E rejects the new proposal, the VC decides whether to return to the original agreement $\alpha,1-\alpha$ (in which case the game ends), or to expropriate the project. Following Ueda (2004), this involves the VC taking the project and 'going it alone'. However, if the VC does so, she must pay a fine $L \geq 0$, which is transferred to the E as compensation. The game ends.

In our model, the level of the fine L represents the strength of the legal system. We consider two possible levels of strength of legal system; Strong legal system, with $L > \frac{R}{2}$, and weak legal system with $L = 0$. We demonstrate that, in the first case, the VC will not force renegotiation (the legal system is sufficiently strong to eliminate the effects of VC untrustworthiness). In the second case, the legal system is not strong enough to eliminate VC untrustworthiness, and the VC will force renegotiation.

A. The Game

We solve the game by backward induction as follows. We first take as given that the E has chosen a VC at date 0, and we solve for the final date 4 stage of the game (the ex post renegotiation sub-game), given the agreed equity stakes at date 1, the effort levels at date 2, and the project outcome at date 3. We then move back to solve for the optimal date 2 effort levels, given the agreed equity stakes at date 1. Then we move back to date 1 to solve for the optimal equity stakes.

Next, we take as given that the E has chosen an A at Date 0. Now the game ends at date 3 (there is no ex post re-negotiation sub-game). Therefore, we now solve for the optimal effort levels at date 2, given the agreed equity stakes at date 1, and then move back to solve for the date 1 optimal equity stakes.

Finally, we move back to date 0 to solve for the E's optimal choice of financier, hence deriving the equilibrium of the entire game.

A.1 Date 4 (The Re-negotiation Sub-game).

We firstly take as given that the E has chosen the VC date 0. Therefore, the game proceeds to the date 4 re-negotiation sub-game. The sequence of events at date 4 is as follows. First, the VC decides whether to retain the original date 1 equity agreement, or to make a new proposal. If the VC makes a new proposal, the E decides whether to accept it or reject it. If the E rejects it, the VC then decides whether to retain the

original proposal, or expropriate the project. If the VC expropriates, she must pay a fine to the E, the level of which reflects the strength of the legal system.
Note that the players' payoffs consist of their equity shares in the project minus their effort costs. We note that, at date 4, both players have already exerted effort (effort costs are sunk). Therefore, the players make their decisions in the date 4 sub-game by merely considering their equity shares.
Firstly, consider the case where the project has succeeded at date 3, achieving income $R > 0$. We solve the re-negotiation sub-game by backward induction. Firstly, consider the case where the VC retains the original agreement, ending the game. Her payoff (excluding the sunk effort costs) is $(1-\alpha^*)R$, where α^* is the VC's optimal date 1 equity offer to the E. Next, consider the following sequence of events: the VC forces re-negotiation by making a new proposal $\hat{a}, 1-\hat{a}$, followed by the E rejecting the new proposal. Now, the VC decides whether to return to the original agreement, giving her a payoff $(1-\alpha^*)R$, or to expropriate, giving her a payoff $R-L$. Therefore, given that the VC has made the new offer, and the E has rejected it, the VC expropriates the project iff $R-L \geq (1-\alpha^*)R$. This gives the E a payoff of L.
Now move back to the E's decision following the VC's new proposal. The E compares his payoff $\hat{a}R$ from accepting the new proposal with his payoff L from rejecting the new proposal (given that $R-L \geq (1-\alpha^*)R$, such that the VC expropriates if the E rejects the new proposal). Therefore, the E accepts the new proposal if $\hat{a}R \geq L$. Since effort is sunk, the VC maximises her equity stake by minimising her offer to the E. She offers $\hat{a}R = L \Rightarrow \hat{a} = L/R$, and the E accepts.
Finally, move back to the VC's first decision in the re-negotiation sub-game; whether to retain the original agreement or make the new proposal. Under the original agreement, she obtains $(1-\alpha^*)R$. Under the new proposal, she obtains $R-\hat{a}R = R-L$ (since her offer $\hat{a}R = L \Rightarrow \hat{a} = L/R$ is accepted by the E). Comparing these two payoffs, we obtain the following;

LEMMA 1: *If the project has succeeded, achieving* $R > 0$ *at date 4,*

a) *If* $(1-\alpha^*)R \geq R-L \Rightarrow L \geq \alpha^* R$, *the VC does not force re-negotiation of the contract at date 4. The E's and VC's respective payoffs are* $\alpha^* R$ *and* $(1-\alpha^*)R$
b) *If* $(1-\alpha^*)R < R-L \Rightarrow L < \alpha^* R$, *the VC forces re-negotiation of the contract at date 4. The E's and VC's respective payoffs are* L *and* $R-L$.

Recall that L represents the strength of the legal system. Furthermore, recall that we consider two possible levels; strong legal system $L > \frac{R}{2}$ and weak legal system $L = 0$. From lemma 1b), in the case of the weak legal system, the VC forces re-negotiation of the contract in the case of success. This provides respective payoffs for the E and the VC of $L = 0$ and $R-L = R$.
In our subsequent analysis, we demonstrate that, if the legal system is strong $(L > \frac{R}{2})$, the VC does not force re-negotiation of the contract at date 4.

Note that, if the project fails, achieving zero income at date 4, the re-negotiation sub-game is irrelevant, since the E and the VC achieve zero income, regardless of their equity stakes.

Next, we note that if the E has chosen the A at date 0, the game ends at date 3 (there is no ex post re-negotiation game).

