

# Strategic vs Financial Investors: The Role of Strategic Complementarities in Financial Contracting

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## **Abstract**

The paper investigates how the existence of strategic complementarities affects financial contracting. We show that strategic complementarities may undermine the credibility of termination threats. i.e. the ability of the financier to discipline the entrepreneur and, thus, result in a sub-optimal effort provision. We characterize the conditions under which the first best effort level can still be achieved and compare the performances of strategic and financial investors. We find that, if termination threat are credible, strategic investors financing dominate financial investors financing i.e. they induce higher effort provision.

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# 1 Introduction

This paper presents a model of financial contracting between a financier and a financially constrained entrepreneur with strategic complementarities, i.e. where the entrepreneur's performance exerts a positive externality on the investor's core business. We define this financier as a *strategic* investor as his objective from the financing of the venture are not merely financial but also, and possibly mainly, strategic. Corporate venture capital, vendor financing and some forms of public-private partnerships are only some examples of borrower-lender relationships in which the lender does not have a purely financial objective but also derives a strategic benefit from the relationship.<sup>1</sup>

By using a simple moral hazard model, in which the financier is able to perfectly observe the entrepreneur's effort at a refinancing stage, we show that the existence of strategic complementarities may undermine the ability of the financier to discipline the entrepreneur and, consequently, results in a sub-optimal provision of effort by the entrepreneur. Subsequently, we compare strategic investors to financial investors, i.e. to investors that exclusively pursue a financial objective from the venture. We derive conditions under which the financing by strategic investors dominates the financing by financial investors, i.e. it results in a higher effort provision by the entrepreneur.

Our paper contributes to the vast literature on termination threats (Stiglitz and Shapiro, 1984; Gibbons, 1998; Compte, 2005). In particular, we extend the paper by Repullo and Suarez (1998). Similarly to us, they also analyze the credibility of termination threats in financial contracting. In their paper, this is affected by the

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<sup>1</sup>Corporate venture capital refers to the financing of a new venture by a large corporation. The venture financed is often quite close to the corporation's core business (Gompers and Lerner, 1999). Vendor financing is a loan from one company to another which is used to buy goods from the company providing the loan. A Public-Private Partnership is a system through which a government service is funded and operated through a partnership of government and one or more private sector companies (Bennett and Iossa, 2006).

ability of the financier to monitor or not the entrepreneur and ultimately depends on the entrepreneur's net worth. In our paper, the financier can always monitor the entrepreneur and the new twist is represented by the (positive) externality the entrepreneur's performance exerts on the financier's payoff, which we show has a clear impact on the credibility of the termination threat. The role of strategic complementarities has instead been investigated by Hellmann (2002) in the context of corporate venturing financing. In his model, the strategic investor faces a trade-off between the strategic benefits he can derive from the venture and the conflict of interest that he may face with the entrepreneur. As a result, the author shows that strategic venture financing should be preferred only when the start-up exhibit a strong complementarity with the investor's core business; in all the other cases independent venture capital or syndication is more efficient. In Hellmann's paper, the focus is on the fact that large negative externalities make harder for the financier to provide managerial support to the entrepreneur. As a consequence, the entrepreneur in this case will find optimal to be financed by an independent investor. Contrary to Hellmann, we do not allow for negative externalities. In our paper, externalities are always positive and we show that, even in this circumstance, it may be more efficient that the project be financed by a financial investor. In our model, strategic venture investing may be inefficient because synergies make the conditions for the credibility of termination threats tighter.

The rest of the paper is organized as followed. The model is described in the next section. Section 3 derives the main results about strategic investor financing. In Section 4, a financial investor is introduced and the performances of financial strategic investors are compared. The last section briefly concludes. All proofs are in Appendix.

## 2 Model

*The venture:* An entrepreneur seeks to finance a project of size  $I_0 > 0$ . She has internal funds  $A < I_0$ , so she needs to raise  $I_0 - A$ . At a later stage, the project will need a second allotment  $I_1 \in [0, I_0]$  in order to be continued. The project has a liquidation value  $L \in [0, I_0]$  if liquidated at the refinancing stage, and 0 if liquidation occurs afterwards. Once the project is started, the entrepreneur expends a privately costly and unverifiable effort  $e \in [0, 1]$  which implies a disutility of effort  $\varphi(e)$  satisfying the standard assumptions,  $\varphi' > 0, \varphi'' > 0, \varphi''' \geq 0$  and with  $\varphi(0) = 0, \varphi'(0) = 0, \lim_{e \rightarrow 1} \varphi'(e) = \infty$ .

