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## Impact of Venture Capital Firms' Reputation on Investment Decisions

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**Abstract:** As one of the most important intangible assets, reputation should be taken into account when VC firms make investment decisions, while the impact of VC firms' reputation on their investment decisions has received little attention. The paper studies how a VC firm's reputation affects its investment decisions by building mathematical models. Our findings show that if enhancement of reputation from completion of a project in the future is taken into account during the VC firm's decision-making process, the VC firm will have a stronger willingness to finance the project initially, to refinance the project which run into difficulties during the implementation process and make more effort in implementation of the project. However, the pursuit of social reputation will dilute the VC firm's incentive to provide effort for the financial objective.

**Key words:** Reputation, impact, venture capital firms, investment decisions, mathematical models

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### INTRODUCTION

Young companies in emerging industries are characterized by a high level of economic and technological uncertainty, the absence of credit history and collaterals and high level of information asymmetry, which prevents them of using more traditional sources of financing. Venture Capital (VC) firms play a very important role in financing of these companies for that reason (Sander and Koomagi, 2007). VC firms raise funds from various investors and then seek to invest these funds in private companies with the purpose of achieving superior investment returns. In addition to providing funding for these companies, VC Firms contribute greatly to their success in many other ways, for example, by helping them in hiring competent management, providing better incentives to companies management and employees, as well as by allowing them access to their network of contacts among suppliers and potential customers in the product market. Many well-known companies including technological leaders such as Intel and Microsoft received venture capital financing during early-stage development. Although, many entrepreneurs in high-growth industries sought venture capital, a majority of them failed to attract venture capital because their companies can't satisfy selection criteria of VC firms.

Researchers have made a substantial contribution to the literature in understanding the investment selection decisions of VC firms by exploring the decision-making process in terms of the selection criteria applied (Muzyka *et al.*, 1996; Wright *et al.*, 1997). The impact of

some influencing factors on the investment decisions of VC firms also have received attention. Reputation as one of the important factors should be taken into account when VC firms make investment decisions. Dimov *et al.* (2007) examined the relationship between the finance expertise of VC firms' management team and investment selections and the moderation of this relationship by the VC firms' reputation and social status. They found while finance expertise is associated with a lower proportion of early-stage investments, this relationship is weaker for firms with high reputation. In contrast to Dimov *et al.* (2007), our paper seeks to understand how reputation of VC firms affect their investment decisions, but do not only explore the role of the VC firms' reputation in moderation of relationship between their finance expertise and investment selections. The paper research the impact of VC firms' reputation on investment decisions by building mathematical models and drives some conclusions. If reputation stemming from completion of a project in the future is taken into account during a VC firm's decision making process, the VC firm will have a stronger willingness to invest the project initially, to make an additional investment when the project run into difficulties during implementation process and provide more effort in the project. However, more effort that the venture capital firm spends in pursuit of social reputation will dilute the incentive to provide effort for the financial objective. Our research contributes to the VC firms' literature by providing insight into how their reputation affect their investment selections. The remainder of our paper is organized as follows. The next sections review

the related literature about the factors influencing VC firms' investment behavior and construct the mathematical models. The last section summarizes the paper.

## RELATED LITERATURE REVIEW

VC firms are considered experts in identifying high potential new ventures-gazelles. Thus, the VC firms' decision process has received tremendous attention within the entrepreneurship literature. VC firms do not invest randomly, rather they select private firms in terms of some selection criteria. Therefore many studies on VC firms' decision-making process focus on which decision criteria are central to selecting gazelles. In other words, they focus on the impact of projects' characteristics on VC firms investment decisions. VC firms' investment decisions can be affected by many influencing factors as well.

**Characteristics of projects affect VC firms' investment behavior:** A relatively large body of research has concentrated on identifying and ranking the evaluation criteria used by VC firms in screening and evaluating new venture proposals compared to the other stages in the VC process. VC firms should assess expected return and perceived risk on the basis of a weighting of several characteristics of the prospective ventures and then make the decision whether or not to invest. Tyebjee and Bruno (1984) recognized five underlying dimensions which affect VC firms' investment decisions to commit funds to the deal, (1) Market Attractiveness (size, growth and access to customers), (2) Product Differentiation (uniqueness, patents, technical edge, profit margin), (3) Managerial Capabilities (skills in marketing, management, finance and the references of the entrepreneur), (4) Environmental Threat Resistance (technology life cycle, barriers to competitive entry, insensitivity to business cycles and down-side risk protection), (5) Cash-Out Potential (future opportunities to realize capital gains by merger, acquisition or public offering) on the basis of the expected return and perceived risk. Macmillan *et al.* (1985) found it is the quality of the entrepreneur that ultimately determines the funding decision. Some most important criteria had to do with the entrepreneur's experience or personality. Baum and Silverman (2004) found that the characteristics that lead to VC firms financing are highly correlated with the characteristics that trigger exit. Specifically, VC firms are attracted to private firms that have technology that can lead to strong future performance. Pintado *et al.* (2007) examined the investment decisions of 51 Spanish VC firms by stage of

development. Their results showed that VC firms ranked evaluation criteria related to the characteristics of the entrepreneurs, manager background and management team experience as more important than market and product characteristics.