A.2 Date 2 (Optimal effort levels)

We now move back to solve for the date 2 effort levels. If E has chosen A at date 0, or if he has chosen the VC under a strong legal system $(L \geq \alpha * R)$, there is no ex post re-negotiation threat (since, in the case of angel-financing, the financier is trustworthy, while in the case of VC-financing, the financier is untrustworthy, but the ex post hold-up threat is eliminated by a strong legal system). Therefore, the expected payoffs consist of the players' equity stakes in the project (agreed at date 1) minus the effort costs. That is, the respective payoffs of the E and financier $i \in \{A, VC\}$ are;

$$\prod_E = \alpha\theta^{\omega(1+\gamma_i)} e_E^{\,1-\gamma_i} e_{VC}^{\,\gamma_i} R - \beta e_E^{\,2} \qquad (1)$$

$$\prod_i = (1-\alpha)\theta^{\omega(1+\gamma_i)} e_E^{\,1-\gamma_i} e_{VC}^{\,\gamma_i} R - \beta e_i^{\,2} \qquad (2)$$

with $\gamma_{VC} \in \{0, \frac{1}{2}\}$ and $\gamma_A = 0.$

The E and the VC choose their optimal effort levels to maximise their expected payoffs (given each player's expectation of the other's effort level). Therefore, we substitute for $\gamma \in \{0, \frac{1}{2}\}$ into (1) and (2), and solve $\frac{\partial \prod_E}{\partial e_E} = 0,$ $\frac{\partial \prod_{VC}}{\partial e_{VC}} = 0.$ When the VC has value-adding ability $(\gamma = \frac{1}{2}),$ we obtain the following reaction functions;

$$e_E^* = [\frac{\alpha\theta^{\frac{3\omega}{2}} e_{VC}^{\frac{1}{2}} R}{4\beta}]^{\frac{2}{3}}, \quad e_{VC}^* = [\frac{(1-\alpha)\theta^{\frac{3\omega}{2}} e_E^{\frac{1}{2}} R}{4\beta}]^{\frac{2}{3}}. \qquad (3)$$

These reaction functions are informative. They demonstrate that, since the E's and VC's efforts are *complementary* in adding value, the E needs to consider the VC's effort incentives when deciding on his own effort level (e_{VC} appears in the equation for e_E^*), and the VC needs to consider the E's effort incentives when deciding on her own effort level (e_E appears in the equation for e_{VC}^*). In particular, if either party expects the other party to exert zero effort, the first party will optimally exert zero effort. Note the contrast with models of substitute efforts; (eg Casamatta 2003,

Fairchild 2004, and de Bettignies and Brander 2007), where the E and VC do not consider the other party's effort level when deciding on their own optimal effort level. In section A.2 below, we note the implications of complementary efforts for the VC's optimal equity offer.

Solving the reaction functions in equation (3), we obtain the optimal effort levels. We present these optimal effort levels in lemma 2a.

Next, if E chooses the VC, and the legal system is weak $(L = 0)$, then, from lemma 1b), the VC will force re-negotiation of the contract (in the case of project success) at date 4. By backward induction, the E anticipates the VC's ex post renegotiation threat; that is, the E is aware that he will have ex post payoff $L = 0$, regardless of the VC's ex ante equity offer. Therefore, (1) becomes

$$\prod_E = 0 - \beta e_E{}^2. \qquad (4)$$

Therefore, E will exert zero effort at date 2. Since efforts are complementary, the VC's best response is to exert zero effort, and venture value becomes zero. We present this result in lemma 2b.

We obtain the following:

LEMMA 2:

a) If the E has chosen the trustworthy A, or the VC under a strong legal system $(\alpha * R < L)$, there is no ex post renegotiation threat. Therefore, if the E has chosen a value-adding VC $(\gamma = \frac{1}{2})$, the optimal effort levels are

$$e_E* = \frac{(1-\alpha)^{\frac{1}{4}}\alpha^{\frac{3}{4}}\theta^{\frac{3\omega}{2}}R}{4\beta},\ e_{VC}* = \frac{(1-\alpha)^{\frac{3}{4}}\alpha^{\frac{1}{4}}\theta^{\frac{3\omega}{2}}R}{4\beta}.$$

If the E has chosen a non-value adding VC, or if E had chosen A, the optimal effort levels are

$$e_E* = \frac{\theta^{\omega}\alpha R}{2\beta}, e_{VC}* = e_A* = 0.$$

b) If the E has chosen VC with $\alpha * R > L = 0$, the VC will force re-negotiation at date 4 in the case of success, taking all of the equity. Therefore, the E and the VC (of either ability) will exert zero effort.

Note that, in lemma 2a), both players' equity shares, α and $1-\alpha$, appear in both players' optimal effort levels. Each player considers his own equity share when

deciding on his optimal effort level. However, since efforts are complementary, each player must also consider the effect of his opponent's equity share on his opponent's effort level, when considering his own optimal effort level. This results in an interesting trade-off for the value-adding VC when considering her optimal equity proposal, as analysed in the next section.

A.2 Date 1 (The Financier's Equity Proposal).

