

Fairness Norms and Self-interest in Venture Capital/Entrepreneur

Contracting and Performance

Author: Richard Fairchild, School of Management, University of Bath,
UK.

Date: 19th May 2010

Word Count: 6490

Abstract

We consider the combined impact of agency problems and behavioural factors on venture capital/entrepreneur contracting and performance. Particularly, we develop a behavioural game-theoretic model in which a venture capitalist and an entrepreneur negotiate over their respective equity shares, and then exert value-adding efforts in running the business. Double-sided moral hazard exists in that both parties may exert sub-optimal effort (the ‘shirking’ problem). We demonstrate that, for a given level of VC-ability, an increase in social fairness norms induces the VC to offer more equity to the entrepreneur, which in turn induces the entrepreneur to exert more effort. This improves venture performance.

1. Introduction

Venture capitalists specialise in financing risky, innovative start-up companies that may be unable to obtain funding elsewhere. Hence, the venture capitalist sector has the potential to be a great source of economic wealth creation. However, researchers have identified that the performance of venture capital-backed firms may be adversely affected by the complex economic relationships, and the extreme double-sided incentive problems, that exist between the investor (the venture capitalist) and the investee (the entrepreneur).

More recently, it has been recognised that venture-backed performance may also be affected by behavioural factors. It is argued that venture capitalist/entrepreneurial cooperative value-creating efforts may be affected (either destroyed or enhanced) by reciprocal feelings of fairness, trust, empathy and spite.

In this paper, we consider the combined impact of agency problems and behavioural factors on venture capital/entrepreneur contracting and performance. Particularly, we develop a behavioural game-theoretic model in which a venture capitalist and an entrepreneur negotiate over their respective equity shares, and then exert value-adding efforts in running the business. Double-sided moral hazard exists in that both parties may exert sub-optimal effort (the 'shirking' problem). This may be mitigated by feelings of fairness (we model this using the concept of social- or fairness-norms), which may induce the venture capitalist to offer more equity to the entrepreneur, which in turn induces the entrepreneur to exert more effort.

1.1 Existing literature on venture capitalist/entrepreneur contracting.

Researchers have identified that venture capitalist/entrepreneur financial contracting may be subject to extreme problems of moral hazard and asymmetric information. Hence, venture capitalists and entrepreneurs have developed contracts that attempt to overcome these problems and align the parties' interests (Klausner and Litvak 2001).

Research into the financial contract between the venture capitalist and the entrepreneur can be traced back to Sahlman's (1990) seminal paper. Early models (e.g., Admati and Pfleiderer 1994; Amit, Glosten and Muller 1990; Bascha 2000) usually assumed that either the manager or the venture capitalist has the power to decide on the form of financial contract. Recent research (e.g., Kaplan and Stromberg 2000) recognizes the importance of negotiations between the manager and the venture capitalist over both cash-flow rights and control rights in the financial contract.

Furthermore, the early financial contracting models (e.g., Baker and Gompers 1999) assumed a pure principal-agent relationship in which the venture capitalist, as principal, suffers from moral hazard problems from the entrepreneur, as agent. However, Smith (1998) argues that both parties contribute to wealth creation, and therefore a form of double-sided moral hazard exists. Recently, models have been developed to analyze this type of agency problem (e.g., Casamatta 2003, Elitzur and Gaviious 2003, Fairchild 2004, Repullo and Suarez 2004, De Bettignies and Brander 2007, De Bettignies 2008, Fairchild 2009). In each of these models, the entrepreneur and the venture capitalist both supply value-adding effort, and double-sided moral hazard exists due to the parties' incentives to shirk. The first-best financial contract maximises firm value. However, Fairchild (2004) demonstrates that the ability to

achieve the first-best contract is affected by the players' relative bargaining powers and value-adding abilities.

The existing financial contracting models assume that entrepreneurs and venture capitalists maximize utility based on narrow self-interest. However, behavioral economists are increasingly recognizing that relationships may be affected by psychological factors, such as feelings of fairness and reciprocity (e.g., Bolton 1991, Rabin 1993, Fehr and Schmidt 1999, Bolton and Ockenfels 2000), empathy (e.g., Sally 2001), and trust (e.g., Berg et al 1995, Bolle 1995, Huang 2000, Bacharach et al 2001). Furthermore, these feelings may affect the outcomes of negotiations and performance.

Following Fehr and Schmidt's (1999) model of inequity aversion (in which players are concerned about fairness of outcomes), experimental principal-agent games (e.g., Anderhub et al 2001, Fehr et al 2001, Fehr and Gächter 2002, Fehr and Schmidt 2004) reveal that the principal frequently offers equity, and the agent frequently exerts effort, in excess of the minimal levels predicted by game theory. Therefore, these experiments provide empirical support for mutual feelings of fairness. Furthermore, we note that these experimental results motivate our theoretical analysis, in which we examine the effects of fairness on the venture capitalist's equity offer to the entrepreneur, and the effort levels exerted by both the VC and the entrepreneur.

In this paper, our objective is to catalyze the research agenda by developing the first formal game-theoretic model to incorporate fairness into venture capital/entrepreneur financial contracting and performance.

Although no explicit game-theoretic models exist examining the impact of fairness on venture capitalist/entrepreneur relationships and performance, conceptual approaches exist. For example, Cable and Shane (1997) focus on post-investment performance,

and argue that mutual cooperation between the entrepreneur and the venture capitalist is important for project success. They further consider how the parties may trade-off short run gains from 'defection' versus long-run gains from 'cooperation.' The authors consider the use of the prisoner's dilemma framework for considering this situation. They argue that the prisoner's dilemma approach is superior to existing research that uses the agency perspective.