**Characteristics of VC firms affect their investment behavior:** Some researchers analyze the impact of characteristics of VC firms on investment decisions. Zacharakis and Shepherd (2001) indicated that VC firms are indeed overconfident and that overconfidence negatively affects VC decision accuracy. Although overconfidence in itself does not necessarily lead to a wrong decision, the bias is likely to inhibit learning and improving the decision process. Overconfident VC firms may not fully consider all relevant information, nor search for additional information to improve their decision. Reducing overconfidence may lead to stronger decisions. Cheng (2012) provided evidence that the attributes of VC investors in initial investments affect the likelihood of investing in early movers. The propensity for syndicate investments in early start-ups in the Internet industry increases with the presence of heterogeneous investors' attributes but decreases with the presence of homogeneous investors' attributes. Dimov *et al.* (2007) found VC firms with higher finance expertise select fewer early-stage investments and while finance expertise is associated with a lower proportion of early-stage investments, this relationship is weaker for firms with high reputation.

**External factors affect VC firms' investment behavior:** Jeng and Wells (2000) found that early stage venture capital investing is negatively impacted by labor market rigidities, while later stage is not. IPOs have no effect on early stage venture capital investing across countries, but are a significant determinant of later stage venture capital investing across countries. Fujiwara and Kimura (2012) found VC firms significantly tend to require control rights and liquidation rights in country's with poor investor protection. Hassan and Ibrahim (2012) found the origin of the VC firms seem to have an effect on the Egyptian VC firms' behaviors. International VC firms are also more likely to get involved in every decision at the strategic level of the private companies. Dai *et al.* (2012) investigated the investment behavior and exit performance of VC firms that have pursued expansion in Asia. Their findings indicate that when investing alone, foreign VC firms are more likely to invest in more information-transparent ventures.

There is a large body of research analyzing the influencing factors affect VC firms' investment behavior.

However, the impact of VC firms' reputation on their investment behavior has received relatively attention. As one of the important factors, reputation should be taken into account during VC firms' investment decision-making process. Corporate reputation has been defined as 'a perceptual representation of a company's past actions and future prospects that describe the firm's overall appeal to all its key constituents when compared to other leading rivals' (Fombrun, 1996). In the context of the VC industry, reputation is widely recognized as a valuable intangible asset which can be one of the most important sources of competitive advantage. Reputation of VC firms are associated with the success of their previous investments, which in turn affects the ability to raise and invest new funds. In addition, VC firms with high reputation are more desirable syndication partners and thus have access to more deals. Although there is a long tradition of examining the effects of reputation on investment behavior in financial markets, little studies focus on the effects of reputation of VC firms on investment decisions. So our paper seeks to understand how reputation of VC firms affect their investment decisions by building mathematical models.

### MATHEMATICAL MODELS

The mathematical models in this section are developed from the models presented by Dewatripont and Maskin(1995).

We assume that there are two periods, one venture capitalist (VC firm) and one project (private company). The project is carried out in periods 1 and 2 and it can be either good or poor. A good project is completed after one period; a poor project requires two periods for completion. Whether good or poor, it requires one unit of capital per period. The entrepreneur has no capital himself and so has to obtain capital from the venture capitalist. The venture capitalist has the capital and needs to decide whether or not to invest in the project, but cannot initially distinguish between good and poor projects. The venture capitalist will assess the observable monetary return and unobservable private benefits such as enhancement of his ability and reputation before financing the entrepreneur's project. He provides effort  $e$ , the cost of effort is  $\phi(e)$  and  $\phi'(e) > 0$ ,  $\phi''(e) > 0$ . The paper only consider the reputation as unobservable private benefit. Motivated by De Castro *et al.* (2006), we divide the reputation into two dimensions. One is business reputation, that includes the different aspects of corporate reputation related to the agents and stakeholders that appear closely tied to the business activities and process of the firm, as entrepreneurs, suppliers of capital, managers and so on.

The other is social reputation, which is the result of the insights and perceptions of other stakeholders that are not close to day by day business activities, as the community in a wider sense. The expected payoff to the venture capitalist by financing the project includes monetary return  $R(e)$  and total reputation  $T(e)$ .  $T(e)$  includes business reputation  $F(e)$  and social reputation  $S(e)$ . We assume that  $R'(e) > 0$ ,  $R''(e) < 0$ ,  $F'(e) > 0$ ,  $F''(e) < 0$ ,  $S'(e) > 0$  and  $S''(e) < 0$ .