The probability of success of the venture depends on the effort exerted by the entrepreneur. Specifically, we assume that with probability  $e$ , the project succeeds and generates cash flows  $\Pi$ , whereas with probability  $1 - e$  it fails in which case cash flows are zero.

We also assume that the project has a positive NPV, so

$$e\Pi - \varphi(e) > I_0 + I_1$$

where  $e$  is the equilibrium effort choice of the entrepreneur. We simplify the analysis by assuming risk neutrality and no discounting.

*The financier:* Assume now that the entrepreneur can be funded by a strategic financier (with deep pockets). We assume that the financier has a financial as well as a strategic interest in the venture and we model this by assuming that, if the project succeeds, in addition to the financial return, the investor also derives a strategic benefit  $\Delta$  (the strategic benefit is zero in case of project failure). Larger strategic benefits reflect a higher degree of complementarity between the entrepreneur's project

and the financier. Should the project be financed elsewhere, the financier can still get a fraction  $\alpha$  of the strategic benefit. Therefore,  $\alpha\Delta$  defines the financier's outside option. The parameter  $\alpha$  defining the financier's outside option effectively encompasses and synthesizes three different components: firstly, the uncertainty about whether the project will be financed elsewhere, should the financier decide not to fund it himself. Secondly, conditionally upon the project being financed outside, the expected strategic benefit will depend on the entrepreneur's effort under outside financing and it is likely that the financier will not be able to fully benefit from them if the venture is financed elsewhere<sup>2</sup>. In Section 4, when we compare strategic to financial investors, we will develop further this idea that the outside option depends on the effort the entrepreneur would expend under alternative financing sources.

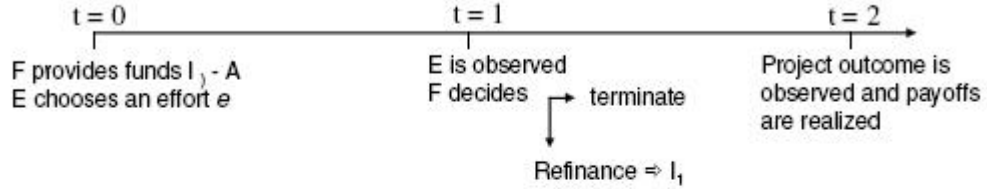
We endow the financier with a monitoring technology that enables him to observe the entrepreneur's effort level at the refinancing stage when the financier has to decide whether to continue or terminate the venture. Consequently, while the effort remains unverifiable and uncontractible, the financier can effectively use the termination threat to curb the incentives of the entrepreneur to perform high effort.

Finally, we assume perfect competition in the financial sector so that the entrepreneur has all the bargaining power at the contracting stage and investors always break even. The timing of the events is as follows:

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<sup>2</sup>One could think for instance about innovations that would be beneficial to an entire industry and that, only by financing them directly, it is possible to exclusively exploit because of some type of IP protection the financier can rely upon in this case..

Figure 1: Timing



### 3 Strategic investor financing

We start by defining the first best effort level for the financier,  $e^{fb}$ , as the one maximizing the joint surplus of the investor and the entrepreneur; i.e.

$$e^{fb} = \arg \max \mathcal{S}(\Delta) = e(\Delta)(\Pi + \Delta) - I_0 - I_1 - \psi(e(\Delta)) \quad (1)$$

which is, in turn, the (unique and interior) solution to the following FOC

$$\Pi + \Delta = \varphi'(e^{fb})$$

Note that the first best effort is continuous and strictly increasing in  $\Delta$ . Similarly, the joint surplus of the corporation and the entrepreneur is continuous and strictly increasing in the size of the strategic benefit *under the first best effort*. The reason for this is straightforward: by definition, externalities are fully internalized under the first best

and hence the entrepreneur's first best performance level is increasing in the size of the strategic benefit conveyed on the financier.