Next, we move back to date 1 to solve for the financier's optimal equity proposal. First, consider the case where there is no ex post renegotiation threat (the E has either chosen the VC with a strong legal system $(\alpha_0 * R < L)$, or he has chosen the A). In order to solve for the VC's or A's optimal date 1 equity proposal, we first derive the indirect firm values by substituting the optimal effort levels, given in lemma 2a, into the firm value $V = pR = \theta^{\omega(1+\gamma)} e_E^{\,1-\gamma} e_{VC}^{\,\gamma} R$, given that $\gamma \in \{0, \frac{1}{2}\}$. If the E has chosen a value-adding VC with $(\alpha_0 * R < L)$, the indirect firm value[10] is

$$V = \frac{\theta^{3\omega}(1-\alpha)^{\frac{1}{2}}\alpha^{\frac{1}{2}}R^2}{4\beta}. \qquad (5)$$

If the E has chosen the non-value adding VC with strong legal system $(\alpha_0 * R < L)$, or he has chosen the A, the indirect firm value is

$$V = \frac{\alpha\theta^{2\omega}R^2}{4\beta}. \qquad (6)$$

Next, substitute these indirect firm values, and the optimal effort levels from lemma 2, into the players' payoffs (1) and (2) to obtain their indirect[11] payoffs $\hat{\Pi}_E, \hat{\Pi}_{VC}$ and $\hat{\Pi}_A$. If the E has chosen the A, the equilibrium date 1 fair equity proposal α_F equalises payoffs $\hat{\Pi}_E = \hat{\Pi}_A$. If the E has chosen the VC, the VC chooses the equity proposal to maximise her payoff; hence, we solve $\frac{\partial \hat{\Pi}_{VC}}{\partial \alpha} = 0.$

Therefore, we obtain the following results;

[10] The indirect firm value incorporates the effect of the equity proposal on the partners' optimal effort levels.

[11] The indirect payoffs capture the effect of the equity allocations on the partners' optimal effort levels. In order to focus the paper, these are not shown here, but are available on request from the author.

Proposition 1: *The effect of financier type and value-adding ability on the equilibrium date 1 equity proposal is as follows;*

a) If E has chosen the A, the payoff equalising equity proposal is $\alpha_F = \frac{2}{3}$.

b) If E has chosen the VC and the legal system is strong $(\alpha * R < L)$, *there is no ex post re-negotiation threat (see lemma 1). If the VC is value-adding, her optimal equity proposal is* $\alpha^* = \frac{1}{4}$. *If the VC is non value-adding, her optimal equity proposal is* $\alpha^* = \frac{1}{2}$. *Therefore, regardless of VC ability, there is no renegotiation threat in the case of the strong legal system* $(\alpha * R < L => \frac{R}{2} < L)$.

c) *If the E has chosen the VC, and the legal system is weak* $(L = 0)$, *the VC will force ex post re-negotiation (see lemma 1) to take all of the equity. Due to the VC's ex post hold-up threat, the E will exert zero effort at date 2. Since efforts are complementary, the VC will respond by exerting zero effort at date 2, and the success probability, value of the venture, and the E's and VC's payoffs will be zero*[12].

Firstly, we note that the highest (fair) equity offer is provided by the non value-adding A. The second highest equity offer is provided by the non value-adding VC (this is lower than A's offer, because the VC has the bargaining power, making an ultimatum offer to the E). The lowest equity offer is provided by the value-adding VC (this is lower than the non value-adding VC's offer, since the value-adding VC does not need to provide such an equity incentive to the E, since the VC can add value of her own[13]).
A further point to note is that, even when the VC and the E have equal value-adding abilities, the VC offers some equity to the E, due to complementary value-adding efforts (if the VC took all of the equity, the E would exert zero effort, and, as demonstrated by the reaction functions (3), the VC would react by exerting zero effort. As a result, venture value, and players' payoffs would be zero).

Note the contrast with existing models of *substitute* efforts, where a VC with the same value-adding abilities as the E takes all of the equity (see, for example; Fairchild 2004, de Bettignies and Brander 2007). Furthermore, analysing a model with

[12] In the case of the weak legal system, it may be asked whether the VC can make some other re-negotiation-proof equity proposal in order to eliminate the ex post hold-up threat, so that the E will be induced to exert effort. However, since we assume that $L = 0$ when the legal system is weak, the re-negotiation proof offer would involve the VC taking all of the equity at date 1 anyway. Therefore, the E will still exert zero effort at date 2, and the problem is not solved.

[13] It is interesting to note that the value-adding VC makes a lower equity offer than the non value-adding VC, given our assumption of binary VC-abilities. This provides an intuitive result (not formally modelled here) that the VC's optimal equity offer to the E is negatively related to her ability.

complementary efforts makes the ex post hold up problem (and the effect of VC trustworthiness) more interesting. That is, in our model, the value-adding VC requires some effort from the E, and so needs to offer him some equity. If the VC is untrustworthy (with a weak legal system), she will take all of the equity ex post. Therefore, both the E and the VC suffer ex ante, as the E exerts zero effort at date 2. In an effort-substitutes model, the value-adding VC can go-it-alone, and takes all of the equity ex ante anyway, so that the ex post threat is irrelevant.

A.3: Date 0: E's choice of financier.

In the final stage of our analysis, we move back to date 0 to consider the E's optimal choice of financier. In order to do so, we first derive the E's expected payoff[14] by substituting the optimal equity proposals from proposition 1 into the expected venture values (5) and (6), and then into the E's, VC's, and A's payoffs (1) and (2) to obtain the indirect payoffs.

If the E chooses the A, the E's expected payoff, and firm value, is

$$\hat{\Pi}_E = \hat{\Pi}_A = \frac{\theta^{2\omega} R^2}{9\beta}, \qquad (7)$$

$$V = \frac{\theta^{2\omega} R^2}{3\beta}. \qquad (8)$$

Note that the equity-allocation agreed by the E and the A at date 1 $(\alpha_F = \frac{2}{3})$, is indeed equitable (payoff-equalising).