In the period 1, the venture capitalist needs to decide whether or not to finance the project. If the monetary return  $R_0(e)$  in period 1 is the only criteria for the venture capitalist to make investment decisions, the venture capitalist will finance the project on the condition that  $R_0(e) > 1$ . In other words,  $R_0(e) > 1$  is the participation constraint for the venture capitalist. If the venture capitalist take into account monetary return  $R_0(e)$ , business reputation  $F_0(e)$  and social reputation  $S_0(e)$ , he will finance the project on the condition that  $R_0(e) + F_0(e) + S_0(e) > 1$ . Obviously, the participation constraint for the venture capitalist will be more easily satisfied when he takes both monetary return and reputation into account.

Impact of reputation on the venture capitalist's decision to refinance the project: If the entrepreneur's project is good, the venture capitalist's will get an observable monetary return and enhance its reputation at its completion. If the entrepreneur's project is poor, the venture capitalist obtains nothing unless he agrees to refinancing at the beginning of period 2, i.e., agrees to invest another unit of capital (since the observable and unobservable return is zero at the end of the first period). Moreover, we assume that regardless of the first period agreement, the venture capitalist cannot commit himself not to refinance. It also requires the venture capitalist investing another unit of capital in period 2. If refinanced, the poor project generates an observable return  $R_f(e)$ ,  $F_f(e)$  and  $S_f(e)$  at the end of the period 2.

If the venture capitalist does not take into account business reputation and social reputation, he will refinance the project on the condition that  $R_f(e) > 1$ . Therefore we get the venture capitalist's constraint of refinancing the project.

$$1 < R_f(e) < 2 \tag{1}$$

Now we analyze the constraint of refinancing the project when the venture capitalist takes reputation into account.

If the project is poor, the venture capitalist needs to make decision whether or not to invest another unit capital in the project at the end of the first period. The venture capitalist's net return is  $-1 - \phi(e)$  when he does not

refinance the project. If he decide to invest another unit capital in the project, his net return is  $R_f(e)+F_f(e)+S_f(e)-2\phi(e)$ . The venture capitalist will make the decision to refinance the project if  $R_f(e)+F_f(e)+S_f(e)-2\phi(e)>-1-\phi(e)$ . So we get the constraint of refinancing for the venture capitalist:

$$R_f(e)+F_f(e)+S_f(e)>1 \tag{2}$$

As described earlier, both  $F_f(e)$  and  $S_f(e)$  exceed 0. Comparing expressions (1) and (2), we obtain the following proposition:

**Proposition 1:** Constraint of refinancing the project will be more easily satisfied when the venture capitalist takes reputation into account at the end of period 1.

**Impact of reputation on the venture capitalist's effort level:** We now analyze the impact of reputation on the venture capitalist's effort level in implementation of the project. The expected payoff to the venture capitalist when he takes reputation into account in decision-making process is:

$$R_f(e)+T_f(e)-2\phi(e) \tag{3}$$

$T_f(e)+F_f(e)+S_f(e)$  and  $T'_f(e)>0$  The venture capitalist will choose effort level  $e_s$  to maximize his expected payoff. Optimal effort is obtained by setting the derivative of Eq. 3 with respect to  $e_s$  to 0 to obtain:

$$R'_f(e_s)+T'_f(e_s)-\phi'(e_s)=0 \tag{4}$$

In a similar way, optimal effort  $e_0$  when the venture capitalist does not take reputation into account can be obtain from the following Eq. 5:

$$R'_f(e_0)-\phi'(e_0)=0 \tag{5}$$

Comparing Eqs. 4 and 5, we obtain the following proposition:

**Proposition 2:** The venture capitalist will make more effort when he takes reputation stemming from completion of the project in the future into account than he neglects it. Proof of proposition 2

Equation 4 indicates that  $R'_f(e_s)-\phi'(e_s)<0$ , because  $T'_f(e)>0$ . Comparing it and Eq. 5, we obtain:

$$R'_f(e_0)-\phi'(e_0)>R'_f(e_s)-\phi'(e_s)$$

Let  $\psi(e)=R'_f(e)-\phi'(e)$ , we set the derivative of  $\Psi(e)$  with respect to  $e$  and obtain  $\psi'(e)=R''_f(e)-\phi''(e)$ . As described earlier,  $R''(e)<0$ ,  $\phi''(e)>0$ , so  $\psi'(e)<0$  and  $\psi(e)$  is strictly monotone decreasing. Since  $R'_f(e_0)-\phi'(e_0)>R'_f(e_s)-\phi'(e_s)$ , the fact that  $\psi(e)$  is strictly monotone decreasing indicates  $e_s>e_0$ . In other words, the venture capitalist will make more effort when he does take reputation into account than he neglects it.