Whether or not the first best effort level is achieved in equilibrium crucially depends on whether or not the financier can credibly threaten the entrepreneur to terminate the project in the case of poor performances. Intuitively, for the termination threat to be credible, it must be that the payoff the financier gets under liquidation is at least equal to what he will get under continuation.

The next Lemma formally establishes the conditions under which the termination threat is *credible*:

**Lemma 1** *Disciplinary termination threats are credible only if*

$$\Delta \leq \frac{L - (I_0 - A)}{\alpha} = \bar{\Delta}$$

*i.e. if the project has a salvage value  $L > I_0 - A$  (or alternatively  $A > I_0 - L$ ) and the strategic benefit  $\Delta$  for the corporation are not too large.*

Notice that the threshold  $\bar{\Delta}$  is a decreasing function of  $\alpha$ , that is, higher outside option makes the condition for the credibility tighter.

The above result illustrates an important point: when it comes to disciplining entrepreneurs for poor performance, a financier deriving too high strategic benefit from the project may be too soft, because, intuitively, he may have *too little to gain* and *too much to lose* from terminating the project. The larger the level of complementarities between the investor and the entrepreneur, the more severe the problem. Finally, also notice that for low net worth entrepreneurs, i.e. with an initial wealth  $A \leq I_0 - L$  termination threats are never credible.

The next sections describes the optimal financial contract and entrepreneur's effort choice when termination threat are not credible and when they are credible, respectively. We will see that in the latter case, the corporation is able to enforce the first best effort level.

### 3.1 Non credible termination threats

Assume that termination threats are not credible, i.e. either  $\Delta > \bar{\Delta}$  or  $A < I_0 - L$ . In these circumstances, liquidation never occurs and the corporation provides funds  $I_0 - A$  to the entrepreneur in exchange for a return stream  $[R_S^H; R_S^L; R_S^T]$  - in case of success, failure and termination, respectively of the venture (the index denotes the strategic investor) - and a promised effort level determined by the solution of the following optimization program:

$$\begin{aligned} \max e (\Pi - R_S^H) - (1 - e) R_S^L - \varphi(e) \\ \text{s.t.} \end{aligned} \tag{2}$$

$$\Pi - R_S^H + R_S^L = \varphi'(e) \tag{3}$$

$$e (R_S^H + \Delta) + (1 - e) R_S^L - I_0 + I_1 - A = \alpha \Delta \tag{4}$$

$$0 \leq R_S^j \leq \Pi \quad j = H, L \tag{5}$$

i.e. the entrepreneur's payoffs must be maximized subject to his incentive compatibility constraint (equ. 3); the financier's break even constraint (equ. 4) and the entrepreneur's limited liability constraint  $R_S^j \leq \Pi$  and the financier's participation constraint ( $R_S^j > 0$ ) (equ. 5). The solution to the problem is summarized in the next proposition.

**Proposition 1** *Assume that termination threats are not credible. Then, the optimal financial contract is such that the financier invests  $I_0 - A$  in the venture and gets a return  $R_S^L = 0$  and  $R_S^H = \frac{I_0 + I_1 - A - (e^*(\Delta) - \alpha) \Delta}{e^*(\Delta)}$  and the entrepreneur optimally exerts an effort  $e^*(\Delta)$  given by the (largest) solution of the following condition:*

$$\Pi - \frac{I_0 + I_1 - A - (e^*(\Delta) - \alpha) \Delta}{e^*(\Delta)} = \varphi'(e^*(\Delta)) \quad (6)$$

where the equilibrium effort level  $e^*(\Delta) < e^{fb}(\Delta)$ .

The result shows that, if the financier cannot credibly threaten the entrepreneur to terminate the venture, the second-best effort level performed by the entrepreneur will be strictly lower than the first best effort level.

### 3.2 Credible Termination Threats

Assume now  $\Delta < \bar{\Delta}$ , so that termination threats are credible.<sup>3</sup> Therefore, the financier can effectively threaten the entrepreneur to terminate the venture at the refinancing stage in case of a downward deviation from the promised effort level. We allow renegotiation at the interim stage and show that, in this context, the financier is able to enforce the first best effort level,  $e^{fb}(\Delta)$ .<sup>4</sup> The next proposition states formally the result.