Next, consider the case where the E has chosen the VC at date 0. At this stage, the E does not know whether the VC has high or low-ability. Therefore, if the E chooses the VC, *with strong legal system* $L > R/2$, the E's indirect payoff, and firm value, is

$$\hat{\Pi}_E = q.\frac{3\sqrt{3}\theta^{3\omega} R^2}{256\beta} + (1-q)\frac{\theta^{2\omega} R^2}{16\beta}. \qquad (9)$$

$$V = q.\frac{\sqrt{3}\theta^{3\omega} R^2}{16\beta} + (1-q)\frac{\theta^{2\omega} R^2}{4\beta}. \qquad (10)$$

We assume the following regarding the 'synergy' parameter[15];

[14] The indirect payoffs incorporate the effects of the optimal equity proposals on the optimal effort levels.

[15] As noted previously, we develop Repullo and Suarez (2004) by incorporating the synergy parameter. However, we require that this parameter is sufficiently large to ensure that the synergy effect is positive. This is reflected in assumption A.1.

$$\theta^{\omega} > \frac{256}{27\sqrt{3}} > \frac{16}{3\sqrt{3}}. \qquad \text{(A.1)}$$

Define $\hat{\Pi}_E(i)$ and $V(i)$ as, respectively, the E's indirect payoff and the expected value of the venture at date 0, given that the E has chosen financier $i \in \{VC, A\}$.

Assumption A.1 ensures that $\hat{\Pi}_E(VC) > \hat{\Pi}_E(A)$, and $V(VC) > V(A)$, when $q = 1$. Since $\hat{\Pi}_E(VC) < \hat{\Pi}_E(A)$, and $V(VC) < V(A)$ when $q = 0$, we define two critical values q' (which equates (7) and (9)) and q'' (which equates (8) and (10)). Therefore,

$$q' = \frac{4}{3\sqrt{3}\theta^{\omega} - 12}, q'' = \frac{112}{27\sqrt{3}\theta^{\omega} - 144} \qquad \text{(11)}$$

Note that, due to assumption (A.1), $q'' > q'$. (Refer to diagram 1).

Under the weak legal system, $L = 0$, the VC cannot commit not to steal the project ex post. Therefore, the E will not exert effort at date 2. Due to complementarity of efforts, the VC will not exert effort either. Therefore, the probability of success is zero, and $\hat{\Pi}_E(VC) = V(VC) = 0$. Therefore, under the weak legal system, $\hat{\Pi}_E(VC) < \hat{\Pi}_E(A)$, and $V(VC) < V(A) \ \ \forall q \in [0,1]$.

We are therefore able to state the following;

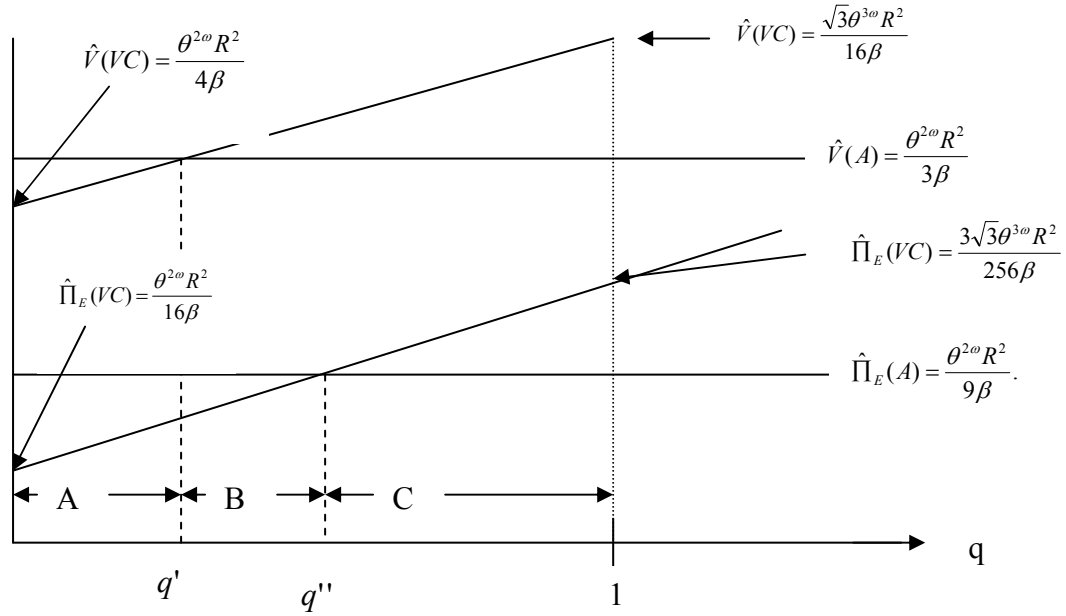
Proposition 2: *Under the strong legal system* $(L > R/2)$,

a) *If the VC has low expected ability,* $q \in [0, q']$, *the E chooses A as the financier. This is value-maximising.*
b) *If the VC has medium expected ability,* $q \in (q', q'']$, *the E continues to choose A as the financier. However, this is value-minimising.*
c) *If the VC has high expected ability,* $q \in (q'', 1]$, *the E switches to the VC as the financier. This is value-maximising.*

Under the weak legal system $(L = 0)$, *the E chooses the A for all* $q \in [0,1]$. *This is value-maximising.*

Proposition 2a), b) and c) are demonstrated in diagram 1.