Lehtonen et al (2004) compare the agency approach with Procedural Justice (PJ) Theory, and argue that the latter focuses on the perceived sense of fairness in making decisions. According to PJ, the more one party perceives a procedure to be fair, the greater they will trust the other party. Kim and Mauborgne (1991, 1993) argue that an increase in a person's perception of fairness may lead to an increase in commitment to decisions, performance, behavior and attitude. Sapienza and Korsgaard (1996) provide empirical evidence that a person's willingness to share information and provide timely feedback signals his openness and honesty.

Therefore, Procedural Justice Theory may be particularly relevant to the venture capitalist/entrepreneur relationship. Sapienza (1989) argues that VCs often complain that entrepreneurs are reluctant to share information. De Clercq and Sapienza (2001) argue that increased trust and communication between entrepreneurs and venture capitalists can create 'relational rents'. Shepherd and Zacharakis (2001) argue that open and frequent communication between the entrepreneur and the venture capitalist may result in an increase in perceptions of fairness and trust, thus mitigating agency problems. Our model analyses these arguments in a formal manner.

PJ theory can also be applied to the VCs opportunistic threat of early exit. The VC may use this threat to re-negotiate the terms of the contract in her favour. According to PJ theory, feelings of fairness and trust may be positively related to intentions to

remain in a relationship. Conversely, Shepherd and Zacharakis (2001) discuss how VCs may pursue short-term gains, at the expense of the entrepreneur, through harvesting the venture rather than re-investing in firm growth, and pressuring the entrepreneur to pursue short-term, rather than long-term, profitability. Empirical research by Busenitz et al (1997) suggests that performance may be enhanced if a venture capitalist-entrepreneur relationship is framed as being fair. In summary, research in PJ suggests that perceptions of fairness should be positively related to long-term performance of the VC/E relationship, and negatively related to the risk of opportunism.

Utset (2002) provides an extensive discussion of reciprocal fairness and strategic behaviour in venture capitalist/entrepreneur relationships. He argues that the performance of the venture is at risk from the combination of two main factors. Firstly, the entrepreneur may have mistaken beliefs about the fairness of the VC at the time of contracting. Secondly, as he begins to realise over time that the VC may have an incentive to act opportunistically, the entrepreneur may react with costly self-preserving strategic behaviour and retaliation.

The main objective of our game-theoretic model is to understand the impact of fairness on the players' negotiated equity stakes, effort levels, and performance of the venture. In order to analyse this, there are several approaches to fairness that we could use. Fehr and Schmidt (2000) provide a useful classification of the fairness models. They note that there are two main approaches. The first approach is to assume that some of the agents have "social preferences," whereby they gain utility from their own absolute payoff *and* their payoff relative to the other agents (see, for example, Adreoni and Miller 2000, Bolton 1991, Kirchsteiger 1994, Fehr and Schmidt 1999). The second approach considers "intention-based reciprocity." In this approach, a

player reacts to the other player's intentions. Therefore, if a player feels that her opponent has acted with kindness, she will react by being kind in return. To analyse this kind of behaviour, we cannot use standard game theory. Instead we must use behavioural or psychological game theory (first developed by Genakoplos et al 1989). Intention-based models of reciprocity include Rabin (1993) and Falk and Fischbacher (1999), who examine reciprocal fairness, Sally (1999), who examines reciprocal empathy, and Huang (1999), who considers the effects of social equity-norms on the equilibrium of ultimatum bargaining games.

In this paper, we have chosen Huang's (1999) social equity-norm approach as being most relevant to our problem. Huang considers the effect of equity-norms on ultimatum offers in bargaining games¹.

The rest of the paper is organised as follows. In section 2, we present the model, and solve for the VC's equilibrium equity offer. In section 3, we analyse equilibrium venture performance. In section 4, we briefly outline some hypotheses that may arise from our model. Section 5 concludes the paper.

2. The Model.

2.1 The general setting.

We consider a setting in which a risk-neutral entrepreneur, drawn from a mixed population of self-interested and 'fair' types, has an innovative idea, but lacks the personal funds to start his venture. Therefore, he approaches a risk-neutral venture

¹ Other interesting social-norm games are a) The waitress-tipping game, which examines why diners give generous tips to waitresses, even if they have no intention of visiting that restaurant again (the social norm here is that a good tip is expected by society), and b) Levitt's () bagel analysis, in which office-workers pay for their bagels on a voluntary basis.

capitalist, drawn from another mixed population of self-interested and fair types, in an attempt to obtain start-up finance. The players' types (fair or self-interested) are private knowledge.

The parties negotiate over the financial contract (particularly, they negotiate over the players' relative equity stakes). We assume that the venture capitalist has all of the bargaining power, and so makes a take-it-or-leave-it equity offer to the entrepreneur. Once the financial contract has been agreed, the entrepreneur and the venture capitalist provide effort input into running the firm, and their efforts affect the probability of the venture's success.

Our objective is to consider the effects of fairness, combined with the extent of the VC's value-adding abilities, on financial contracting (the venture capitalist's equity offer to the entrepreneur), the players' effort levels, the venture's performance (in terms of success probability and expected value), and economic welfare.

There are several models of fairness that we could employ. We have chosen to use a social norm approach. A 'fair' VC makes an equitable equity proposal to the entrepreneur. A self-interested VC makes an offer that may diverge from the social norm. An entrepreneur who is concerned with fairness observes the equity offer from a self-interested venture capitalist, and compares it with the 'fair' offer. The difference affects his effort level. A self-interested entrepreneur makes no such comparison. We demonstrate that the equilibrium equity offer, effort levels, venture performance, and welfare depends on the proportion of self-interested and fair entrepreneurs and VC in the economy, combined with the level of the VC's value-adding abilities.

