Bargaining with Venture Capitalists when Bank Financing is an Endogenous Opportunity

Abstract
In this theoretical paper, I examine bargaining over the financial terms of a contract between an entrepreneur willing to realize a project and a supportive financier such as a venture capitalist. I study the impact of the endogenous opportunity to resort to non-supportive financiers such as banks as an alternative to the supportive financier on the outcome of the negotiation. I show that the entrepreneur's personal wealth, even when it is not dedicated to the project, is crucial in determining the outcome of the negotiation.

Key words: Bank; venture capital; supportive financing; non-supportive financing.

JEL code: G24
INTRODUCTION

Financing decisions are of critical importance to entrepreneurs willing to realize innovative projects. Some contract with venture capitalists that provide them with funds and advice. Others contract with commercial banks, whose role in the U.S. was until recently limited to lending.\(^1\) However the actual source of funds used does not reflect that some entrepreneurs actually can make a choice between supportive financiers and non-supportive financiers.\(^2\) The main purpose of this paper is to determine how this possibility, for those who face it, impacts on the financial terms of the contract they can expect to sign.

To study this question in the simplest way, I develop the following agency model. An entrepreneur has an investment project and some wealth, but needs external funds to realize the investment. Provision of these funds by a non-supportive financier or by a supportive financier is problematic because of moral hazard. Indeed, entrepreneurial effort is unobservable and costly. So is the supportive financier’s effort.\(^3\) Non-supportive financiers compete to fund firms so that they leave the entrepreneur with the project’s net present value (NPV) when they grant funds. By contrast, efficient support can be provided only by a financier specialized in the line of business chosen by the entrepreneur. Thus, the entrepreneur and the supportive financier bargain over the project’s NPV.

I show how the entrepreneur uses the opportunity to resort to non-supportive financing as a lever in the negotiation. I also show that since this opportunity is endogenous, i.e., rich entrepreneurs have an easier access to non-supportive financing than poor entrepreneurs, the former obtain a higher percentage of the NPV when bargaining with supportive financiers.

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1 The sample of Silicon Valley-based start-up companies examined in Hellmann and Puri (2002) evidences this heterogeneity.
2 To avoid confusions I contrast in the following of the text supportive financing with non-supportive financing, rather than bank financing with venture capital financing. Indeed, in Europe, banks sometimes play a supportive role. In the U.S. and in Europe, angels also play a supportive role.
3 By considering a double-sided moral hazard problem in a venture capital context, the present paper is in line with Renucci (2000), Casamatta (2003), Schmidt (2003), Inderst and Müller (2004), and Repullo and Suarez (2004).
This result is interesting because it holds true even if the entrepreneur does not invest all his wealth in the project under supportive financing. (For it is optimal to have the supportive financier invest sufficient funds to encourage her to exert proper effort.) But the entrepreneur’s personal wealth makes credible the opportunity to contract with non-supportive financiers. Stated differently, I expect that for a given entrepreneur’s financial contribution to the project, the terms of the contract will be all the more favourable to the entrepreneur as the wealth he shows up to the supportive financier is high. Wealth refers not only to the personal resources he invests in the project but also to resources that are not part of the financial contract. Thus, the present paper suggests a new role for personal resources.

To the best of my knowledge, personal wealth as a determinant of bargaining power has not been examined so far by the burgeoning empirical literature on bargaining between entrepreneurs and venture capitalists. Hsu (2004) shows that more experienced venture capitalists command better financing terms. Hochberg, Ljungqvist and Lu (2007) observe that U.S. venture capital firms engage in practices that increase their bargaining power. They restrict entry of new-comers into local venture capital markets such as Silicon Valley and Route 128.

These empirical tests have been partially suggested by theoretical literature on venture capital. Koskinen, Rebello and Wang (2009) examine the impact of the venture capitalists' experience and of entry costs on relative bargaining power, and the related optimal form of contracts between venture capitalists and entrepreneurs, in a double-sided, multi-staged adverse selection setting. In a double-sided moral-hazard framework, Inderst and Müller (2003) investigate how entry costs in the venture capital industry, the transparency of the venture capital market, and the profitability of start-ups affect the relative scarcity of venture capital. In turn, it impacts on relative bargaining power, and thus on pricing, contracting, and value
creation. However, none of these theoretical papers focuses as I do on one of the entrepreneur's personal attributes as a determinant of bargaining power.

The next section presents the model and a full-information benchmark. The section that follows shows the impact of the entrepreneur's wealth on the bargaining outcome. Finally, the results are discussed. Proofs are in the Appendix.

**THE MODEL**

**Assumptions**

An entrepreneur has a project that requires a financial investment $I$ and owns liquid assets $A$, with $A < I$. Thus, the entrepreneur needs external funding. Once (and if) funds are obtained, the entrepreneur has to exert effort. Exerting proper effort costs $B$, is unobservable, and makes the project succeed with probability $p_h < 1$. Exerting insufficient effort reduces the probability of success from $p_h$ to $p_l < p_h$. When the project succeeds, cash flows are equal to $R$. When the project fails cash flows are equal to zero. Cash flows are verifiable.

