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Strategic versus Financial Investors: The Role of Strategic Objectives in Financial Contracting

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Strategic versus Financial Investors: The Role of Strategic Objectives in Financial Contracting *

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Abstract

Strategic investors, such as corporate venture capitalists, engage in the financing of start–up firms to complement their core businesses and to facilitate the internalization of externalities. We argue that while strategic objectives make it more worthwhile for an investor to elicit high entrepreneurial effort, they can also undermine his commitment to penalize poorly performing entrepreneurs by terminating their projects. Based on this tradeoff we develop a theory of financing choice between strategic and financial investors. Our framework provides insights into the design of corporate venturing deals and the choice between corporate venturing and independent venture capital finance.

Keywords: Corporate Venturing, Internalization of Externalities, Soft Budget Constraint
JEL Classification: G2, G3, L1

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1 Introduction

Financiers often benefit from the success of the projects they finance not only because of direct financial returns, but also because of synergies with their existing lines of business or investment portfolios. Consider the example of corporate venturing where a corporation provides financing to a downstream start–up firm in attempt to spur demand for its own products. In this case, the success of the start–up firm entails a positive externality on the corporation's core business. A related example is vendor financing where a supplier extends a loan to a customer to finance the purchase of products. In this situation, the vendor financier may benefit from the customer's success not only because it makes it more likely that the loan will be repaid but also because of the possibility of repeat business. We refer to such externalities as *strategic benefits.* What is the role of strategic benefit objectives in financial contracting? How do they affect entrepreneurial incentives and project performance? And how do they shape the choice between strategic and financial investors? The aim of this paper is to develop a theoretical framework that provides answers to these questions.

The starting point of our theory comes from the management literature. Practitioners frequently express concerns that corporations are less disciplined than purely financial investors in abandoning their investments and terminating poorly performing projects. For example, Brody and Ehrlich (1998, p. 53), in an article on corporate venturing published in the McKinsey Quarterly, write:

> "*... VC [venture capital] firms manage their portfolios ruthlessly, weeding out likely losers early. [...] Abandoning ventures in this way has never been easy for large corporations, whose projects are often underpinned by personal relationships, political concerns, and vague strategic objectives.*"[1]

The idea that strategic objectives may threaten an investor's financial discipline is central

[1]Similarly, Gompers and Lerner (1998, p. 10) remark: "*Independent venture capitalists often stop funding for failing firms because they want to devote their limited energy to firms with the greatest promise. Corporate venture capitalists have been frequently unwilling to write off unsuccessful ventures, [...].*" And Siegel et al. (1988, p. 234) write: "*Strategic benefit objectives are not necessarily ill advised so long as they do not interfere with sound financial decision making. When they do, the corporate venture capital process is likely to become less effective. [...] Investments that appear exciting from a corporate perspective [...] but are not financially attractive may well drain resources rather than produce opportunities.*"

to our theory. Specifically, we argue that while strategic objectives make it more worthwhile for an investor to elicit high entrepreneurial effort, they can also undermine his commitment to penalize managerial slack by terminating the entrepreneur's project. The investor faces a credibility problem: although he would like to commit to penalize shirking, the fact that he would lose the strategic benefit upon terminating the project means that it may not be in his interest to do so. Anticipating the investor's lack of commitment to exercise the termination threat, the entrepreneur may be less inclined to work hard, and suboptimal performance may result. This "soft budget constraint" problem must be traded off against the strategic investor's potential willingness to finance the project at lower cost than an independent, purely financial investor. The mere fact that the strategic investor internalizes the positive externality and appropriates the strategic benefit may allow him to break even at a lower rate of interest than an independent investor. This, in turn, may have positive implications for the entrepreneur's incentive to exert effort.

Which effect dominates depends on the size of the strategic benefit. As long as the strategic benefit is sufficiently small, the threat of termination is still credible under strategic investor financing (provided it is credible in the absence of strategic benefits). In this case, strategic investor financing dominates financing by an independent investor, as it facilitates the internalization of the strategic externality. As the strategic benefit becomes larger, however, the threat of termination eventually loses its credibility under strategic investor financing, while it is credible under independent investor financing. In this situation, independent investor financing dominates strategic investor financing for intermediate values of the strategic benefit, while the opposite is true if the strategic benefit is "very" large. In the latter case, it becomes an overriding concern to facilitate the internalization of the externality by having a strategic investor finance the project, even though an independent investor would be a "tougher" financier.

We develop several extensions of the base model. One extension concerns the possibility of deal syndication where the entrepreneur is financed by both the strategic and an independent investor. Much in spirit of the literature on multiple lenders (e.g., Dewatripont and Tirole 1994, Repullo and Suarez 1998), we show that syndicated financing enhances the entrepreneur's incentive to exert effort and improves project outcomes. Intuitively, having an independent investor contribute to the financing of the project allows to reduce the strategic investor's financial stake in the project, which in turn enhances the credibility of the termination threat imposed by him. At the same time, having the strategic investor on board facilitates the internalization of the strategic externality. In other words, corporate and independent venture capital may actually be complements, rather than substitutes.

We are not first to investigate the effect of strategic benefits on financing choices and project outcomes. Hellmann (2002) presents a model of financing choice between strategic and financial investors where project success relies on the financier's support. He shows that positive externalities make financing by a strategic financier more advantageous, while the opposite is true for the case of negative externalities. The reason for the latter result is that negative externalities make it more costly to provide the financier with an incentive to provide support. Riyanto and Schwienbacher (2006) analyze the strategic use of corporate venture financing to influence product market competition. Taking a different perspective, Bettignies and Chemla (2007) explore the impact of corporate venturing on managerial incentive contracts and the corporation's position in the managerial labor market.

The rest of the paper is organized as follows. The following section presents the base model. Section 3 analyzes the choice between strategic and independent investor financing. Section 4 provides several extensions and robustness checks. Section 5 contains a discussion of the model's empirical implications, and concludes.

2 The Model

Consider a setting with universal risk–neutrality and no discounting. There are four points in time, $t = 0, 1, 2, 3$. At date 0, an entrepreneur has the opportunity to undertake a project at cost $I > 0$. The entrepreneur has personal wealth $w < I$; she thus requires external funding $I - w$. At date 1, the entrepreneur can exert non–contractible effort $e \in [0, 1]$ at private cost $\psi(e) = \beta e^2/2$, where $\beta > 0$ is sufficiently large as to ensure interior solutions. Effort will enhance the probability of project success, as specified below. At date 2, the project is either continued or irreversibly terminated (to be explained in more detail below). Assets in place have a liquidation value $L < I$ at date 2 and zero at date 3. At date 3, if the project is continued, final and verifiable cash flows realized. Cash flows are $\Pi > 0$ with probability e and zero with probability $1 - e$. We assume

$$\max_e \{e\Pi - \psi(e)\} > I \tag{1}$$

In other words, conditional on the entrepreneur exerting project value maximizing effort, the net present value of the project is positive.

While effort is non–contractible, it is assumed to be privately observable to the entrepreneur's financier (e.g., by virtue of the financier's close relationship with the entrepreneur). Non–contractibility of effort gives rise to a standard moral hazard problem. Observability of effort has the advantage that the financier can potentially sharpen the entrepreneur's incentive to exert effort by threatening to terminate her project should she underprovide effort. To allow for this possibility, we consider financial contracts under which the financier is pledged the right to terminate the project at date 2. As is standard, the entrepreneur is protected by limited liability. A financial contract in our setup then consists of payments (R, R_0), where $R \leq \Pi$ is the payment to the financier in the event of project success,[2] and $R_0 \leq L$ is the financier's share of the liquidation proceeds in the event of project termination.