2.2 The time line.

The timing of the game is as follows. At date 0, a risk-neutral entrepreneur (drawn randomly from a population, consisting of r fair and $1-r$ self-interested entrepreneurs) has an idea for a new venture, but no private funds. His new project requires investment funds $I > 0$. Therefore, he approaches a risk-neutral venture capitalist (randomly drawn from another population, consisting of r fair and $1-r$ self-interested VCs) in an attempt to obtain financing. Each player's type (fair or self-interested) is private knowledge. We describe our approach to fairness in more detail below.

At date 1, the VC and the E negotiate over their relative equity stakes. Specifically the VC makes an ultimatum proposal regarding the equity allocation $\alpha \in [0,1]$ and $1-\alpha$ for the entrepreneur and the venture capitalist respectively (this reflects the idea that the VC has the bargaining power). The entrepreneur chooses whether to accept or reject the proposal. If the entrepreneur rejects, both players receive payoffs of zero. If the entrepreneur accepts, the game continues to date 2.

In date 2, the entrepreneur and the VC exert respective effort levels e_m and e_{vc} which affect the date 3 probability of success as follows. In date 3, the project succeeds with probability² $p = \gamma_m e_m + \gamma_{vc} e_{vc}$, in which case it provides income of $R > 0$. The project fails with probability $1-p$, in which case it provides income of zero. Therefore, the expected value of the project is $V = pR = (\gamma_m e_m + \gamma_{vc} e_{vc})R$.

Note that γ_m and γ_{vc} are the E's and VC's respective ability parameters. We are interested in considering the players' relative abilities. We model this using the following relationship $\gamma_{vc} = \theta \gamma_E$, where $\theta \in [0,1]$ represents the VC's relative ability

² Of course, we constrain this probability to lie between zero and unity. We discuss this further later in the paper.

(that is, in relation to the entrepreneur's ability). When $\theta = 0$, only the entrepreneur has ability (we term this the 'single-sided moral hazard' case). When $\theta > 0$, the VC has some value-adding ability (double-sided moral hazard). When $\theta = 1$, the VC and the E have equal value-adding ability. Note that we assume that the VC cannot have more ability than the E.

After the success or failure of the project is revealed at date 3, the players are paid according to the financial contract that was agreed at date 0, and the game ends.

Note that, since $p = \gamma_m e_m + \gamma_{vc} e_{vc}$, the entrepreneur's and the VC's efforts are substitutes in our model³.

Exerting effort is equally costly for the entrepreneur and the VC; that is, the disutility-of-effort (or cost-of-effort) functions are given by $c(e_m) = \beta e_m^2$, $c(e_{vc}) = \beta e_{vc}^2$. Hence, the players face increasing marginal costs of effort.

2.3 Social fairness norms versus self-interest.

There are several approaches to fairness that we could have employed in our model. (Altruism, reciprocal fairness, inequity-aversion, reciprocity, spite, empathy, retaliation). Instead, we have chosen to focus on the social norm (or equity norm) approach (see Huang 1999), combined with the inequity-aversion approach pioneered by Fehr and Schmidt (1999). In this approach, the social norm provides a benchmark, and deviations from this norm provide some disutility for the players. However, the extent of this disutility depends upon the strength of the norm. This is measured as the probability that the player will play that norm. Hence, if there is a high probability

³ Casamatta (2003) considers a double-sided moral hazard problem in which the entrepreneur's and the VC's efforts are substitutes. In contrast, in Repullo and Suarez (2004), and Fairchild (2009), the parties' efforts are complements. We leave the analysis of the interaction of complementary efforts and fairness norms for future research.

that the player will play that norm, deviations provide extreme disutility. If there is a low probability that the player will play that norm, deviations provide a low disutility. Hence, intentions matter (See Huang 1999 for a detailed discussion, and analysis, of these arguments).

In our model, the VC makes an equity proposal, which the E compares with the social norm, where the social norm is the equity proposal that equates the E's and VC's expected payoff. A deviation from the social norm provides a disutility for the E, where the strength of the disutility depends on the probability r that the VC will make the fair offer. This affects the effort level of the E, which in turn affects the VC's proposal.

2.4 The players' decisions.

We solve the game-theoretic model using backward induction. That is, we firstly take as given that a particular type of E has matched with a particular type of VC (self-interested or 'fair') at date 0, and that the VC has proposed equity allocation $\alpha, 1-\alpha$ at date 1 (which the E has accepted), and we proceed to solve for the players' optimal effort levels e_m^* and e_{vc}^* at date 2.

3.4.1 The entrepreneur matches with a self-interested VC.

The entrepreneur cannot observe the VC's type. However, all that the entrepreneur cares about is the equity offer, which he can observe. We denote the equity offer from the self-interested VC as α_U (where the sub-script U denoted the *ultimatum* offer).

We denote the equity offer from the fair VC as α_F (to be examined in the next subsection 3.4.2).

We denote the E's and the VC's respective expected payoffs as follows (note that the terms P_{ES} and P_{EF} in equation (2) represent the venture's success probability given that the VC has matched with the self-interested or fair E respectively. We discuss this further below);

$$\Pi_E = \alpha_U PR - \beta e_E^2 - r(\alpha_F - \alpha_U), \quad (1)$$

$$\Pi_{VC} = r[(1 - \alpha_U)P_{ES}R] + (1 - r)[(1 - \alpha_U)P_{EF}R] - \beta e_{VC}^2, \quad (2)$$

where the first term of equation (1) represents E's equity share of the expected project value, given the VC's ultimatum equity offer α_U to the E, and the second term represents his date 2 effort costs. The third term represents our innovation in this model. This is the E's disutility from receiving an equity allocation α_U that is different from the equity-norm α_F . The strength of this disutility depends on the proportion of fair VCs $r \in [0,1]$ in the economy. If r is large, there is a high probability that the E will match with a fair VC. In this case, if the E observes a deviation from the fairness-norm (that is, he has matched with a self-interested VC), he will experience a large disutility. On the other hand, if r is small, there is a low probability that E will match with a fair VC. Therefore, he suffers a small disutility from observing an inequitable equity offer. The E's optimal effort level maximises equation (1).