Diagram 1: *The effect of VC ability on the E's choice of financier, and the effect on firm value, under the strong legal system.*



This diagram demonstrates the effect of the VC's ability on the E's choice of financier, and the effect on firm value (under the strong legal system), as described in proposition 2. Interval A represents low VC ability (proposition 2a), interval B represents medium VC ability (proposition 2b), and interval C represents high VC ability (proposition 2c).

In summary, our analysis demonstrates that, under the strong legal system, the entrepreneur's choice of VC or A is affected by the VC's value-adding ability relative to the A's non value-adding ability, combined with the characteristics of the financiers (with the A being fair and trustworthy, and the VC being unfair and untrustworthy).
In order to consider the effects of VC ability on the equilibrium of the game, we consider binary levels; that is, the VC is either non value-adding $(\gamma = 0)$ or has the same value-adding ability as the E $(\gamma = 1/2)$. We consider variations of VC ability in this interval by changing the probability $q \in [0,1]$ of the VC being of high-ability. In other words, $q \in [0,1]$ represents the expected ability of the VC, from the E's viewpoint.

The expected ability of the VC affects the E's choice of financier. When $q = 0,$ the VC is a pure financier for sure (providing no value-adding attributes). In this case (as demonstrated in diagram 1) angel financing dominates, both in terms of the E's choice, and in terms of expected venture value. The A and the VC are both pure financiers, but A provides more equity to the E (due to fairness). Therefore, the E prefers A-financing, and, since the E has higher ability than either of the financiers, the fairer (higher) equity offer from the A provides the superior value-creating incentives for the venture.

As we increase the VC's expected ability q under the strong legal system, we observe, from proposition 1, that there is a decrease in the E's expected equity stake (that is, with probability q, he will be offered $\alpha^* = 1/4$ from a value-adding VC, while with probability $1-q$, he will be offered $\alpha^* = 1/2$ from a non value-adding VC). However, this reduction in the E's equity stake is offset by the higher value-creating abilities of the VC, such that the E's payoff, and the expected venture value is increasing with q (the E obtains a lower equity stake in a higher venture value). In contrast, in a weak legal system, angel financing dominates (in terms of the E's choice, and expected venture performance) for all q, due to the E's lack of trust in the VC.

II. Model Extension and Policy Implications.

In this section, we outline extensions to the model which have the potential to inform policy-makers regarding VC-financing. We leave formal analysis of these extensions for future research.

We begin by considering the case where the E is making his choice under the weak legal system $(L = 0)$, so that $\prod_E = V = 0$ if the E chooses the VC. In this case, the E chooses A-financing, and this maximises firm value. Furthermore, consider $q \in [0, q'']$; that is, the VC has low or medium expected ability.

Now, consider the following steps available to the policy-maker. First, he can improve the legal system, such that it becomes strong $(L > \frac{R}{2})$. Therefore, we now consider proposition 2 (and diagram 1). Since $q \in [0, q'']$, we consider intervals A or B in the diagram. We observe that, although the policy-maker has strengthened the legal system, the E continues to choose the A, since the VC has insufficient value-adding ability.

Therefore, the policy-maker's next step is to improve VC ability to $q > q''$. Now, the E will switch from A-financing to VC-financing, which maximises venture value. Furthermore, venture value is increasing with q, and is maximised at $q = 1$ (the VC has high-ability for sure). Hence, the policy-maker should aim to maximise q.

Note that Bottazzi et al (2005) provide evidence that a thriving venture capital sector requires a strong legal system[16]. In contrast, McNally (1995) focuses on policies to enhance VC-ability. Indeed, he notes that the European Commission has called for the development of the corporate venture capital (CVC) sector in order to improve strategic value-adding services. We argue that both factors (strong legal system *and* high VC value-adding abilities) are important.

Now, return to the base case (weak legal system with $q \in [0, q'']$). Furthermore, consider the case where the policy-maker is unable to enhance the legal system (recall that, in this case, $\prod_E = V = 0$ so that A-financing dominates). However, consider the case where the policy-maker can encourage the VC to become fair and trustworthy[17]. In particular, consider the case where the VC can be encouraged to be trustworthy for

[16] In addition to empirical evidence, Botazzi et al (2005) provide a theoretical model that suggests that venture capital requires a strong legal system.

[17] We do not analyse the case where the VC is fair and trustworthy in our model, but leave this for future research.

sure (so that we are considering diagram 1), and fair with a certain probability $r \in [0,1]$. We now provide an informal argument that the E's payoff curve $\hat{\prod}_E(VC)$ and the curve representing venture value $\hat{V}(VC)$ will shift upwards (see diagram 2 below, which reproduces diagram 1, with the dotted lines representing the upward shifts of the curves).

The extent of the upward shift depends on the level of r. If $r = 0,$ the curves do not shift upwards. This is because the VC is trustworthy (which is identical to our main analysis with strong legal system), but makes a self-interested offer, as in our main analysis.