There are two types of financiers in our setup: a "strategic" investor and "independent" investors. The strategic investor differs from an independent investor in that he is endowed with an asset (or portfolio of assets) whose value will be enhanced if the project turns out to be successful. In other words, project success entails a positive externality on the strategic investor. For example, the strategic investor could be a corporation whose core business would benefit from the entrepreneur's project, if successful. We can also think of the strategic investor as a financial intermediary (e.g., a venture capitalist) holding a portfolio of financial securities (e.g., equity stakes) in complementary projects. Formally, we assume that the strategic investor enjoys a strategic benefit $\Delta > 0$ in the event of project success (regardless of whether the project is financed by him or by an independent investor[3]).

For the moment, we restrict attention to the case of single investor financing, i.e., we assume that the entrepreneur is financed either by the strategic or an independent investor (if at all), but not by both. The case of syndicated financing where the entrepreneur is financed by more than one investor will be considered in Subsection 4.4. Throughout the

[2]By limited liability, the payment in the event of project failure is zero.

[3]This assumption will be relaxed in Subsection 4.2.

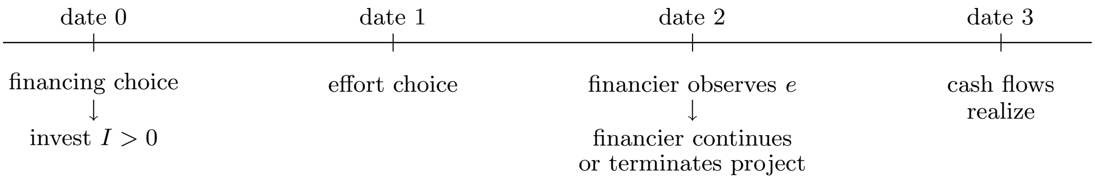

Figure 1: Sequence of Events

paper, we assume that financial markets are perfectly competitive in that the entrepreneur makes take–it–or–leave–it contract offers to financiers, including the strategic investor.[4]

The game at hand can now be summarized as follows (see Figure 1):

- At date 0, the entrepreneur chooses between strategic and independent investor financing, a financial contract is signed, and investment is made.
- At date 1, the entrepreneur exerts non–contractible effort.
- At date 2, the entrepreneur's financier, after having observed the effort choice, decides whether to continue or irrevocably terminate the project.
- At date 3, final and verifiable cash flows realize (if project continued).

Finally, we assume that parties can commit to not renegotiate the contract in place. We will discuss later the robustness of our analysis to the possibility of renegotiation.

3 Strategic versus Independent Investor Financing

In this section, we analyze the choice between strategic and independent investor financing. Subsection 3.1 derives the optimal contracts under strategic and independent investor financing, respectively. Subsection 3.2 characterizes the optimal financing choice.

3.1 Optimal Contracts

We start with the case of strategic investor financing, taking the outcome under independent investor financing as given. We subsequently derive the outcome under independent investor financing. Suppose the entrepreneur seeks to be financed by the strategic investor, and

[4] Subsection 4.3 briefly discusses the case where the strategic investor has the full bargaining power.

let e^{out} denote the effort level that the entrepreneur would exert if the strategic investor turned down her contract offer (in which case the entrepreneur would seek financing from an independent investor). Since the entrepreneur makes take–it–or–leave–it contract offers, an optimal financial contract between the strategic investor and the entrepreneur solves

$$\max_{(e\in[0,1],R\leq\Pi,R_0\leq L)} \quad e(\Pi - R) - \psi(e) \tag{2}$$

s.t.

$$e(R+\Delta) \geq R_0 \tag{CO}$$

$$e(R+\Delta) = I - w + e^{\text{out}}\Delta \tag{IR}$$

$$e \text{ is incentive–compatible} \tag{IC}$$

where (2) is the entrepreneur's payoff, and e denotes the (candidate) equilibrium effort level. The continuation incentive constraint (CO) guarantees that the strategic investor has no incentive to terminate the project *in equilibrium* (which must be the case, since $L < I$). The left hand side is the strategic investor's payoff from project continuation, and the right hand side is his payoff from irreversibly terminating the project and seizing liquidation proceeds R_0 (but losing the strategic benefit). The break–even constraint (IR) ensures that the strategic investor makes zero profits. The left hand side is his payoff from accepting the contract, and the right hand side is his payoff from rejecting. The incentive–compatibility constraint, which is yet to be derived, ensures that the entrepreneur finds it privately optimal to exert effort e. For later reference, notice that if (IC) were not binding, then the optimal solution to the maximization problem would entail first best effort,

$$e^{FB}(\Delta) = \arg\max_e e(\Pi + \Delta) - \psi(e)$$

Given our specification for the effort cost function, $\psi(e) = \beta e^2/2$, first best effort is

$$e^{FB}(\Delta) = (\Pi + \Delta)/\beta$$

To understand how the threat of termination affects the entrepreneur's incentive to exert effort, we need to know whether the threat of termination is credible following a deviation from the target effort level e. We say the threat of termination is credible if and only if for any $e' < e$ the strategic investor prefers to terminate the project. Formally, for any $e' < e$,

$$e'(R+\Delta) < R_0 \tag{3}$$

The following lemma gives a necessary condition for the threat of termination to be credible.

Lemma 1 *Under strategic investor financing, the threat of termination is credible only if*

$$\Delta \leq \frac{L - (I - w)}{e^{\text{out}}}$$

Proof. By (CO) and (3), the threat of termination is credible if and only if in equilibrium the strategic investor is just indifferent between continuation and termination,

$$e(R + \Delta) = R_0$$

Substituting for the break–even constraint (IR), this expression reduces to $I - w + e^{\text{out}}\Delta = R_0$, which is feasible (i.e., $R_0 \leq L$) if and only if $\Delta \leq (L - (I - w))/e^{\text{out}}$. □

In other words, the threat of termination is credible only if the strategic externality is not too large (and the liquidation value of the project is not too small either).[5] To see the intuition, notice that the strategic investor's continuation payoff is increasing in Δ via its effect on his outside option payoff (i.e., $I - w + e^{\text{out}}\Delta$). Consequently, as the strategic externality increases, the strategic investor has more to lose from terminating the project. This weakens his commitment to terminate the project, and thereby undermines the credibility of the termination threat. We are now in the position to state the following result:

Lemma 2 *Suppose the entrepreneur undertakes her project with the strategic investor. Then:*

[5] It is worth emphasizing that asking the investor to post a bond which would be lost if the project were continued does not allow to improve the credibility of the termination threat. The reason is that, ultimately, the investor will have to recoup the bond via an increase in the final repayment, otherwise he would not break even. This in turn means that he holds a larger stake in the continuation value of the project, which precisely offsets the additional payment from the bond which the investor would receive if he terminated the project. To see this more formally, suppose the investor provides funding $T > I - w$, so that $T - (I - w)$ constitutes the bond. In an equilibrium in which the threat of termination imposed by the strategic investor is credible we must have (i) in equilibrium the investor is indifferent between continuation and termination, $e(R + \Delta) = R_0$, (ii) R_0 does not exceed the sum of the liquidation value and the bond (limited liability), $R_0 \leq L + T - (I - w)$, (iii) the strategic investor makes zero profits, $e(R + \Delta) = T + e^{\text{out}}\Delta$. It is straightforward to show that these conditions reduce to the condition stated in Lemma 1. In other words, the bond is irrelevant.