Now consider the self-interested VC's expected payoff, equation (2). The VC cannot observe the E's type. She knows that, with probability r , she will match with a fair E, while, with probability $1 - r$, she will match with a self-interested E. Since the self-

interested E is not concerned with the social norm, $r = 0$ in equation (1). Therefore, a self-interested E will exert a different effort level, and this will result in a different success probability P_{ES} than if the VC had matched with a fair E. The fair E's effort level will provide success probability $P_{EF} \neq P_{ES}$.

A self-interested VC chooses her equity offer α_U to maximise equation (2).

2.4.2: *The entrepreneur matches with a fair VC.*

As a benchmark case, we first consider a fair VC. She offers a fair equity stake α_F that equalises the expected payoffs (this is the equity-norm).

We derive the equity-norm α_F by considering equations (1) and (2). By definition, the fair VC will propose $\alpha_U = \alpha_F$. Therefore, equation (1) becomes

$$\Pi_E = \alpha_U PR - \beta e_E^2 \quad (3)$$

for both types of E (fair or self-interested). That is, since the fair VC offers the equity norm $\alpha_U = \alpha_F$, it is irrelevant whether the fair VC matches with a self-interested or fair E. Either type of E faces the same expected payoff function (3). Therefore, whether a fair VC matches with a fair or self-interested E, E's optimal effort will be identical for either type, and $P_{ES} = P_{EF}$ for either type. Therefore, when $\alpha_U = \alpha_F$, the fair VC's expected payoff (3) becomes

$$\Pi_{VC} = (1 - \alpha_F)PR - \beta e_{VC}^2. \quad (4)$$

We solve for the equilibrium fair offer $\alpha_U = \alpha_F$, by backward induction. Firstly, we derive the players' optimal effort levels, given the fair VC's proposal α_F . We do so by substituting $p = \gamma_m e_m + \gamma_{vc} e_{vc} = \gamma_E e_m + \theta \gamma_E e_{vc}$ into (3) and (4), and solving $\frac{\partial \Pi_E}{\partial e_E} = 0$, and $\frac{\partial \Pi_{VC}}{\partial e_{VC}} = 0$. We thus obtain the optimal effort levels for the fair VC and either type of E, given that the fair VC has proposed $\alpha_U = \alpha_F$. These are as follows;

$$e_E^* = \frac{\alpha_F \gamma_E R}{2\beta}, e_{VC}^* = \frac{(1 - \alpha_F) \theta \gamma_E R}{2\beta}. \quad (5)$$

Substituting these optimal effort levels into $V = PR = [\gamma_E e_E + \theta \gamma_E e_{VC}]R$, and then substituting into (3) and (4), we obtain the indirect payoffs for either type of E, given that he has matched with a fair VC who proposes $\alpha_U = \alpha_F$;

$$\widehat{\Pi}_E = \left[\frac{\alpha^2 \gamma_E^2}{4\beta} + \frac{\alpha(1 - \alpha) \theta^2 \gamma_E^2}{2\beta} \right] R^2 \quad (6)$$

$$\widehat{\Pi}_{VC} = \left[\frac{(1 - \alpha)^2 \theta^2 \gamma_E^2}{4\beta} + \frac{\alpha(1 - \alpha) \gamma_E^2}{2\beta} \right] R^2 \quad (7)$$

Equating (6) and (7), we obtain the fair (payoff-equalising) equity proposal α_F , as follows;

Proposition 1: *If the VC is fair, she proposes the equity-norm*

$$\alpha_F = \frac{1 - 2\theta^2 \pm \sqrt{1 + \theta^4 - \theta^2}}{3(1 - \theta^2)}. \quad (8)$$

This proposal equates the players' payoffs.

2.4.3 The VC is self-interested; revisited.

Having derived the fair VC's optimal equity proposal, we now return to the case where the VC is self-interested. First, consider the case where the self-interested VC has matched with a fair E, and has made the equity proposal $\alpha_U \neq \alpha_F$. Using equation (1), we derive the fair E's optimal equity proposal by solving $\frac{\partial \Pi_E}{\partial e} = 0$. We thus obtain the fair E's optimal effort;

$$e_E^* = \frac{[\alpha_U - r(\alpha_F - \alpha_U)]\gamma_E R}{2\beta}. \quad (9)$$

The self-interested E's optimal effort level is obtained by simply setting $r = 0$ in equation (9).

The self-interested VC's optimal effort level is given by equation (5) (replacing α_F with α_U), regardless of whether she has matched with a self-interested or fair E⁴. Therefore, we substitute for (5) and (9) into $V = PR = [\gamma_E e_E + \theta \gamma_E e_{VC}]R$, and then into (1) and (2) to obtain the fair or self-interested ($r = 0$ in equation (1)) E's and the self-interested VC's indirect payoffs;

$$\widehat{\Pi}_E = \left[\frac{(\alpha_U + r(\alpha_U - \alpha_F))^2 \gamma_E^2}{4\beta} + \frac{(\alpha_U + r(\alpha_U - \alpha_F))(1 - \alpha) \gamma_{VC}^2}{2\beta} \right] R^2 \quad (10)$$

$$\begin{aligned} \widehat{\Pi}_{VC} = & r \left[\frac{(1 - \alpha_U)(\alpha_U + r(\alpha_U - \alpha_F)) \gamma_E^2}{2\beta} + \frac{(1 - \alpha_U)^2 \gamma_{VC}^2}{4\beta} \right] R^2 \\ & + (1 - r) \left[\frac{(1 - \alpha_U) \alpha_U \gamma_E^2}{2\beta} + \frac{(1 - \alpha_U)^2 \gamma_{VC}^2}{4\beta} \right] R^2 \end{aligned} \quad (11)$$

Note that, if the E is self-interested, $r = 0$ in equation (10).