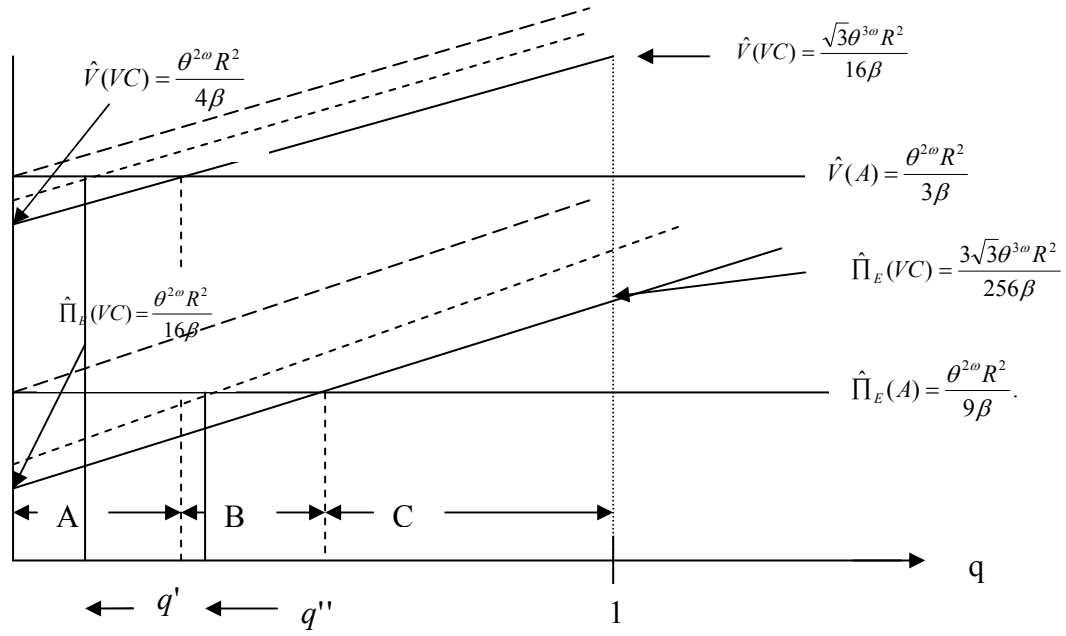
When $r = 1$ (the VC is fair for sure), $\hat{\prod}_E(VC)$ and $\hat{V}(VC)$ shift upwards to the 'long-dashed' dotted lines. This is because the non value-adding (pure financier) fair VC and non-value-adding (pure financier) fair A make identical equity offers. Therefore, venture value and entrepreneurial payoffs are the same under the non value-adding fair VC and non-value-adding fair A. Therefore, for $q < 0,$ VC financing dominates (since the lines are upward-sloping).

The 'short-dashed' dotted lines represent the case where $r \in (0,1)$. Intuitively, they are placed between the curves for $r = 0$ and $r = 1$ (when the E makes his choice of financier, he assesses the probability of the VC being fair as $r \in (0,1),$ and so his expected payoff, and expected venture value under VC must lie[18] between the case where $r = 0$ and $r = 1$).

We note that the critical values q' and q'' shift to the left (interval A shrinks, while the effect on the size of interval B is ambiguous).

[18] We emphasise that here we merely provide an outline of this case. We leave formal analysis for future research.

Diagram 2: *The effect of VC ability on the E's choice of financier, and the effect on firm value, when the VC becomes trustworthy for sure, and fair with probability* $r \in [0,1]$.



Indeed, procedural justice theory conceptualises that venture capital performance can be enhanced by relational factors such as fairness and trust. Furthermore, in contrast to Bottazzi et al (2005), Allen and Song (2002) argue that the venture capital sector becomes more important when the legal system is weak, as relational factors substitute for formal contractual control.

Future research will develop our model further to provide a formal analysis of the policy-maker's incentives to enhance legal protection of Es and VCs, VC value-adding abilities, and fairness and trust in the VC/E relationship.

Our model provides the basis for a further possible extension, as follows. In our analysis, the E's choice of financier is an either/or decision; he either chooses the angel or the VC. Furthermore, we have demonstrated that E chooses the (fair and trustworthy) angel when the value-adding abilities of the (self-interested and untrustworthy) VC are low, and/or the legal system is weak. The choice of angel does not maximise the value-creating potential of the venture.

It would be informative to develop the model by considering a population of Es, VCs, and angels, such that a proportion of Es choose angels, with the remainder choosing VCs. Our model suggests that measures to improve the VC's value-creating abilities, strengthen the legal system, and encourage VCs to be fairer and more trustworthy, may result in an increase (decrease) in the proportion of start-ups financed by VCs (Angels), together with an increase in the value-creating potential of the innovative sector. Hence, given the current dominance of angel-financing over VC financing around the world (see the introduction for a discussion), our analysis suggests that the innovative sector may not be achieving its full value-creating potential. Additionally,

we suggest that empirical research should analyse the relationship between VC value-adding abilities, legal strength, VC fairness and trust, the proportion of angel- and VC-financing, and value-creation.

III. Descriptive and Normative Implications.

de Bettignies and Brander (dB 2007) note that their model of the E's choice of VC- or bank-finance is based upon the assumption that market-participants are fully rational. Noting that, in reality, agents may be prone to psychological and cognitive biases, particularly "bounded rationality", dB state that "we view our analysis as only partially descriptive and at least as partially normative or prescriptive." In similar vein, we believe that our model can also be considered as both descriptive and normative.

The implications of our model are similar to dB's analysis. Our model predicts that VC-financing will dominate A-financing when the VC has sufficiently high ability relative to the A. As in dB, our model demonstrates that, as VC ability improves, the equity share favours the VC.

We extend dB (2007) as follows. In addition to considering value-adding abilities, we analyse the effects of fairness, trust, and the legal system. At the descriptive level, we suggest that VC financing is more likely to dominate when the legal system is strong, and/or the VC sector is fairer and more trustworthy. As a further development of dB (who only consider substitute efforts), we suggest that VCs and Es consider the interaction of their (complementary) efforts, strengthening the view that they need each other (even a high-ability VC needs to give some equity to her E).