(i) *For* $\Delta \leq (L-(I-w))/e^{\text{out}}$ *(threat of termination credible), the incentive–compatibility constraint (IC) is not binding, i.e., the entrepreneur exerts efficient effort*

$$e^{FB}(\Delta) = (\Pi + \Delta)/\beta$$

An optimal contract entails $R = (I - w + e^{\text{out}}\Delta)/e^{FB}(\Delta) - \Delta$ *and* $R_0 = I - w + e^{\text{out}}\Delta$*.*

(ii) *For* $\Delta > (L-(I-w))/e^{\text{out}}$ *(threat of termination not credible), effort is second best and given by*

$$e^* = \frac{\Pi + \Delta + \sqrt{(\Pi+\Delta)^2 - 4\beta(I - w + e^{\text{out}}\Delta)}}{2\beta} < e^{FB}(\Delta) \qquad (4)$$

An optimal contract entails $R = (I - w + e^{\text{out}}\Delta)/e^* - \Delta$ *and* $R_0 = L$*.*

Proof. See the Appendix.

To understand the first part of the lemma, notice that under the optimal contract the strategic investor is just indifferent between project continuation and termination if and only if the entrepreneur exerts efficient effort. Hence, if the entrepreneur exerted less than efficient effort, then the strategic investor would terminate the project. This, in turn, ensures that the entrepreneur has no incentive to shirk. The second part of the lemma shows what can be implemented when the threat of termination lacks credibility. In this case, the strategic investor prefers to continue the project for any $e' \geq e - \epsilon$, where $\epsilon > 0$ but sufficiently small. Consequently, the entrepreneur's payoff from exerting effort $e' \geq e - \epsilon$ is $e'(\Pi - R) - \psi(e')$, which in turn implies that e is incentive–compatible only if $\Pi - R = \psi'(e)$. As a result, efficient effort is no longer implementable (since $R > -\Delta$).

We next characterize the outcome under independent investor financing:

Corollary 1 *Under independent investor financing the entrepreneur exerts effort*

$$e^{\text{out}} = \begin{cases} e^{FB}(0) = \Pi/\beta & \text{for } L \geq I - w \text{ (threat of termination credible)} \\ \frac{\Pi + \sqrt{\Pi^2 - 4\beta(I-w)}}{2\beta} < e^{FB}(0) & \text{for } L < I - w \text{ (threat of termination not credible)} \end{cases}$$

An optimal contract entails $R = (I - w)/e^{\text{out}}$ *and* $R_0 = \min[I - w, L]$*.*

Proof. Follows directly from Lemma 2 by setting $\Delta = 0$. □

Notice that the condition under which the termination threat is credible is less stringent under independent than under strategic investor financing. In other words, an independent investor is more committed to discipline the entrepreneur for poor performance than a strategic investor. This highlights a major point we wish to make: while the strategic externality makes it more worthwhile for the strategic investor to elicit high effort, it may also undermine his commitment to discipline the entrepreneur for poor performance by terminating the project. This may weaken the entrepreneur's incentive to exert effort and potentially result in inferior effort. To have an interesting tradeoff between strategic and independent investor financing, we assume in what follows that the threat of termination is credible under independent investor financing, i.e., we restrict attention to the case $L \geq I - w$.[6] The entrepreneur's payoff under independent investor financing is then given by[7]

$$V^{\text{independent}} = e^{FB}(0)\Pi - \psi(e^{FB}(0)) - (I - w) \tag{5}$$

Notice that, by (1), (5) strictly exceeds the entrepreneur's personal wealth w.

At this stage, one may still wonder why, for the case $\Delta > (L - (I - w))/e^{\text{out}}$, the entrepreneur and the strategic investor cannot do better by simply mimicking the outcome under independent investor financing. To see why, suppose the parties adopted the contract that is optimal under independent investor financing, $(R, R_0) = ((I - w)/e^{FB}(0), I - w)$. Under this contract, the strategic investor is willing to finance the project if and only if the entrepreneur exerts effort

$$e' \geq e^{FB}(0)\frac{I - w}{I - w + e^{FB}(0)\Delta}$$

By inspection, the right hand side of this inequality is strictly smaller than $e^{FB}(0)$, and it is decreasing in Δ. In other words, the larger the strategic benefit, the more reluctant is the strategic investor to exercise the termination threat in the event shirking. Anticipating the strategic investor's lack of commitment to penalize slack, the entrepreneur will exert less effort than $e^{FB}(0)$, and consequently the strategic investor will not break even under the contract that is optimal under independent investor financing.

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[6]See the Appendix for a characterization of the case $L < I - w$.

[7]To see this in more detail, notice that the entrepreneur's residual payoff is $e^{FB}(0)(\Pi - R) - \psi(e^{FB}(0))$, where $R = (I - w)/e^{FB}(0)$ is the repayment to the investor in the high cash flow state. Substituting for R and rearranging terms yields (5).

3.2 Choice of Financing Source

We now characterize the choice between strategic and independent investor financing. The entrepreneur prefers strategic over independent investor financing if and only if strategic investor financing is feasible (i.e., (4) is a real number) and her payoff under independent investor financing does not exceed her payoff under strategic investor financing. The entrepreneur's payoff strategic investor financing, if feasible, is

$$e(\Pi + \Delta) - \psi(e) - (I - w) - e^{FB}(0)\Delta \tag{6}$$

where e denotes the equilibrium effort level under strategic investor financing (see Lemma 2). Notice that (5) does not exceed (6) if and only if

$$e(\Pi + \Delta) - \psi(e) \geq e^{FB}(0)(\Pi + \Delta) - \psi(e^{FB}(0))$$

This reduces to $e \geq e^{FB}(0)$.[8] Thus, strategic investor financing is the preferred financing choice if and only if it is feasible and $e \geq e^{FB}(0)$. We now have the following result:

Proposition 1 *Suppose the threat of termination is credible under independent investor financing, $L \geq I - w$. Then, there are thresholds $\underline{\Delta} = (L - (I - w))/e^{FB}(0)$ and $\bar{\Delta} = \Pi + \sqrt{4\beta(I - w)}$, with $\underline{\Delta} < \bar{\Delta}$, such that*

(i) *for $\Delta \in (0, \underline{\Delta}]$, the entrepreneur is financed by the strategic investor and exerts first best effort $e^{FB}(\Delta)$.*

(ii) *for $\Delta \in (\underline{\Delta}, \bar{\Delta})$, the entrepreneur is financed by an independent investor and exerts effort $e^{FB}(0)$.*

(iii) *for $\Delta \geq \bar{\Delta}$, the entrepreneur is financed by the strategic investor and exerts effort*

$$e^* = \frac{\Pi + \Delta + \sqrt{(\Pi + \Delta)^2 - 4\beta(I - w + e^{FB}(0)\Delta)}}{2\beta} \in \left(e^{FB}(0), e^{FB}(\Delta)\right) \tag{7}$$

Proof. See the Appendix.

Figure 2 provides an illustration. For $\Delta \leq \underline{\Delta}$, the threat of termination is credible under strategic investor financing, and hence efficient effort is implementable. Strategic investor

[8]This follows from $e^{FB}(\Delta) = \arg\max_{e'} e'(\Pi + \Delta) - \psi(e')$, $e \leq e^{FB}(\Delta)$, $e^{FB}(0) \leq e^{FB}(\Delta)$, and concavity.