**Proposition 2** *Assume that  $\Delta < \bar{\Delta}$ , so that termination threats are credible under strategic venture financing. Then the optimal financial contract requires the entrepreneur to expend the first best effort  $e^{fb}(\Delta)$  and pay the financier long term returns*

$$\left\{ R_S^L = 0; R_S^H = \frac{I_0 + I_1 - A - (e^{fb}(\Delta) - \alpha) \Delta}{e^{fb}(\Delta)} \right\} \text{ and a liquidation payoff } R_S^T = I_0 - A + \alpha \Delta.$$

<sup>3</sup>Notice that, a necessary condition for this to be true is that  $L > I_0 - A$ .

<sup>4</sup>Our result still holds if we rule out the possibility to renegotiate or if we shift the bargaining power to the financier in the renegotiation process. To save space, we omit the proofs of these results but they are available from the authors upon request.

About the previous results, it should be noticed that in both cases the financier is willing to pay a premium for the strategic benefit he derives from the venture. This is consistent with the evidence on corporate venture financing which documents that corporations normally pay higher valuations compared to independent venture capitalists (Gompers and Lerner, 2000). It is in fact typically found that corporations typically pay a premium as compared to independent venture capitalist to fund a venture and this seems to be a consequence of the strategic benefit corporations enjoy from the venture.

## 4 Strategic vs Financial Investors

Assume now that the venture could be alternatively financed by an independent financier who does not derive any synergy from it, i.e. a *financial* investor. The following result derives readily from Proposition 1 and 2:

**Corollary 1** *Suppose the entrepreneur is financed by a financial investor. Then, the optimal financial contract and effort provision are given by the solution of the following optimization contract*

$$\max e (\Pi - R_F^H) + (1 - e) R_F^L - \varphi(e)$$

*s.t.*

$$\Pi - R_F^H - R_F^L = \varphi'(e) \tag{7}$$

$$e R_F^H + (1 - e) R_F^L = \mathcal{I} - A \tag{8}$$

$$0 \leq R_F^j \leq \Pi \quad j = H, L \tag{9}$$

*and is such that:*

1. If  $L \geq I_0 - A$ , then termination threat are credible under independent investor financing: the entrepreneur exerts the first best effort  $e^{fb}(0)$  such that  $\Pi = \varphi'(e^{fb}(0))$  and pays to the financier long term returns  $\left\{ R_F^L = 0; R_F^H = \frac{I_0 + I_1 - A}{e^{fb}(0)} \right\}$  and a liquidation payoff  $R_F^T = I_0 - A$ ;
2. If  $L < I_0 - A$ , then termination are not credible: the entrepreneur exerts an effort  $e^*(0)$  given by the solution of

$$\Pi - \frac{I_0 + I_1 - A}{e^*(0)} = \varphi'(e^*(0))$$

with  $e^*(0) < e^{fb}(0)$  and pays to the financier long term returns  $\left\{ R_F^L = 0; R_F^H = \frac{I_0 + I_1 - A}{e^*(0)} \right\}$  and a liquidation payoff  $R_F^T = I_0 - A$ .

As we know, the effort exerted by the entrepreneur under alternative financing sources affects the outside option of the strategic investor. To be able to compare strategic with independent investor financing we make the following simplifying assumption:

**Assumption:** The outside option of the strategic investor is  $e(0)\Delta$ .

The above assumption implies the following about the credibility of termination threats under strategic venture investing:

**Lemma 2** *Assume that the outside option of the strategic investor is  $e(0)\Delta$ , then termination threats are credible under strategic venture financing if*

$$\Delta \leq \frac{L - (I_0 - A)}{e(0)} = \bar{\Delta}(e(0))$$

It is clear that the higher the effort performed under independent venture financing the tighter the conditions for the credibility of the termination threats under strategic venture financing.