Impact of reputation on the venture capitalist's allocation of effort: The objectives of the venture capitalist are to achieve capital growth, enhance reputation and so on. We now study the impact of reputation on the venture capitalist's allocation of effort in realizing different objectives.

Assume that the venture capitalist will allocate his effort among different objectives, such as improvement of financial performance, financial reputation and social reputation. We divide the objectives into two types. One is financial objective  $\pi(e)$  including financial performance and financial reputation in view of the fact that financial reputation is significantly related to financial performance. The other is social reputation  $S(e)$ . Thus the venture capitalist will allocate effort  $e_1$  for improvement of  $S(e_1)$  and effort  $e_2$  for improvement of  $\pi(e_2)$ , respectively. We also assume that  $S'(e_1)>0$ ,  $S''(e_1)<0$ ,  $\pi'(e_2)>0$ ,  $\pi''(e_2)<0$  and  $e_1+e_2=e$ . The venture capitalist obtains a share  $\alpha \in (0, 1)$  of the project's profit and  $k$ . The pursuit of social reputation erodes the project's profit and  $k \in (0, 1)$  denotes the negative effect that pursuit of social reputation on the latter,  $k \in (0, 1)$ . For example, the entrepreneur donates money may do good to social reputation but do harm to profit in the short run.

Here the payoff to the venture capitalist is  $S(e_1)+\alpha[\pi(e_2)-k\pi(e_2)]-2$ , that is:

$$S(e_1)+\alpha(1-k)\pi(e_2)-2$$

So the venture capitalist maximizes the Eq. 6 when he chooses optimal effort  $e_1$  and effort  $e_2$ .

$$\text{Max}[S(e_1)+\alpha(1-k)\pi(e_2)-2] \tag{6}$$

However, the venture capitalist needs to maximizes the Eq. 7 when he does not seek to enhance social reputation:

$$\text{Max}[\alpha\pi(e_2)] \tag{7}$$

By setting the first order condition for Eqs. 6 and 7 to 0 respectively, we can get the corresponding optimal solutions  $e_2^{**}$  and  $e_2^*$  and may obtain the following proposition:

**Proposition 3:** The pursuit of social reputation will dilute the venture capitalist's incentive to provide effort for the financial objective, that is  $e_2^{**} < e_2^*$

Proof of proposition 3.

Set the first order condition of Eq. 6 to 0.

$$-S'(e - e_2) + \alpha(1 - k)\pi'(e_2) = 0 \quad (8)$$

The venture capitalist will choose optimal effort  $e_2$  to maximize Eq. 6. Set the first order condition of Eq. 7 to 0.

$$\pi'(e_2) = 0 \quad (9)$$

The venture capitalist will choose optimal effort  $e_2$  to maximize Eq. 7. Assume that Eq. 8 has only one optimal solution  $e_2^{**}$  and Eq. 9 has only one optimal solution  $e_2^*$ . That is  $\pi'(e_2^*) = 0$  and  $\pi'(e_2^{**}) = S'(e - e_2)/\alpha(1 - k) > 0$ . Since  $\pi''(e_2) < 0$ :

$$\pi'(e_2^{**}) > \pi'(e_2^*)$$

indicates  $e_2^* > e_2^{**}$ . In other words we prove the proposition 3. Because  $e_1 + e_2 = e$ , thus  $e_2^* > e_2^{**}$  and  $e_1^* < e_1^{**}$ .

### CONCLUSION

A relatively large body of research has concentrated on the venture capitalist firms' investment decisions. However these earlier studies had some limitations. Reputation as one of the important factors should be took into account when VC firms make investment decisions, while the impact of VC firms' reputation on their investment decisions has received relatively little attention. The paper research the impact of a VC firm's reputation on its decisions to refinance the project, change of effort level and allocation of effort among different objectives by building mathematical models. Results show that if reputation stemming from completion of a project in future is taken into account during a VC firm's decision-making process, the VC firm will have a stronger willingness to invest in the project initially. Constraint of refinancing the poor project will be more easily satisfied when the venture capitalist takes reputation into account at the end of period 1. The

venture capitalist will make more effort when he does take reputation stemming from the project in the future into account than he neglects it. The pursuit of social reputation will dilute the venture capitalist's incentive to provide effort for financial objective.

Although our research contributes to the VC firms' literature by providing insight into how their reputation affect their investment selections, there are some limitations, such as the main method we use in the paper is mathematical models. In fact, it is necessary to provide empirical evidence for the propositions in the paper.

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