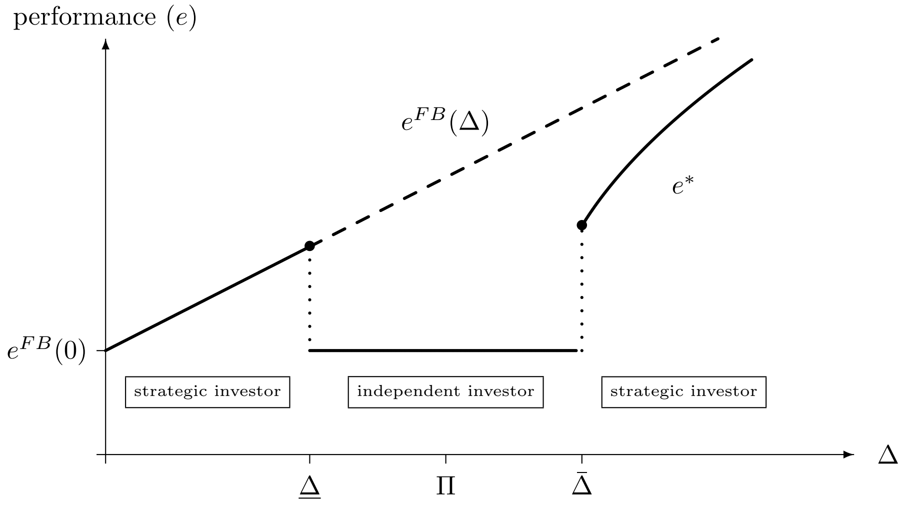

Figure 2: Performance and Financing Choice

financing is then the preferred financing choice as it facilitates the internalization of the strategic benefit. For $\Delta > \underline{\Delta}$, the threat of termination lacks credibility under strategic investor financing, while it is credible under independent investor financing. In this case, strategic investor financing is the preferred financing choice only if the *second* best effort level under strategic investor financing exceeds the *first* best effort level under independent investor financing (i.e., $e > e^{FB}(0)$, where e is given by (4)).[9] By inspection, this will be the case if and only if the repayment under strategic investor financing is *negative*.[10] To see why this can be an equilibrium outcome, suppose the strategic investor were to accept a negative repayment. If so, then equilibrium effort—and hence the expected value of the strategic benefit—would be higher under strategic than under independent investor financing. As Δ becomes sufficiently large (i.e., $\Delta \geq \bar{\Delta}$), the gain due to enhanced expected value of the strategic benefit becomes so strong that it induces the strategic investor to indeed accept a negative repayment. One interpretation of this result is that the investor enters a "strategic alliance" with the entrepreneur where the investor not only invests upfront but also commits

[9]In addition, it must be the case that strategic investor financing is feasible, i.e., (4) is a real number.

[10]To see why, notice that the effort level under independent investor financing is characterized by $\Pi = \psi'(e^{FB}(0))$, while under strategic investor financing it is characterized by $\Pi - R = \psi'(e)$ (given that the termination threat lacks credibility). Thus, by concavity, $e > e^{FB}(0)$ if and only if $R < 0$.

to make an additional payment upon the achievement of a "milestone".[11] It is worth noting that this outcome occurs only if the project return is relatively less important than the strategic benefit (i.e., $\Pi < \Delta$). For intermediate values of Δ, however, strategic investor financing is either not feasible or would result in inferior effort, and hence independent investor financing is the preferred financing choice.

The comparative statics are as follows. As the external financing burden $I - w$ increases, the threshold $\underline{\Delta}$ decreases and $\bar{\Delta}$ increases. Thus an increase in the magnitude of the entrepreneur's capital constraint reduces the range of parameter values under which the project is financed by the strategic investor. Essentially, this is because the strategic investor will have to be given a larger stake in the project when $I - w$ increases. This not only makes it more likely that the threat of termination lacks credibility but also reduces the entrepreneur's incentive to exert effort when the threat of termination does lack credibility. For these two reasons, financing by the strategic investor becomes relatively less attractive.

An increase in the project return Π also reduces the range of parameter values under which the project is financed by the strategic investor. In particular, as Π increases, the threshold $\underline{\Delta}$ decreases and the threshold $\bar{\Delta}$ increases. The intuition behind both observations is that an increase in Π enhances the effort level that the entrepreneur would exert if she were financed by an independent investor. Thus, as Π increases, the strategic investor's outside option payoff increases. This not only makes it more likely that the threat of termination will lack credibility under strategic investor financing (i.e., $\underline{\Delta}$ decreases), but also increases the extent to which strategic investor financing is not feasible (i.e., $\bar{\Delta}$ increases).

Lastly, the effect of an increase in the strategic externality on the entrepreneur's financing choice is *non–monotonic*. For small values of Δ, the entrepreneur is financed by the strategic investor and effort is increasing in Δ. At $\underline{\Delta}$, the entrepreneur switches to independent investor financing and effort drops to $e^{FB}(0)$. For very large values of Δ, the entrepreneur is again financed by the strategic investor, and effort is increasing in Δ. *Conditional* on the project being financed a strategic investor, however, there is an unambiguously positive relationship

[11]Such contracting arrangements are frequently observed in the biotechnology industry where established pharmaceutical companies regularly enter alliances with biotechnology ventures. For example, in 2006, Genmab, a Danish biotechnology firm, entered a strategic alliance with GlaxoSmithKline, a UK drug firm, under which GlaxoSmithKline not only invested $357m upfront but also offered milestone payments worth up to $1.6b provided Genmab's drug meets expectations (see The Economist, June 12, 2008).

between the performance of the project and the size of the strategic externality.[12]

These comparative statics give rise to a number of empirical implications. These will be discussed in more detail in Section 5.

4 Discussion & Extensions

In this section, we provide a discussion of some of the assumptions of the base model. Subsection 4.1 relaxes the assumption that the parties can commit to not renegotiate the contract. Subsection 4.2 looks at the case where the strategic externality in the event of project success depends on which party finances the project. Subsection 4.3 provides a discussion of our assumption that the entrepreneur has the full contract bargaining power vis–à–vis the strategic investor. Subsection 4.4 considers the case of deal syndication where the entrepreneur establishes a contracting relationship with both types of investors.

4.1 Renegotiation

Thus far we have assumed that the parties can commit to not renegotiate the contract in place. We now show that the previous analysis does not rely on this assumption. Renegotiation comes into consideration when the investor prefers to terminate the project but termination is inefficient. In this case, the parties have an incentive to renegotiate the contract as to effectively avoid termination of the project. To induce the investor to continue the project, the entrepreneur will have to increase the investor's stake in the project. Faced with threat, the entrepreneur will have no incentive to provide less than efficient effort.

To see this more formally, consider the case of strategic investor financing and suppose the entrepreneur were to exert effort $e' = e^{FB}(\Delta) - \epsilon$, where $\epsilon > 0$ but sufficiently small (so that project continuation is still efficient). In this case, if the threat of termination is credible, the strategic investor prefers to terminate the project under the status–quo contract. However, since project termination is inefficient, the parties can increase their joint payoff by signing a new contract and avoiding termination. The outcome of renegotiation then depends on the allocation of bargaining power between the parties. If the entrepreneur has the full bargaining power in renegotiation, then she offers the strategic investor to swap his claim

[12]This amounts to $e^{FB}(\underline{\Delta}) < e^{*}(\bar{\Delta})$. It is straightforward to show that this inequality holds.

R into a new claim R' such that the strategic investor is just indifferent between project continuation and termination, i.e.,

$$e'(R' + \Delta) = R_0$$

Thus the entrepreneur's payoff from the deviation is

$$e'(\Pi - R') - \psi(e') = e'(\Pi + \Delta) - R_0 - \psi(e') \tag{8}$$

which is maximized at $e^{FB}(\Delta)$. Consequently, the entrepreneur has no incentive to deviate from $e^{FB}(\Delta)$ (the complete proof can be found in the Appendix). Conversely, if the entrepreneur did not have the full bargaining power in renegotiation, then her payoff from deviating would be even lower than (8). Hence, she would have no incentive to deviate either. Notice too that following effort $e \geq e^{FB}(\Delta)$, the strategic investor (at least weakly) prefers to continue the project under the status–quo contract. Hence, the project is continued without renegotiation, irrespective of who has the bargaining power in renegotiation.