As a further development of dB, we derive an interval of VC's expected ability $(q \in [q', q''])$, where the E does not make the value-maximising choice. In this interval, VC-financing would provide higher venture value than A-financing. However, the E chooses the A (since the E is only interested in his own payoff, and not total venture value).

dB note that "actual decisions often fall short of full rationality and emphasise that our analysis suggests specific insights that might be helpful to entrepreneurs (and others) in making financial decisions." In similar vein, at the normative level, we suggest that entrepreneurs need to consider several factors when making their choice of angel- or VC-financing. For example, if entrepreneurs focus on the relational aspects of angels (fairness and trust), ignoring the value-creating potential of VCs, they may make an inefficient choice.

IV. Conclusion.

We have presented a theoretical analysis of an entrepreneur's choice of financier (angel or venture capitalist). The venture capitalist possessed more value-adding ability, but the angel was fairer and more trustworthy. The entrepreneur's choice of financier, and the resulting performance of the venture, depended on the strength of the legal system and the level of the venture capitalist's ability. Our analysis suggested that authorities should consider measures to enhance the venture capital sector's value-adding capabilities, strengthen legal protection afforded to Es, and promote fairness and trust in VC/E relationships.

Our approach provides a basis for future research. First, we suggested a theoretical and empirical extension which considers the effect of the various factors on the proportion of angel- and VC-financing, and the resulting value-creating potential of the innovative sector. Secondly, we have taken some steps towards a behavioural approach, by considering the impact of fairness and trust. We have taken these as exogenous characteristics of VCs and angels. For future research, we could analyse why VCs and angels may be behaviourally different. A useful approach may be to employ psychological game theory, such as Sally's (2001) empathy game, trust games (Bacharach et al 2001, Berg et al 1995, Bolle 1995), and fairness (Rabin 1993). Such analysis may enable us to consider the entrepreneur's dynamic choice of angel or VC over time.

Appendix

1. *The financiers' value-adding abilities.*

We analyse, in more detail, our functional form regarding the effect of the parties' efforts on the success probability $p = \theta^{\omega(1+\gamma)} e_E^{\,1-\gamma} e_i^{\,\gamma} \in [0,1]$. We develop Repullo and Suarez (2004) in two ways.

i): We constrain the VC's relative value-adding ability to take two possible values; $\gamma \in \{0, \frac{1}{2}\}$. That is, the VC either has no ability, or she has the same ability as the E. This enables us to obtain tractable closed-form solutions for the equilibrium equity allocation, effort levels, and performance (RS were unable to do so).

Although we consider binary VC abilities, we can vary the *expected* ability of the VC (by varying the probability $q \in [0,1]$ of the VC having equal ability, and $1-q$ of the VC having no ability) from zero ability through to the same ability as the E. Following Casamatta (2003), we do not allow the VC to have higher value-adding ability than the E.
Furthermore, we assume that the A has no value-adding ability $(\gamma = 0)$.

ii): RS's (2004) formulation $p = e_E^{\,1-\gamma} e_i^{\,\gamma}$ does not allow us to vary the ability of the VC while holding the ability of the E constant. The equation implies that an increase in the VC's relative ability arises as a result of an increase in the VC's absolute ability *and* a decrease in E's absolute ability. The implication of this for the effect of relative ability on success probability is as follows.
Firstly, consider the case where the partners' effort levels are constant and equal, $e_E = e_i = \bar{e}$, regardless of the ability parameter $\gamma \in \{0, \frac{1}{2}\}$. Therefore, $p(\gamma = 1/2) = e_E^{\,1/2} e_i^{\,1/2} = \bar{e}$, and also $p(\gamma = 0) = e_E = \bar{e}$. Therefore, regardless of the relative ability parameter, we obtain the strange result that (given that the partners' effort levels are fixed and identical) the success probability is constant, whether the

VC has no ability or the same ability as the E ($\gamma \in \{0, \frac{1}{2}\}$). This is because an increase in the VC's ability is exactly offset by a decrease in the E's ability.

If we then consider the effect of the RS formulation on the parties' optimal effort levels, both players' effort incentives are weakened when $\gamma = \frac{1}{2}$ compared to $\gamma = 1$, such that $p(\gamma = 0) > p(\gamma = 1/2)$. That is, the success probability is higher when the VC has no ability compared to the case where the VC has equal ability to the E!

We address this by incorporating the parameter (not included in RS 2004) $\theta^{\omega(1+\gamma)}$. This parameter represents the synergistic effects of combining the efforts of the E and the VC on value-adding performance[19].

References:

Allen, Franklin, and Wei-ling Song, 2002, Venture capital and corporate governance, Working paper, Wharton Financial Institutions Center.

Al-Najjar, N and Ramon Casadesus-Masanell, 2001, Trust and discretion in agency contracts, Working paper.

Bacharach, M., G. Guerra, and D. Zizzo, 2001, Is trust self-fulfilling? An experimental study, Discussion Papers, University of Oxford.

Berg, J., J. Dickhaut and K.McCabe, 1995, Trust, reciprocity and social history, *Games and Economic Behavior* 10, 122 – 142.

Bernile, Gennaro, Douglas Cumming, and Evgeny Lyandres, 2007, The size of venture capital and private equity fund portfolios, *Journal of Corporate Finance* 13, 564-590.

Bigus, Jochen, 2002, Staging of venture financing, investor opportunism, and patent law, Working paper, University of Hamburg.

Bolle, F., 1995, Rewarding trust: an experimental study, *Theory and Decision* 25, 83 – 98.