When the self-interested VC makes her equity proposal, she does not know whether she has matched with a fair or self-interested E, but she does know the respective probabilities r and $1 - r$. Therefore, she chooses her optimal equity proposal α_U^* to maximise her expected payoff. Therefore, from equation (11), we derive the self-

⁴ Note that the self-interested VC's optimal effort level is independent of the type of E because efforts are independent substitutes in the success probability function. If the efforts were complements, the VC's optimal effort level would then depend on her anticipation of the E's optimal effort level. Since the VC cannot observe E's type, this analysis would be much more complex. We discuss this further in the conclusion.

interested VC's optimal equity proposal, by solving $\frac{\partial \hat{\Pi}_{VC}}{\partial e_{VC}} = 0$. We obtain the following;

Proposition 2: *The self-interested VC's optimal equity proposal is;*

$$\alpha_U^* = \frac{1 - \theta^2 + r^2(1 + \alpha_F)}{2(1 + r^2) - \theta^2}. \quad (12)$$

We observe that there is a relationship between the fair equity proposal α_F and α_U^* , and that this relationship is moderated by the influence of the VC's relative ability θ and the strength of the fairness norm r . Further, the analysis is complicated by the observation that the fair equity proposal α_F is affected by the relative ability parameter θ (see equation (8) in proposition 1).

For example, if the VC has no ability ($\theta = 0$), equation (8) reveals that the fair equity proposal is $\alpha_F = \frac{2}{3}$. Since the VC has no ability (and hence exerts no effort), her fair

(payoff-equalising) offer compensates the entrepreneur for his effort costs. Given $\theta = 0$, the moderating impact of societal fairness r is as follows. If society has a self-

interest norm, $r = 0$, equation (12) (with $\alpha_F = \frac{2}{3}$) reveals that a self-interested VC

offers $\alpha_U = \frac{1}{2}$. As the societal fairness norm increases towards $r = 1$, equation (12)

reveals that a self-interested VC's optimal equity offer increases towards $\alpha_U = \frac{2}{3}$.

Next, consider the case where the VC and E have equal ability ($\theta = 1$). Now, the fair equity proposal (from equation (8)) is $\alpha_F = \frac{1}{2}$. This is intuitively sensible. Since the E and the VC have equal ability, an equal share of the equity will induce the players to exert equal effort, and therefore, their expected payoffs will be equalised. Given that $\theta = 1$, the moderating impact of societal fairness r is as follows. If society has a self-interest norm, $r = 0$, equation (12) (with $\alpha_F = \frac{1}{2}$) reveals that a self-interested VC offers $\alpha_U = 0$. That is, since the players have equal ability, and since the VC does not need to worry about the E's feelings of fairness, the VC will take all of the equity, since she can contribute to project success on her own (in practical terms, this might mean that the VC takes all of the equity, and retains the E as a paid employee, with a fixed salary). As the societal fairness norm increases towards $r = 1$, equation (12) reveals that a self-interested VC's optimal equity offer increases towards $\alpha_U = \frac{1}{2}$.

Note that, in both cases, $\theta = 0$ and $\theta = 1$, the self-interested VC's optimal equity offer increases towards the fair equity offer as the societal fairness norm increases towards unity. We observe in the next section that this is a general result for all relative ability parameters $\theta \in [0,1]$.

2.4.4 Graphical analysis of self-interested VC's Equity Offer

Since the relationship between the fair equity proposal α_F and α_U^* is complicated by the influence of the VC's relative ability θ and the strength of the fairness norm r , and further complicated by the observation that the fair equity proposal α_F is affected by the relative ability parameter θ , we now proceed to present numerical results for the entire parameter intervals $\theta \in [0,1]$ and $r \in [0,1]$.

Diagram 1 demonstrates the effect of relative ability and fairness on the self-interested VC's equilibrium equity proposal for $\theta = 0$, $\theta = 0.5$, and $\theta = 1$. Table 1 demonstrates the effects of fairness on the equity offer for the range of $\theta \in [0,1]$ in 0.1 increments.