4.2 Endogenous Strategic Benefits

We have assumed that the size of the strategic benefit in the event of project success does not depend on whether the project is financed by the strategic or an independent investor. We now show how the analysis would be altered if this assumption were not satisfied. To fix ideas, suppose the strategic benefit is $\delta\Delta$ (where $\delta < 1$) if the project is financed by an independent investor, and Δ if the project is financed by the strategic investor. The idea is that the strategic investor may not be able to capture the full strategic benefit if the project is not financed by him, e.g., due to lack of control rights or monitoring capabilities aimed at protecting strategic benefits and avoiding their dissipation to third parties. Another example would be vendor (or trade) financing where a company provides a loan to a customer to finance the purchase of products. In this case, the strategic benefit may stem from the possibility to engage in repeat business in the future. It seems plausible that the vendor can increase its chances to secure future deals by establishing an early financing relationship with its customer. The parameter δ would then denote the probability of winning a future deal when the company does *not* provide vendor finance.

The strategic investor's outside option payoff is now given by $I - w + e^{\text{out}}\delta\Delta$. Consequently, the threat of termination is credible under strategic investor financing only if

$$\Delta \leq \frac{L - (I - w)}{e^{\text{out}}\delta}$$

Notice that as δ decreases, this inequality becomes less stringent. This highlights again the point made earlier: what matters for the credibility of termination threat is the size of the strategic investor's outside option payoff, i.e., the payoff that he would derive if the project were financed by an independent investor. As δ decreases, the strategic investor's outside option payoff—and hence equilibrium continuation payoff—decreases. Consequently, the strategic investor has less to lose from terminating the project, which in turn strengthens the credibility of the termination threat.

If the threat of termination is not credible under strategic investor financing, then first best effort is not implementable. Second best effort under strategic investor financing is

$$e^* = \frac{\Pi + \Delta + \sqrt{(\Pi + \Delta)^2 - 4\beta(I - w + e^{\text{out}}\delta\Delta)}}{2\beta} \tag{9}$$

Thus, as δ decreases, effort increases and hence the range of parameter values for which strategic investor financing is the preferred financing choice widens. Intuitively, as δ decreases, the strategic investor becomes more eager to finance the project in attempt to reap the full strategic benefit. This makes the strategic investor willing to accept a lower stake in the project, which in turn induces the entrepreneur to exert more effort. A key implication of this analysis is that as control considerations and strategic benefit protection motives become more important, strategic investor financing becomes more effective and *a fortiori* more important.

4.3 Contract Bargaining Power

We have assumed that the entrepreneur has the full contract bargaining power vis–à–vis the strategic investor. This is arguably a strong and somewhat ad hoc assumption. In what follows, we provide a brief discussion how the analysis would be altered if we assumed alternatively that the strategic investor makes a take–it–or–leave–it contract offer to the entrepreneur. At the same time, we maintain our initial assumption that the entrepreneur has the full bargaining power vis–à–vis independent investors. The justification for this assumption stems from the fact that there are several independent investors in our model. Bertrand competition among independent investors drives their profits down to zero.

Consider an equilibrium candidate in which the entrepreneur is financed by the strategic investor. Since the strategic investor makes a take–it–or–leave–it contract offer to the entrepreneur, the contracting problem is

$$\max_{(e\in[0,1],R\leq\Pi,R_0\leq L)} \quad e(R+\Delta) \tag{10}$$

s.t.

$$e(R+\Delta)\geq R_0 \tag{CO}$$

$$e(\Pi-R)-\psi(e)\geq V^{\text{independent}} \tag{IR}$$

$$e \text{ is incentive–compatible} \tag{IC}$$

where (10) is the strategic investor's payoff and (IR) now denotes the entrepreneur's participation constraint (which may or may not be binding). The right hand side of (IR) is the entrepreneur's payoff from undertaking her project with an independent investor, (5). Notice that strategic investor financing will be the equilibrium financing mode if and only if at the optimal solution the strategic investor's payoff is not smaller than his outside option payoff, that is,

$$e(R+\Delta)\geq I-w+e^{FB}(0)\Delta \tag{11}$$

If (11) does not hold at the optimal solution of the contracting problem specified above, then the entrepreneur undertakes her project with an independent investor. The following proposition, whose proof is relegated to the Appendix, describes the equilibrium outcome (the thresholds are defined in Proposition 1):

Proposition 2 *Suppose the strategic investor has the full bargaining power vis–à–vis the entrepreneur. Then:*

(i) *for* $\Delta\in(0,\underline{\Delta}]$*, the entrepreneur is financed by the strategic investor and exerts first best effort* $e^{FB}(\Delta)$*.*

(ii) *for* $\Delta\in(\underline{\Delta},\bar{\Delta})$*, the entrepreneur is financed by an independent investor and exerts effort* $e^{FB}(0)$*.*

(iii) *for* $\Delta \geq \bar{\Delta}$*, the entrepreneur is financed by the strategic investor and exerts second best effort* $e^{**} = (\Pi + \Delta)/(2\beta) \in (e^{FB}(0), e^{*}]$*, where* e^{*} *is given by (7).*[13]

Proof. See the Appendix.

When the strategic investor has bargaining power vis–à–vis the entrepreneur, he may tempted to exploit it and ask for a higher stake in the project than he does receive under the perfect competition scenario considered above. This has two potential effects. First, it may threaten the credibility of the termination threat in that the strategic investor becomes more reluctant to shut down the project. Second, if the threat of termination is not credible, then an increase in the strategic investor's stake will reduce the entrepreneur's residual payoff, which in turn makes it less worthwhile for her to exert high effort. The proposition shows that the first effect does not materialize. Intuitively, extracting a higher rent from the entrepreneur at the expense of losing the credibility of the termination threat is too costly for the strategic investor, as it would result in a too large decrease in effort. The second effect does materialize, however. Specifically, for $\Delta > \bar{\Delta}$, the strategic investor will extract a larger payment relative to the case where the entrepreneur has the full bargaining power, which in turn results in an additional effort distortion. An any rate, however, the key message of Proposition 1 is not altered under the alternative assumption of the strategic investor having the full contract bargaining power.

4.4 Syndication

Thus far we have assumed that the entrepreneur cannot be financed by more than one investor, i.e., we have excluded the possibility of syndicated financing. This is a plausible assumption for the case of smaller ventures, where the transaction cost of syndicated lending is arguably prohibitively high, but it seems a too restrictive assumption for the case of larger deals. This section sheds light on deal syndication where the entrepreneur establishes a contracting relationship with both the strategic and an independent investor.

We again restrict attention to the case $L \geq I - w$. From the previous section, we know that as long as the threat of termination is credible under strategic investor financing, i.e., $\Delta \leq \underline{\Delta}$, the project is financed by the strategic investor and the first best is implemented. For

[13]Notice that $e^{**} = e^{*}$ at $\Delta = \bar{\Delta}$ and $e^{**} < e^{*}$ for $\Delta > \bar{\Delta}$.

$\Delta > \underline{\Delta}$, however, the threat of termination lacks credibility under strategic investor financing. In this case, as we will show now, financial discipline can be restored and efficiency enhanced by bringing an independent investor on board. More specifically, consider the following arrangement: the entrepreneur secures financing T^i from an independent investor and $T^s = I - w - T^i$ from a strategic investor. The strategic investor then takes the role of monitoring the entrepreneur's effort choice and potentially disciplining her for poor performance. In other words, the liquidation control right is allocated to the strategic investor. By contrast, the independent investor takes a passive role and is at arm's length (and hence does not observe the entrepreneur's effort choice). To ensure that the threat of termination is credible, it must be the case that in equilibrium the strategic investor is just indifferent between project continuation and termination. It also must be the case that the payment that the strategic investor would receive if he terminated the project does not exceed the liquidation proceeds. That is,

$$e(R^s + \Delta) = R_0 \leq L \tag{12}$$

where R^s denotes the strategic investor's claim. Furthermore, under an optimal contract, the strategic investor just breaks even in equilibrium,

$$e(R^s + \Delta) = I - w - T^i + e^{FB}(0)\Delta$$

Substituting for this expression, inequality (12) reduces to

$$I - w - T^i + e^{FB}(0)\Delta = R_0 \leq L$$

Thus, to ensure that the threat of termination is credible, the independent investor's contribution to the financing of the project must satisfy

$$T^i \geq I - w - L + e^{FB}(0)\Delta \tag{13}$$

Notice that, by $\Delta > \underline{\Delta}$, the right hand side of this expression is strictly positive.