Furthermore, Propositions 1 and 2 and Corollary 1 imply that  $e^*(\Delta) < e^{fb}(0) < e^{fb}(\Delta)$ , which in turn leads to the result below above the optimal financing choice:

**Proposition 3** *The optimal financing choice for the entrepreneur is such that:*

1. *If  $L \geq I_0 - A$ , then, strategic venture financing is the preferred financing choice for  $\Delta$  small, i.e.  $\Delta < \bar{\Delta}(e^{fb}(0))$ . Conversely, for values of  $\Delta \geq \bar{\Delta}(e^{fb}(0))$  a financial investor dominates a strategic investor;*
2. *If instead  $L < I_0 - A$ , then financing through a strategic investor weakly dominates financing through a financial investor.*

When termination threats are not credible for a financial investor, *a fortiori* they are not credible for a strategic investor. In this case, the optimal financing choice is given

In short, there are two main effect at play under strategic venture financing. There is an *internalization effect* which stems from the ability of the strategic investor to facilitate the internalization of the strategic externalities conveyed by the venture on the investor's core business. This effect decreases with the size of the strategic benefits because it crucially depends on the credibility of termination threats. The second effect is a *premium effect* which stems from the fact that, because of the existence of positive strategic benefits, the strategic investor is willing to invest at a premium. This, consequently, alleviates the burden of external financing to the entrepreneur with positive effects on his incentive to exert high effort. This effect clearly increases with the strategic benefits.

Therefore, for values of the synergies sufficiently low, termination threats are credible for a strategic investor and, consequently, the entrepreneur fully internalizes the

consequences of her effort choice on the joint surplus. As a result, the first best effort level under strategic venture financing is achieved. For  $\Delta \geq \bar{\Delta}(e^{fb}(0))$ , termination threats are not longer credible. Cutting down refinancing is too costly for the strategic investor and, therefore, the entrepreneur does not internalize the strategic externalities conveyed to the investor's core business. Effort falls down to the second best level, which turns to be smaller than the first best effort under an independent venture financing because the premium effect is too weak to countervail the lack of credibility of termination threats.

These findings suggest that, while the presence of strategic benefits may undermine the strategic investor's commitment to discipline the entrepreneur for poor performance, in many cases strategic investors will still be more efficient than pure financial investors. This is mainly due to this premium effect which can lead to strong performances even when the internalization of strategic complementarities is not fully achieved.

## 5 Conclusion

In this paper, we show that a high level of complementarities in a financier-entrepreneur relationship may undermine the ability of the financier to exert credible termination threats on the entrepreneur. Credible termination threats allow the financier to enforce the first best effort level by the entrepreneur, namely the one that maximize the joint surplus. Conversely, when termination threats are not credible, externalities are not fully internalized and the financier can only achieve a second best effort level which is strictly lower than the first best. When compared to pure financial investors, we find that as long as termination threats are credible, financing by strategic investors should

be the preferred financing choice.

Our results yield several empirical implications.

- Strategic investors are willing to pay a premium compared to pure financial investors. This is supported by the existing empirical evidence on corporate venturing (Gompers and Lerner, 2000).
- Strategic investing financing should be the preferred financing choice when there exist positive synergies between the venture and the financier's core business but these synergies are not too high.

Dushnitsky and Lenox (2006) indeed document that corporations investing corporate capital with a clear strategic focus may create more value than corporations investing corporate capital exclusively to reap high financial returns. They classify corporations into *strategic* or *financial* depending on the focus of their investment strategies and measure value creation by looking at Tobin q. Their data do not allow to distinguish among corporations with different degrees of strategic complementarities. Our results suggest that not only the existence of such complementarities matters for the success of strategic investment but also their size.

In this respect, our results are consistent with a large strategic management literature (Sorrentino and Williams, 1995; Thornhill and Amit, 2000) on corporate venturing that stresses the ambiguity of the effect of a high degree of strategic complementarity on the probability of success of the venture. The argument is that whilst synergies – e.g. resource sharing and cost savings – are best exploited if the venture is closer to the firm's core business, the pitfalls of a too high degree of complementarity may be

severe internal political problems and cost coordination difficulties. In general, it seems that this mixture of financial and strategic objectives is likely to lead to unfocussed strategies.

Finally, we have not considered in this paper the possibility of syndicated deals. We leave to future research the investigation of whether the use of syndication may enable to overcome the limitations of stand-alone strategic venture financing.