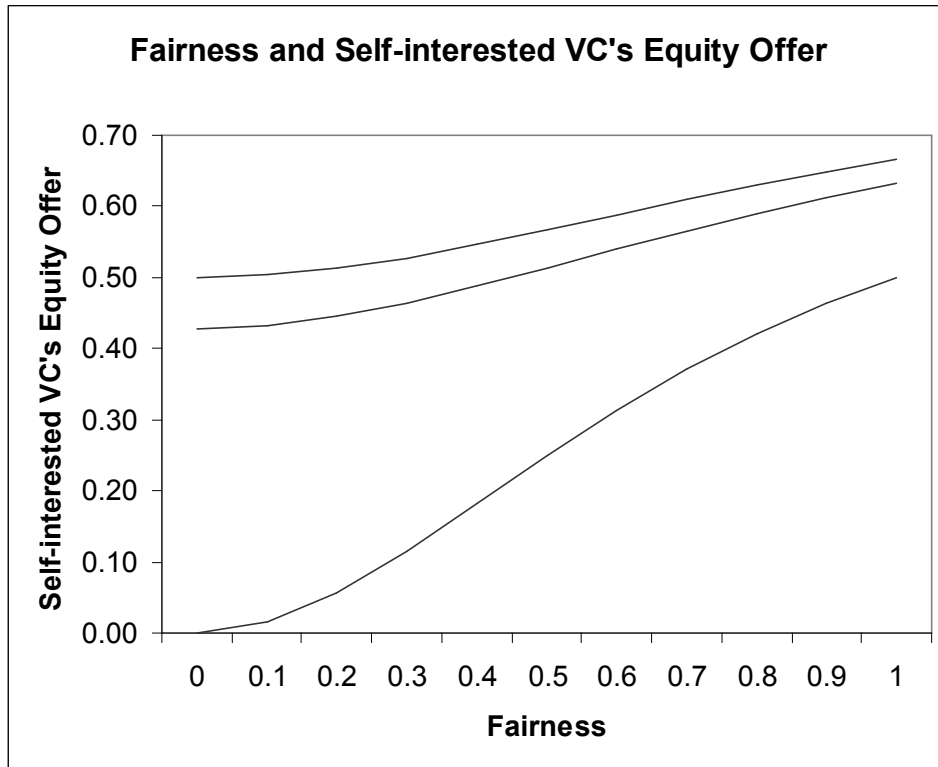


Diagram 1 demonstrates that, as the level of the societal fairness-norm increases, the VC increases her equity offer to the E, regardless of the level of VC ability. Further, for any level of VC ability, the self-interested VC's equity offer approaches the fair VC's equity offer as the level of fairness approaches unity.

Table 1: *Self-interested VC's Optimal Equity Proposal*

VC ability/Fairness θ	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
0	0.50	0.50	0.51	0.53	0.55	0.57	0.59	0.61	0.63	0.65	0.67
0.1	0.50	0.50	0.51	0.53	0.54	0.56	0.59	0.61	0.63	0.65	0.67
0.2	0.49	0.49	0.50	0.52	0.54	0.56	0.58	0.60	0.62	0.64	0.66
0.3	0.48	0.48	0.49	0.51	0.53	0.55	0.57	0.59	0.62	0.64	0.66
0.4	0.46	0.46	0.47	0.49	0.51	0.53	0.56	0.58	0.61	0.63	0.65
0.5	0.43	0.43	0.45	0.46	0.49	0.51	0.54	0.57	0.59	0.61	0.63
0.6	0.39	0.40	0.41	0.43	0.46	0.49	0.52	0.54	0.57	0.59	0.62
0.7	0.34	0.34	0.36	0.39	0.42	0.45	0.48	0.52	0.55	0.57	0.60
0.8	0.26	0.27	0.29	0.32	0.36	0.40	0.44	0.48	0.51	0.54	0.57
0.9	0.16	0.17	0.20	0.24	0.29	0.34	0.39	0.43	0.47	0.51	0.54
1	0.00	0.01	0.06	0.11	0.18	0.25	0.31	0.37	0.42	0.46	0.50

The table can be read horizontally or vertically. First, we note, from the graph and table (horizontally) that the self-interested VC's equity offer is positively related to the societal fairness-norm. For any level of ability, the optimal equity offer increases towards the fair offer as the fairness norm increases towards unity. The increase is steeper (shallower) for higher (lower) VC ability. The intuition is that, for low VC ability, the self-interested VC makes a high equity offer to the E, even when the fairness norm is low. For high VC ability, the self-interested VC takes much more of the equity for low levels of the fairness-norm, increasing the equity offer to the E much more rapidly as the fairness norm increases.

Reading the table vertically, we note that for a given level of fairness, the VC's offer to the E falls as the VC's ability increases.

3. Equilibrium venture performance

In this section, we consider the combined effects of fairness (in the form of social norms) and value-adding abilities on the equilibrium equity proposal, effort levels, and expected firm value for the entire parameter intervals $\theta \in [0,1]$ and $r \in [0,1]$.

We consider the effect of relative ability and fairness on ex ante expected firm value, from the point of view of an external observer, who knows the probabilities of a fair or self-interested E matching with a fair or self-interested VC. This provides a measure of expected venture performance. Hence, expected firm value is given by;

$$E(V) = r[V(VC_F; E_i)] + (1-r)r[V(VC_S, E_F)] + (1-r)^2[V(VC_S, E_S)].$$

Diagram 2.