Proposition 3 *Suppose $\Delta > \underline{\Delta}$. Then, as long as renegotiation is not possible, the following syndication deal implements first best effort $e^{FB}(\Delta)$: (i) the strategic and independent investor invest $T^s = L - e^{FB}(0)\Delta$ and $T^i = I - w - L + e^{FB}(0)\Delta$ and are given claims*

$R^s = (T^s + e^{FB}(0)\Delta)/e^{FB}(\Delta) - \Delta$ and $R^i = T^i/e^{FB}(\Delta)$, respectively;[14] *(ii) the strategic investor is given the right to terminate the project and seize liquidation proceeds L.*

Proof. We first show that $e^{FB}(\Delta)$ is incentive–compatible. Notice that under the contract specified in the proposition, the strategic investor prefers to continue the project if and only if $e \geq e^{FB}(\Delta)$. Consequently, the entrepreneur's payoff from exerting effort e is

$$U(e) = \begin{cases} e\left(\Pi - R^s - R^i\right) - \psi(e) & \text{for } e \geq e^{FB}(\Delta) \\ -\psi(e) & \text{for } e < e^{FB}(\Delta) \end{cases}$$

This is maximized at $e = e^{FB}(\Delta)$. To show that the deal is optimal, it suffices to note that efficient effort is implemented, investors just break even, and the project is continued in equilibrium. □

The main effect of deal syndication is that it allows to reduce the strategic investor's stake in the project. This makes him less reluctant to terminate the project in the event of poor performance, which in turn restores the credibility of the termination threat. Thus, syndicating the deal and bringing in an independent investor restores financial discipline and enhances the entrepreneur's incentive to exert effort.[15]

[14] Notice that the strategic investor's investment contribution will be negative for Δ large. This may be hard to interpret. An alternative syndication deal implementing first best effort would be the following: the strategic and independent investor invest zero and $T^i = I - w$ and are given claims $R^s = -\Delta + e^{FB}(0)/e^{FB}(\Delta)\Delta < 0$ and $R^i = T^i/e^{FB}(\Delta)$, respectively, and the independent investor is given the right to terminate the project and seize liquidation proceeds $I - w$. The difference is that now the independent investor takes the role of potentially disciplining the entrepreneur for poor performance. The strategic investor no longer invests upfront but commits to pay a reward conditional on project success.

[15] It should be noted that the proposition is not entirely robust to the possibility of renegotiation. To see this, notice that efficient effort $e^{FB}(\Delta)$ does not maximize the joint continuation payoff of the strategic investor and the entrepreneur, i.e., $e(\Pi + \Delta - R^i) - \psi(e)$. In consequence, if the strategic investor and the entrepreneur were free to renegotiate the contract, efficient effort would not be incentive–compatible. More specifically, one can show that in this case equilibrium effort would be characterized by the following first order condition:

$$\Pi + \Delta - \frac{I - w - L + e^{FB}(0)\Delta}{e} = \psi'(e)$$

The corresponding solution would be inferior to efficient effort but still superior to equilibrium effort level in the absence of syndication (Proposition 1). In other words, deal syndication enhances efficiency even if renegotiation is possible.

5 Conclusion and Empirical Implications

Strategic objectives can make an investor willing to finance a project at low cost, but they may also interfere with the investor's financial discipline and threaten his commitment to discipline poorly performing entrepreneurs. The aim of this paper was to demonstrate that this tradeoff has implications for the provision of entrepreneurial incentives, project performance, the design of corporate venturing deals, and the choice between strategic and financial investors. We conclude with a discussion of the model's empirical implications.

Our first set of empirical predictions concerns the choice of financing source between strategic and financial investors. The model predicts that an increase in the investment outlay I and a decrease in the entrepreneur's net worth w make it less likely that the entrepreneur will be financed by a strategic investor. The model thus suggests that strategic investors, such as corporate venture capitalists, finance relatively small ventures with less binding financial constraints. We are not aware of empirical evidence along those lines.

The model also predicts a positive relationship between the strength of strategic benefits and project success.[16] This is consistent with Gompers and Lerner (1998). Using the likelihood of going public as a proxy for success, they find that corporate venture investments are significantly more successful than other investments in their sample. They also find that if a dummy variable denoting corporate venture investments with a strategic fit is added to the regressions, the corporate venture dummy variable becomes insignificant (and frequently negative). In other words, corporate venture investments in general do not perform better, only those with a strategic fit do. Chemmanur and Loutskina (2008) report that the probability of a successful exit (IPO or acquisition) is higher in corporate venture capital (CVC) backed firms compared to independent venture capital (IVC) backed firms. They also find that corporate venture capitalists are more likely to select portfolio companies in industries closely related to that of the corporate parents.[17]

The model also provides insights into the choice of contractual or organizational form in strategic venturing. As seen in Section 3, the model suggests that if strategic benefits

[16] This, however, does not necessarily imply that an increase in the strength of strategic benefits entails an increase in efficiency. As explained earlier, the reason is that an increase in the strategic benefit may induce the entrepreneur to secure financing from an independent, purely financial investor.

[17] However, Chemmanur and Loutskina (2008) also find that CVC–backed firms tend to underperform IVC–backed firms in terms of operating performance for the first five years after an IPO.

are high relative to the stand–alone return of the project, then strategic investors choose strategic alliances whereby the investor not only invests upfront but also commits to make additional milestone payments. By contrast, if project returns are more important than strategic benefits, then "traditional" corporate venturing should be more prevalent. To the best of our knowledge, this prediction has not been tested yet.

Our framework also sheds light on the role of deal syndication in the context of corporate venturing. In our model, sharing the investment burden with an independent venture capitalist enhances the financial discipline of a corporate venture capitalist, which in turn has positive implications for the entrepreneur's incentive to exert effort. This may well explain for why larger corporate venturing deals, where the transaction cost of deal syndication is small relative to the size of the project, are frequently co–financed by a corporation and independent venture capitalists. Our approach thus suggests that corporate and independent venture capital are actually complements, rather than substitutes (see Birkinshaw and Hill 2003 for suggestive evidence along those lines).

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Appendix

Proof of Lemma 2

Consider an equilibrium candidate in which the project is financed by the strategic investor.

(i) Case $\Delta \leq (L-(I-w))/e^{\text{out}}$. Given the contract specified in the lemma, the strategic investor is willing to continue the project if and only if $e' \geq e^{FB}(\Delta)$. Thus the entrepreneur's payoff from exerting effort e' is

$$U(e') = \begin{cases} e'(\Pi - R) - \psi(e') & \text{for } e' \geq e^{FB}(\Delta) \\ L - R_0 - \psi(e') & \text{for } e' < e^{FB}(\Delta) \end{cases} \tag{14}$$

where $R = (I - w + e^{\text{out}}\Delta) - \Delta$ and $R_0 = I - w + e^{\text{out}}\Delta$. We now show that $e^{FB}(\Delta) = \arg\max_{e'} U(e')$. Notice that $\arg\max_{e' \geq e^{FB}(\Delta)} U(e') = e^{FB}(\Delta)$ (by $R > -\Delta$) and

$$\begin{aligned} U(e^{FB}(\Delta)) &= e^{FB}(\Delta)(\Pi + \Delta) - \psi(e^{FB}(\Delta)) - (I - w) - e^{\text{out}}\Delta \\ &> \max_{e' < e^{FB}(\Delta)} U(e') = L - (I - w) - e^{\text{out}}\Delta \end{aligned}$$

by $e^{FB}(\Delta)(\Pi + \Delta) - \psi(e^{FB}(\Delta)) > I > L$ (otherwise, the project would not have been undertaken in the first place). To show that the contract is optimal, it suffices to note that the contract is feasible, implements efficient effort, and ensures that the strategic investor just breaks even and continues the project in equilibrium.