## 6 Appendix

### Proof of Lemma 1:

Let us denote then by  $\{R^H; R^L; R^T\}$  the return stream the financier receives in exchange for providing the entrepreneur with  $I_0 - A$  funds, where  $R^H$  is the repayment in case of success,  $R^L$  is the repayment in case of failure and  $R^T \leq L$  is the repayment in case of termination at stage 1. For termination threats to be credible it must be that, for a given (downward deviation) from the first best effort level, the investor's payoff under continuation is lower than his payoff under termination; i.e.<sup>5</sup>

$$e(R^H + \Delta) + (1 - e)R^L - I_1 \leq R^T \quad (10)$$

But we know that in case of continuation, the investor will just breaks even, because of perfect competition. Hence,

$$e(R^H + \Delta) + (1 - e)R^L - I_1 = (I_0 - A) + \alpha\Delta \quad (11)$$

and also that, from limited liability in liquidation,  $R^T \leq L$ . Using this in the equation 1, we easily get  $(I_0 - A) + \alpha B \leq L$  from which the result is straightforward. ■

### Proof of Proposition 1:

Suppose that disciplinary termination threats lack credibility under corporate venturing. Around the equilibrium effort level  $e^*$ , the entrepreneur's payoff is thus given by

$$e(\Pi - R^H) - (1 - e)R^L + R^T - (I_0 + I_1 - A) - \psi(e) \quad (12)$$

with the corresponding incentive constraint,

$$\Pi - R^H + R^L = \psi'(e) \quad (13)$$

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<sup>5</sup>In what follows we simply denote the effort choice as  $e$ , omitting the argument  $(\Delta)$ .

By inspection, as long as  $R^H - R^L > -\Delta$ , the entrepreneur cannot be compelled to stick to the first best effort level  $e^{fb}$ . In this case, an optimal financial contract minimizes  $R^H - R^L$  subject to the financier's binding break even constraint (11), the limited liability constraints,  $R^H \leq \Pi + L - (I_0 + I_1 - A)$  and  $R^L \leq L - (I_0 + I_1 - A)$ , and the investment feasibility constraint  $L \geq I_0 - A$ . This problem is solved for  $L = I_0 - A$ ,  $R^L = 0$ , and  $R^H = \frac{I_0 + I_1 - A + (e^* - \alpha)\Delta}{e^*}$ .

Note then that  $R^H - R^L > -\Delta$ , if and only if  $A < I_0 + I_1 + \alpha\Delta$ . However,  $A < I_0 - L + \alpha\Delta < I_0 + \alpha\Delta$  and hence the first best is indeed not achievable.

We now turn to the characterization of the entrepreneur's equilibrium effort level. Substituting the optimal payments  $R^H$  and  $R^L$  into (13), the entrepreneur's equilibrium effort level is given by the largest solution of the reduced form incentive constraint,

$$\Pi - \frac{I_0 + I_1 - A - (e^* - \alpha)\Delta}{e^*} - \psi'(e^*) = 0 \quad (14)$$

■

### **Proof of Proposition 2:**

The interesting deviations are downward deviations from the first best effort. So suppose the entrepreneur deviates and chooses  $e < e^{fb}$  then the corporation would be better off under termination. However, parties can renegotiate the contract in order to avoid an (inefficient) liquidation. Specifically, the entrepreneur will need to compensate somehow the financier for choosing to continue the venture instead of terminating it. Since we are assuming that the entrepreneur keeps all the bargaining power in the renegotiation process, the size of the compensation is determined as usual by the financier's break even condition. In other words, the entrepreneur needs to pay the corporation a return  $R'$  such that

$$e(R' + B) = I_0 + I_1 - A + \alpha\Delta$$

i.e. the corporation must be indifferent between termination or continuation.

Henceforth, the entrepreneur's payoff will become

$$e(\Pi - R') - \varphi(e) = e(\Pi + B) - [(I_0 + I_1 - A) - \alpha\Delta]$$

which is maximized at  $e = e^{fb}$ . ■

### **Proof of Proposition 3:**

Part a follows readily from Propositions 1 and 2 and Corollary 1.

Part b. instead follows the FOC of the optimization program for a strategic investor:

$$\Pi - \frac{\mathcal{I} - A - (e^*(\Delta) - e^*(0))B}{e^*(\Delta)} = \varphi'(e^*(\Delta)) \quad (15)$$

from which it is easy to check that  $e^*(0)$  is also a solution of the above equation. If  $e^*(0)$  is also the largest solution then strategic and financial investment are equivalent; if it is not the largest strategic investment strictly dominate financial investment.

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