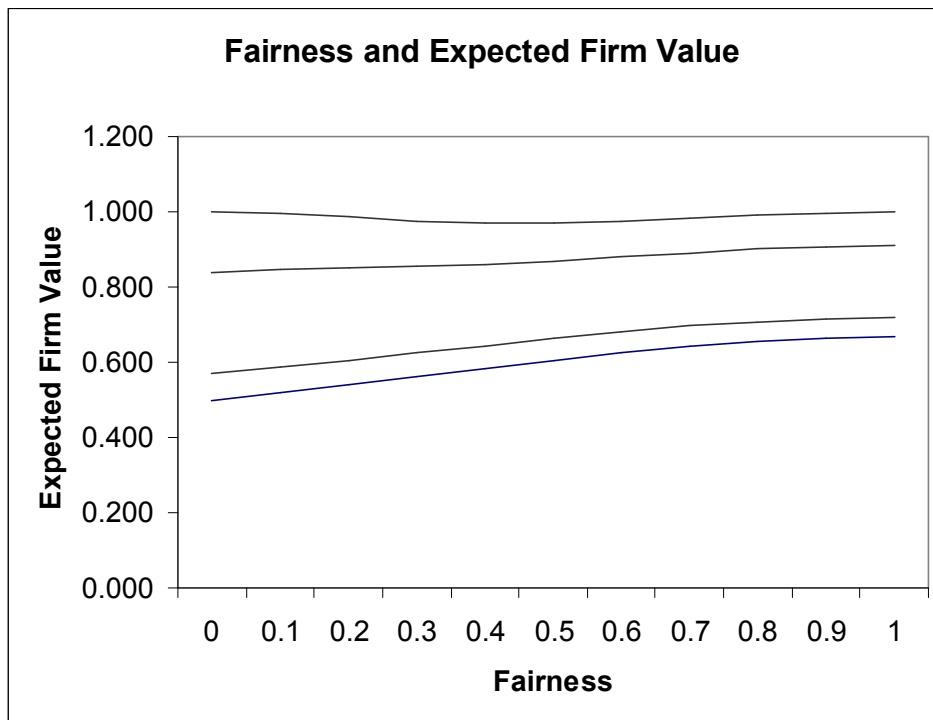


Diagram 2 demonstrates that, as the level of fairness increases, expected firm value unambiguously increases for nearly all levels of VC ability, except when the VC and the E have equal ability $\theta = 1$. In this case, we observe that firm value has a slight U-shape as a function of fairness. The intuition is that increasing fairness drives the self-interested VC to offer more equity to the E. This reduces VC's effort (which, since her ability is high, has a negative impact on firm value). Further, increasing E's fairness reduces E's effort level for proposals less than the equity norm.

We next present table 2.

VC ability/Fairness θ	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
0	0.500	0.518	0.539	0.561	0.583	0.604	0.624	0.641	0.655	0.664	0.667
0.1	0.503	0.521	0.541	0.563	0.585	0.606	0.626	0.643	0.656	0.665	0.668
0.2	0.510	0.528	0.548	0.570	0.591	0.612	0.632	0.649	0.662	0.671	0.674
0.3	0.524	0.541	0.560	0.581	0.603	0.623	0.642	0.659	0.672	0.680	0.683
0.4	0.543	0.560	0.579	0.599	0.620	0.640	0.658	0.674	0.687	0.695	0.697
0.5	0.571	0.587	0.605	0.624	0.643	0.663	0.680	0.696	0.708	0.716	0.717
0.6	0.610	0.624	0.641	0.658	0.676	0.694	0.711	0.726	0.737	0.745	0.746
0.7	0.662	0.675	0.689	0.704	0.720	0.736	0.752	0.766	0.778	0.784	0.785
0.8	0.735	0.746	0.756	0.767	0.780	0.793	0.807	0.820	0.831	0.838	0.839
0.9	0.840	0.846	0.850	0.854	0.860	0.869	0.879	0.891	0.901	0.908	0.910
1	1.000	0.996	0.986	0.976	0.969	0.969	0.973	0.981	0.990	0.997	1.000

From the table, we observe the following. Reading horizontally, expected firm value is unambiguously increasing in the level of the fairness norm for all levels of VC ability, apart from the case where the VC and E have equal ability, when the effect of fairness is U-shaped.

Reading vertically, for any given level of fairness norm, the expected value of the firm is unambiguously increasing in VC ability.

4. Suggested empirical tests

We have analysed the interaction between VC ability and societal fairness norms on the VC's equilibrium equity offer to the E, and the expected venture performance (in the form of expected firm value). In this section, we discuss possible methods of testing our results.

Tests of behavioural models take three major forms; a) Quantitative analysis using large datasets, b) experiments, and c) surveys. In terms of testing VC/E relationship and performance, b) and c) are probably the most appropriate.

From our model, we suggest the following hypotheses. Holding VC ability constant:

Hypothesis 1: A positive relationship exists between societal fairness and the VCs equity offer to the E.

Hypothesis 2: A positive relationship exists between societal fairness and venture performance.

Hypothesis 3: A positive relationship exists between societal fairness and expected venture values.

Hypothesis 4: A positive relationship exists between societal fairness and venture-backed IPO activity.

5. Conclusion

We have developed a game-theoretic model of venture capital that analyses the combined effects of social-norms of fairness and VC-ability on a) the VC's equilibrium equity offer to the E, and b) the expected performance of the venture. Our model shows that venture performance is positively related to social equity-norms. A greater feeling of fairness induces a higher equity offer from the VC, which in turn induces a higher value-adding effort from the E.

Our model suggests an interesting future research agenda. It suggests that venture performance may be affected by a combination of VC-ability and social norms of fairness. Therefore, international and cross-country comparisons would be useful. For example, it is claimed that, in some societies, self-interest dominates (for example, US and UK?). Other societies may be characterised by a culture of fairness (eg China?). How would these societal characteristics affect venture performance?

Our analysis may explain the vast contractual variations observed by Kaplan and Stromberg (2000). This may be because of difference in feelings of fairness, VC-ability and bargaining power. Further empirical analyses of venture capital contracts may prove useful.

We have focused on equity contracts. An interesting analysis of venture capital financial contracting is provided by Cumming (2005). Motivated by the research that claims that VCs make great use of convertibles, Cumming compares the financial contracts of US and Canadian VCs. He demonstrates that US VCs make great use of convertibles while Canadian VCs make great use of equity, with very little evidence of convertible usage. The author considers various reasons for these differences, including addressing agency conflicts, taxation, learning, and institutional factors.

However, an interesting factor that he mentions is the behavioral factor of fairness. He argues that equity contracts may be viewed as a more fair and equal type contract. Therefore, the evidence might be supportive of the view that Canadian VCs and entrepreneurs might have a more trusting and fair relationship than US VCs and entrepreneurs. In our analysis, we do not consider this, since we only consider equity contracts. However, future research should consider this.

Our model focuses on the cash flow rights associated with the financial contract. We do not consider the control rights. Some researchers argue that behavioural factors affect both cash flow and control rights. For example, Lu et al (2006) consider the VC/entrepreneur relationship as a dynamic pure principal-agent relationship, where the VC is subject to post-investment agency risk from E's opportunistic behaviour. The authors argue that the VC's ability to act with ex post reprisal may contain the E's opportunistic behaviour.

Utset (2002) discusses the dynamic relationship between the VC and the E, and argues that long-term opportunism by the VC can lead to value-damaging reprisal activity by the E, even if this reduces E's payoff. Hence, Utset's discussion complements Lu et al's discussion of VC reprisal activity.