We now show that the contract remains optimal when the parties cannot commit not to renegotiate the contract (see Subsection 4.1). Suppose the entrepreneur exerts effort e' and consider the subgame at the project continuation stage. For $e' \geq e^{FB}(\Delta)$, the strategic investor prefers to continue the project and continuation is efficient, and hence the project is continued without renegotiation. For $e' < L/(\Pi + \Delta)$, the strategic investor prefers to terminate and termination is efficient, and hence the project is terminated without renegotiation. Finally, for $e' \in \big[L/(\Pi + \Delta), e^{FB}(\Delta)\big)$, the strategic investor prefers to terminate, but termination is inefficient and hence the parties the parties have an incentive to renegotiate the contract as to effectively avoid termination. Let us assume momentarily that the entrepreneur has the full bargaining power in renegotiation. In renegotiation, the entrepreneur offers the investor to swap his claim R into a new claim R' such that the investor is just willing to continue, i.e., $e'(R' + \Delta) = R_0$ (notice that $R' = R_0/e' - \Delta \leq \Pi$ by $e' \geq L/(\Pi + \Delta)$ and $R_0 \leq L$). The entrepreneur's payoff function is then given by

$$U(e') = \begin{cases} L - (I - w + e^{\text{out}}\Delta) - \psi(e') & \text{for } e' < L/(\Pi + \Delta) \\ e'(\Pi + \Delta) - (I - w + e^{\text{out}}\Delta) - \psi(e') & \text{for } e' \in \big[L/(\Pi + \Delta), e^{FB}(\Delta)\big) \\ e'\left(\Pi - \left((I - w + e^{\text{out}}\Delta)/e^{FB}(\Delta) - \Delta\right)\right) - \psi(e') & \text{for } e' \geq e^{FB}(\Delta) \end{cases}$$

By inspection, $U(e')$ is maximized at $e^{FB}(\Delta)$. Notice that $e^{FB}(\Delta)$ is incentive–compatible regardless of which party has the bargaining power in renegotiation, for if the strategic investor had the bargaining power then the entrepreneur's payoff from exerting effort e' would be given by (14), which, as shown above, is maximized at $e^{FB}(\Delta)$.

(ii) Case $\Delta > (L - (I - w))/e^{\text{out}}$. In this case, the strategic investor necessarily strictly prefers to continue the project in equilibrium. There thus exists a constant $\epsilon > 0$ such that for any $e' \geq e - \epsilon$ the project is continued. In consequence, the entrepreneur's payoff from exerting effort $e' \geq e - \epsilon$ is $e'(\Pi - R) - \psi(e')$, and hence e is incentive–compatible only if

$$\Pi - R = \psi'(e) \tag{15}$$

Now suppose (15) is not only necessary but also sufficient for incentive–compatibility. In this case, an optimal contract solves

$$\max_{e\in[0,1],R\leq\Pi,R_0\leq L} e(\Pi - R) - \psi(e)$$

subject to (CO), (IR), and (15). This is solved for the contract specified in the lemma. Equilibrium effort is then given by the largest solution of

$$\Pi - \left((I - w - e^{\text{out}}\Delta)/e - \Delta\right) = \beta e$$

where we made use of $\psi'(e) = \beta e$. This yields (4). It remains to be shown that (15) is sufficient for incentive–compatibility. To this end, we need to show that the entrepreneur has no incentive to induce the strategic investor to terminate the project. If the entrepreneur had such an incentive then she would exert zero effort and derive a payoff of $L - R_0 = 0$. Yet, the entrepreneur's equilibrium payoff must be non–negative, otherwise the entrepreneur would have preferred to consume her internal funds which would have secured her a payoff of w. Hence, (15) is sufficient for incentive–compatibility.

Proof of Proposition 1

For $\Delta \leq \underline{\Delta} \equiv (L - (I - w))/e^{\text{out}}$, first best effort is implementable under strategic investor financing. In consequence, the entrepreneur's payoff from undertaking the project with the strategic investor exceeds her payoff from undertaking the project with an independent investor (which in turn exceeds her personal wealth w). Hence the entrepreneur is financed by the strategic investor.

For $\Delta > \underline{\Delta}$, equilibrium effort under strategic investor financing, if feasible, is

$$e^* = \frac{\Pi + \Delta + \sqrt{(\Pi + \Delta)^2 - 4\beta(I - w + e^{\text{out}}\Delta)}}{2\beta} \tag{16}$$

Consequently, we have $e^* \geq e^{\text{out}}$ if and only if

$$\sqrt{(\Pi + \Delta)^2 - 4\beta(I - w + e^{\text{out}}\Delta)} \geq 2\beta e^{\text{out}} - (\Pi + \Delta) \tag{17}$$

Moreover, e^* exists (i.e., is a real number) if and only if the term inside the square root is non–negative,

$$(\Pi + \Delta)^2 - 4\beta(I - w + e^{\text{out}}\Delta) \geq 0 \tag{18}$$

Substituting for $e^{\text{out}} = \Pi/\beta$, this inequality reduces to

$$(\Pi - \Delta)^2 \geq 4\beta(I - w)$$

This holds if and only if $\Delta \leq \Pi - \sqrt{4\beta(I-w)}$ or $\Delta \geq \Pi + \sqrt{4\beta(I-w)}$. Conversely, (17) reduces to

$$\sqrt{(\Pi - \Delta)^2 - 4\beta(I - w)} \geq \Pi - \Delta$$

which holds for $\Delta \geq \Pi + \sqrt{4\beta(I-w)}$ but it does not hold for $\Delta \leq \Pi - \sqrt{4\beta(I-w)}$. Consequently, (17) and (18) hold if and only if $\Delta \geq \Pi + \sqrt{4\beta(I-w)} \equiv \bar{\Delta}$. To show that $\underline{\Delta} = (L - (I - w))/e^{\text{out}} < \bar{\Delta} = \Pi + \sqrt{4\beta(I-w)}$, it suffices note that

$$e^{\text{out}}\left(\Pi + \sqrt{4\beta(I-w)}\right) > e^{\text{out}}\Pi > I > L > L - (I - w)$$

In sum, for $L \geq I - w$, the entrepreneur is financed by the strategic investor if and only if $\Delta \leq \underline{\Delta}$ or $\Delta \geq \bar{\Delta}$. Otherwise, she is financed by an independent investor.

Consider now the case $L < I - w$ (not reported in the main text). In this case, the threat of termination is not credible under independent investor financing (and hence it is not credible under strategic investor financing either). Consequently, by Corollary 1 and assuming that financing by an independent investor is feasible (i.e., e^{out} defined below is a real number) and individual rational for the entrepreneur (i.e., the net present value of the project is positive), we have

$$e^{\text{out}} = \frac{\Pi + \sqrt{\Pi^2 - 4\beta(I-w)}}{2\beta}$$

Substituting for this expression, (16) reduces to

$$e^* = \frac{\Pi + \Delta + \sqrt{(\sqrt{\Pi^2 - 4\beta(I-w)} - \Delta)^2}}{2\beta}$$

Hence,

$$e^* = \begin{cases} \frac{\Pi + \sqrt{\Pi^2 - 4\beta(I-w)}}{2\beta} = e^{\text{out}} & \text{for } \Delta \leq \sqrt{\Pi^2 - 4\beta(I-w)} \\ \frac{\Pi + 2\Delta - \sqrt{\Pi^2 - 4\beta(I-w)}}{2\beta} > e^{\text{out}} & \text{otherwise} \end{cases}$$

Consequently, for $\Delta \leq \sqrt{\Pi^2 - 4\beta(I-w)}$, the choice of financing source is irrelevant, while for $\Delta > \sqrt{\Pi^2 - 4\beta(I-w)}$ the entrepreneur strictly prefers strategic investor financing.