Bottazzi, Laura, Marco da Rin, and Thomas Hellmann, 2005, What role of legal systems in financial intermediation? Theory and evidence, Working paper, ECGI.

Busenitz, L.W., D.D. Moesel, J.O. Fiet, and J.B. Barney, 1997, The framing of perceptions of fairness between venture capitalists and new venture teams, *Entrepreneurship: Theory and Practice*, Vol 21, no 3, 5 – 21.

[19] We tried many variations of a synergistic parameter in the probability of success function before we found the one in this paper.

Cable, D.M., and S. Shane, 1997, A prisoner's dilemma approach to entrepreneur-venture capitalist relationships, *Academy of Management Review*, Vol 22, no 1, 142 – 176.

Casamatta, Catherine, 2003, Financing and advising: optimal financial contracts with venture capitalists, *Journal of Finance* 58, 2059-2086.

Casamatta, Catherine, and Carole Haritchabalet, 2004, Learning and syndication in venture capital investments, Working paper, University of Toulouse.

Cassiman, B., and M. Ueda, 2006, Optimal project rejection and new start-up firms, *Management Science* 52, 262-275.

Chemmanur, Thomas, and Zhaohui Chen, 2006, Venture capitalists versus angels: The dynamics of private firm financing contracts, Working Paper Carroll School of Management, Boston College.

De Bettignies, Jean-Etienne and James A. Brander, 2007, Financing entrepreneurship : Bank finance versus venture capital, *Journal of Business Venturing* 22, 808-832.

De Clercq, D. and H. Sapienza, 2001, The creation of relational rents in venture capitalist-entrepreneur dyads, *Venture Capital* 2001, 107 – 127.

Ehrlich, S.B, 1994, After the cash arrives : A comparative study of venture capital private investor involvement in entrepreneurial firms, *Journal of Business Venturing* 9, 67-82.

Elitzur, Ramy, and Gavious, Arieh, 2003, Contracting, signalling, and moral hazard: a model of entrepreneurs, 'angels', and venture capitalists, *Journal of Business Venturing* 18, 709-725.

Fairchild, R., 2004, Financial contracting between managers and venture capitalists: The role of value-added services, reputation seeking, and bargaining power, *Journal of Financial Research* vol 27, no 4, 481-495.

Freear, J, Sohl, S, and William Wetzel, 1996, Creating new capital markets for emerging ventures, Working paper, University of New Hampshire.

Gebhardt, Georg, and Klaus Schmidt, 2006, Conditional allocation of control rights in venture capital finance, Working paper, university of Munich.

Goldfarb, Brent, Gerard Hoberg, David Kirsch, and Alexander Triantis, 2007, Are angels preferred venture investors?, Working paper, University of Maryland.

Hochberg, Y.V, 2002, Venture capital and corporate governance in the newly public firm, Working paper, Stanford University.

Houben, E., 2003, Venture capital, double-sided adverse selection, and double-sided moral hazard, Unpublished Working Paper.

Landier, Augustin, 2001, Start-up financing : Banks versus venture capital, Working paper, MIT.

Lehtonen, O., K. Rantanen, and M. Seppala, 2004, Venture capitalists' opportunistic behaviour towards entrepreneurs, Proceedings of the Hawaii International Conference on Business, 2004.

Leshchinski, Dima, 2002, Indulgent angels or stingy venture capitalists? The entrepreneur's choice, Working Paper, Groupe HEC.

McNally, Kevin, 1995, Corporate venture capital: The financing of technology businesses, International Journal of Entrepreneurial Behaviour and Research, vol 1 no 3, 9-43.

Prowse, S., 1998, Angel investors and the market for angel investments, *Journal of Banking and Finance* 22, 785-792.

Quindlen, R, 2000, Confession of a venture capitalist, Warner books, inc., New York, NY.

Rabin, M., 1993, Incorporating fairness into game theory and economics, *American Economic Review*, Vol 83, no 5, 1281 – 1302.

Repullo, R, and J. Suarez, 2004, Venture capital finance: a security design approach, *Review of Finance* 8 (1), 75- 108.

Sally, D., 2001, On sympathy and games, *Journal of Economic Behavior and Organization 44*, 1 – 30.

Sapienza, H., and M. Korsgaard, 1996, Procedural justice in entrepreneur-investor relations, *The Academy of Management Journal* vol 39, 544 – 574.

Sapienza, H., Korsgaard M., Goulet, P., and Hoogendam, J., 2000, Effect of agency risks and procedural justice on board process in venture capital-backed firms, *Entrepreneurship and Regional Development* vol 12, 331 – 351.

Schmidt, Klaus, Convertible securities and venture capital finance, *Journal of Finance* vol 58 no 3, 1139 – 1166.

Shepherd, D. and A. Zacharakis, 2001, The venture capitalist-entrepreneur relationship: control, trust and confidence in co-operative behaviour, *Venture Capital* 129 – 149.

Skeie, David, 2004, Vesting and control in venture capital contracts, Working paper, Federal Reserve Bank of New York.

Smith, D.G., 1998, Venture capital contracting in the information age, *Journal of Small and Emerging Business Law* 2, 133-74.

Ueda, Masako, 2004, Banks versus venture capital: Project evaluation, screening, and expropriation, The Journal of Finance vol 59, no 2, 601-621.

Utset, M. 2002, Reciprocal fairness, strategic behaviour and venture survival: a theory of venture capital-financed firms. *Wisconsin Law Review*.

Wong, Andrew, 2002, Angel Finance: The Other Venture Capital, Working Paper, University of Chicago.