Lehtonen et al (2004) also consider VCs opportunism towards the entrepreneur, taking into account two stages; the "early phase" and the "mature phase".

Manigart et al (2002) consider a behavioral factor not considered in our model; that of trust. They consider the debate regarding whether trust and control are complements or substitutes. The substitute argument states that increasing trust reduces the need for control. The complement argument argues that trust and control go hand-in-hand. The authors provide an experiment that demonstrates that, as trust increases,

entrepreneurs provide more pro-investor controls in the contract. This would be an interesting case to model and test further.

Scholars are just beginning to understand the economic and behavioural factors that affect venture capital/entrepreneur relationships and performance. Hence, this provides an exciting future research agenda.

Bibliography:

Admati, A. and P. Pfleiderer, 1994, Robust financial contracting and the role of venture capitalists, *Journal of Finance* 49, 371-95.

Anderhub, V., S. Gächter and M. Königstein, 2001, Efficient contracting and fair play in a simple principal-agent experiment. Available at <http://ideas.repec.org/p/zur/iewwpx/018.html>

Amit, R., L. Glosten, and E. Muller, 1990, Entrepreneurial ability, venture investments, and risk sharing, *Journal of Management Science* 36, 1232-43.

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

Baker, M. and P.A. Gompers, 1999, Executive ownership and control in newly public firms: The role of venture capitalists, Working paper. Available at <http://papers.ssrn.com/sol3/papers.cfm?abstract.id=165173>.

Bascha, A., 2000, Why do venture capitalists hold different types of equity securities? Available at http://papers.ssrn.com/sol3/papers.cfm?abstract_249949.

Becker, G. 1974, A theory of social interactions, *Journal of Political Economy* 82, 1063 - 1093.

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

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

Bolton, G., 1991, A comparative model of bargaining: theory and evidence, *American Economic Review* 81, 1096 – 1136.

Bolton, G. and A. Ockenfels, 2000, ERC- A theory of equity, reciprocity, and competition, *American Economic Review* 90, 166 – 193.

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.

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.

Camerer, C., 2003, Behavioral game theory: experiments in strategic interaction.

Casamatta, C., 2003, Financing and advising: Optimal financial contracts with venture capitalists, *Journal of Finance* vol 58, no 5, 2059 - 2085.

Cumming, D.J., 2005, Agency costs, institutions, learning, and taxation in venture capital contracting, *Journal of Business Venturing*, 20, 573 – 622.

De Bettignies, J.E., 2008, Financing the entrepreneurial venture. *Management Science* 54, 151-166.

De Bettignies, J.E, and Brander, J.A. 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.

Elitzur, R., and A. Gaviols, 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.

Fairchild, R. 2009 (forthcoming), An entrepreneur’s choice of venture capitalist or angel-financing: A behavioural game-theoretic approach. *Journal of Business Venturing* (article in press).

Fehr, E. and S. Gächter, 2002, Do incentive contracts undermine voluntary cooperation? Available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=313028

Fehr, E., and K. Schmidt., 1999, A theory of fairness, competition and cooperation, *Quarterly Journal of Economics*, 817 – 868.

Fehr, E., A. Klein and K. Schmidt, 2001, Fairness, incentives and contractual incompleteness, *Working Paper Series, ISSN 1424-0459*, Institute for Empirical Research in Economics, University of Zurich.

Fehr, E., and K. Schmidt, 2004, Fairness and incentives in a multi-task principal-agent model, *Scandinavian Journal of Economics* 106 (3), 453 – 474.

Geanakoplos, J., D. Pearce, and E. Stacchetti, 1989, Psychological games and sequential rationality, *Games and Economic Behavior*, 1, 60 – 79.

Gibson, K. 2003, Games students play: incorporating the prisoner's dilemma in teaching business ethics, *Journal of Business Ethics*, vol 8, issue 1, 53 – 64.

Hellmann, T., 1998, The allocation of control rights in venture capital contracts, *RAND Journal of Economics*, vol 29 (1), 57 – 76.

Hoffman, H, and Blakey, J., 1987, You can negotiate with venture capitalists, *Harvard Business Review*, March/April, vol 65 issue 2, 16 – 20.

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

Huang, P.H., 2000, Reasons within passions: emotions and intentions in property rights bargaining, *Oregon Law Review* 2000.

Kaplan, S. and P. Stromberg. 2000, Financial contracting meets the real world: An empirical analysis of venture capital contracts. Available at <http://papers.ssrn.com/paper.cfm?id=218175>.

Kim, W.C., and R.A. Mauborgne, 1991, Implementing global strategies: the role of procedural justice, *Strategic Management Journal*, Vol 12, 125 – 143.

Kim, W.C., and R.A. Mauborgne, 1993, Procedural justice, attitudes, and subsidiary top management compliance with multinationals' strategic decisions, *Academy of Management Journal*, Vol 36 no 3, 502 – 526.

Klausner, M. and K. Litvak, 2001, What economists have taught us about venture capital contracting. Available at <http://papers.ssrn.com/abstract=280024>

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

Lu, Q., Hwang, P., and Wang, C.K., 2006, Agency risk control through reprisal, *Journal of Business Venturing* 21, 369 – 384.

Manigart, S., Korsgaard, M., Folger, R., Sapienza, H., and Baeyens, K., 2002, The impact of trust on private equity contracts, Vlerick Working papers, Vlerick Leuven Gent Management School.

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: 75 – 108.

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

Sahlman, W., 1990, The structure and governance of venture capital organizations, *Journal of Financial Economics*, 27, 473 – 524.

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.

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

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

Tucker, J. (2004) Leveraging the Venture capital relationship – the entrepreneur's perspective, Unpublished MBA dissertation, School of Management, University of Bath, UK.

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