Proof of Proposition 2

We first show that for $\Delta \in (0, \underline{\Delta}]$ the entrepreneur is financed by the strategic investor and efficient effort $e^{FB}(\Delta)$ is implemented. Let us momentarily assume that the strategic investor prefers to design the contract such that the threat of termination is credible, i.e., (CO) holds with equality. Assuming that (IC) is slack (to be verified later), the contracting problem reduces to

$$\max_{(e\in[0,1], R_0 \le L)} \quad R_0$$

$$\text{s.t.}$$

$$e(\Pi + \Delta) - R_0 - \psi(e) \ge e^{FB}(0)\Pi - (I - w) - \psi(e^{FB}(0)) \qquad \text{(IR')}$$

where we substituted for $R = R_0/e - \Delta$. By inspection, as long as (IR') is slack, this problem is maximized at $R_0 = L$. Thus, since $e = e^{FB}(\Delta)$ relaxes (IR') as much as possible, (IR') is slack if and only if

$$e^{FB}(\Delta)(\Pi + \Delta) - L - \psi(e^{FB}(\Delta)) \ge e^{FB}(0)\Pi - (I - w) - \psi(e^{FB}(0)) \qquad (19)$$

It is straightforward to show that (19) holds if and only if $\Delta \ge \sqrt{\Pi^2 + 2\beta(L - (I - w))} - \Pi \equiv \hat{\Delta}$ where $\hat{\Delta} < \underline{\Delta} = (L - (I - w))/e^{FB}(0)$. Hence we need to consider two cases:

(i) for $\Delta < \hat{\Delta}$, (IR') is binding and the problem reduces to

$$\max_{e\in[0,1]} \quad R_0 = e(\Pi + \Delta) - \psi(e) - \Big(e^{FB}(0)\Pi - (I - w) - \psi(e^{FB}(0))\Big)$$

which is solved for $e = e^{FB}(\Delta)$. The proof that $e^{FB}(\Delta)$ is incentive–compatible is similar to the proof of Lemma 2 and hence omitted. To show that the strategic investor is not better off under an alternative contract under which the threat of termination is not credible, it suffices to note that efficient effort is implemented and the entrepreneur's rent is fully extracted. Lastly, notice that the strategic investor is not better off under the outside option of letting the entrepreneur be financed by an independent investor, since

$$e^{FB}(\Delta)(\Pi + \Delta) - \psi(e^{FB}(\Delta)) - \Big(e^{FB}(0)\Pi - (I - w) - \psi(e^{FB}(0))\Big) > I - w + e^{FB}(0)\Delta$$

by $e^{FB}(\Delta) > e^{FB}(0)$.

(ii) for $\Delta \in [\hat{\Delta}, \underline{\Delta}]$, (IR') is slack. In this case, if the strategic investor prefers to design the contract such the threat of termination is credible, an optimal contract entails $R_0 = L$, $R = L/e^{FB}(\Delta) - \Delta$ and $e = e^{FB}(\Delta)$. The proof that $e^{FB}(\Delta)$ is incentive–compatible is similar to the proof of Lemma 2 and hence omitted. To show that the strategic investor is not better off under the outside option, notice that $L \ge I - w + e^{FB}(0)\Delta$ since $\Delta \le \underline{\Delta}$.

It remains to be shown that the strategic investor is not better off under an alternative contract under which the threat of termination is not credible (i.e., (CO) holds with strict inequality). If the threat of termination is not credible, then the incentive–compatibility constraint is $\Pi - R = \psi'(e)$. The contracting problem reduces to

$$\begin{aligned}
&\mathbf{P}: \\
&\max_{(e\in[0,1])} \quad e(\Pi - \psi'(e) + \Delta) \\
&\text{s.t.} \\
&\qquad e\psi'(e) - \psi(e) \geq V^{\text{independent}} \qquad \text{(IR")}
\end{aligned}$$

where we substituted for $R = \Pi - \psi'(e)$. If (IR") were slack, then this problem would be solved for $e = (\Pi + \Delta)/(2\beta)$. This, however, would be strictly inferior to $e^{FB}(0) = \Pi/\beta$ (by $\Delta < \Pi$), which would violate individual rationality.[18] Consequently, (IR") must be binding. This yields $e = \sqrt{2V^{\text{independent}}/\beta}$. It remains to be shown that $\sqrt{2V^{\text{independent}}/\beta} < e^{FB}(0) = \Pi/\beta$ (which again would violate individual rationality). Substituting for $V^{\text{independent}}$, it is straightforward to show that the previous inequality reduces to $\Pi^2 - 2\beta(I - w) < \Pi^2$, which holds by $I > w$.

In summary, we have shown that for $\Delta \leq \underline{\Delta}$ the entrepreneur is financed by the strategic investor and efficient effort $e^{FB}(\Delta)$ is implemented, as in Proposition 1.

Consider next the case $\Delta > \underline{\Delta}$. In this case, the threat of termination cannot be credible under strategic investor financing, and hence the contracting problem under strategic investor financing reduces to problem **P** stated above. We know from above that (IR") cannot be binding (otherwise, the optimal solution would entail $e < e^{FB}(0)$, violating individual rationality). Thus, in an equilibrium in which the entrepreneur is financed by the strategic investor, (IR") must be slack, i.e., $e = (\Pi + \Delta)/(2\beta) \equiv e^{**}$. Notice that $e^{**} \geq e^{FB}(0)$ if and only if $\Delta \geq \Pi$. The strategic investor's individual rationality constraint is

$$e^{**}(\Pi - \psi'(e^{**}) + \Delta) = \frac{(\Pi + \Delta)^2}{4\beta} \geq I - w + e^{FB}(0)\Delta = I - w + \Pi^2/\beta \tag{20}$$

This inequality holds if and only if $\Delta \geq \Pi + \sqrt{4\beta(I - w) = \bar{\Delta}}$ or $\Delta \leq \Pi - \sqrt{4\beta(I - w)}$. Yet for $\Delta \leq \Pi - \sqrt{4\beta(I - w)}$, we have $e^{**} < e^{FB}(0)$, which again would violate individual rationality. It remains to be shown that the entrepreneur's participation constraint is indeed slack (for $\Delta \geq \underline{\Delta}$). Substituting for e^{**}, it is straightforward to show that the entrepreneur's participation constraint can be expressed as

$$\frac{(\Pi + \Delta)^2}{4\beta} \geq \Pi^2/\beta - 2(I - w)$$

This holds by (20) and $\Delta \geq \bar{\Delta}$. In summary, for $\Delta \geq \bar{\Delta}$ the entrepreneur is financed by the strategic investor (and exerts effort e^{**}), while for $\Delta \in (\underline{\Delta}, \bar{\Delta})$ she is financed by an independent investor.

[18] To see this, notice that adding up the entrepreneur's and the strategic investor's participation constraints reduces to $e(\Pi + \Delta) - \psi(e) \geq e^{FB}(0)(\Pi + \Delta) - \psi(e^{FB}(0))$. This holds if and only if $e \geq e^{FB}(0)$ (see fn. 8).