The entrepreneur can address non-supportive financiers. Then, the NPV is $v \equiv p_hR - B - I$ if the entrepreneur exerts proper effort. If the entrepreneur exerts insufficient effort, the NPV is $p_lR - I < 0$. Non-supportive financiers intensively compete with each other to fund firms, leaving the entrepreneur with the NPV when they finance the project (see Holmström and Tirole, 1997).

Alternatively, the entrepreneur can address supportive financiers. A supportive financier finances the project and helps the entrepreneur. The supportive financier's advice is vain if the entrepreneur does not exert proper effort. It reflects the fact that the entrepreneur's managerial
contribution to the project is essential.\textsuperscript{4} Conditional on the entrepreneur exerting proper effort, the financier’s advice increases the probability of success of the project from $p_h$ to $p_h + \alpha$ with $0 < \alpha \leq 1 - p_h$. Advising requires exerting proper unobservable effort and costs $C$. Thus, if the entrepreneur and the supportive financier exert proper effort, the NPV under supportive financing is $V \triangleq v + (\alpha R - C)$. In what follows, $C < \alpha R$: Supportive financing yields more than non-supportive financing. The entrepreneur and the supportive financier make simultaneously and non-cooperatively their effort decision. Efficient support can be provided only by a financier specialized in the type of project undertaken by the entrepreneur. Thus, the entrepreneur bargains over $V$ with this supportive financier. I model an infinite horizon, alternating offers bargaining game in the spirit of Rubinstein (1982).\textsuperscript{5} A difference is that bargaining is stopped if a potential competitor threatens to enter the market niche targeted by the entrepreneur, before the entrepreneur.\textsuperscript{6} Then the rival would capture all the profits. This threat of entry forces the entrepreneur to obtain funds quickly. Thus, he contracts with a non-supportive financier, if non-supportive financing is possible, because such a contract does not require bargaining. It deters entry by the rival. To be complete, the entrepreneur also can opt out and contract with non-supportive financiers when this threat is absent.\textsuperscript{7} If non-supportive financing is feasible, the timing and exact features of the bargaining game are the following:

\textsuperscript{4} An alternative interpretation of the model is that the entrepreneur must choose between maximizing profits and enjoying some private benefits, and that the latter choice is incompatible with benefiting from the supportive financier’s advice. Consider the following examples. In a family-run firm, a supportive financier proposes a new marketing policy. This value-enhancing policy is feasible only if the design of the product is modified, which can require replacing some family members by specialists. Similarly, the founder of a firm who enjoys controlling every decision can be forced to change the style of management if the supportive financier advises that salesmen be empowered to best cope with consumers’ needs. In the same way, an entrepreneur can invest in research projects that will bring greater recognition among scientific fellows, but will provide less financial return and fall outside the scope of the supportive financier’s activities.

\textsuperscript{5} The results would be immune to any change in the bargaining concept used, provided that the bargaining outcome is at least weakly increasing in $v$, the project’s NPV under non-supportive financing.

\textsuperscript{6} This embodies the exogenous shock imagined by Binmore, Rubinstein and Wolinsky (1986).

\textsuperscript{7} However, as will be shown in Proposition 1, the entrepreneur never opts out in equilibrium.
Step 1. The entrepreneur makes the first offer. If this offer is accepted by the supportive financier, bargaining ends. The entrepreneur and the supportive financier share $V$ according to the rule proposed by the entrepreneur. If the supportive financier rejects this offer, two cases can occur. In the first case which occurs with probability $\pi$, the threat of entry by a rival forces the entrepreneur to contract with a non-supportive financier. Then the entrepreneur earns $v$ while the supportive financier earns 0 (for simplicity). In the second case which occurs with probability $(1 - \pi)$ there is no threat of entry and the game proceeds to step 2.

Step 2. The supportive financier makes a counter-offer to the entrepreneur. If the entrepreneur accepts this offer, $V$ is shared according to the rule proposed by the supportive financier. If the entrepreneur rejects the offer, either (with probability $\pi$) there is a threat of entry and the entrepreneur contracts with a non-supportive financier, or (with probability $1 - \pi$) there is no threat of entry. Then, the entrepreneur is free to opt out, i.e., contract with a non-supportive financier, or to continue bargaining. In the latter case, the game is reset to step 1.

If non-supportive financing is impossible, the bargaining game follows the same steps as above. However, when there is a rival, the latter always enters the market niche, captures all the profits, and the entrepreneur earns 0. Abandoning bargaining is clearly suboptimal.

The entrepreneur and the financiers are risk-neutral. They are protected by limited liability and do not discount the future.

**Benchmark**

Assuming that provision of effort is contractible serves as a benchmark for the analysis. Non-supportive financing is possible as long as the project’s NPV is positive, i.e., $B \leq p_h R - I$.
Supportive financing is possible for higher values of $B$, i.e., $B \leq \bar{B}^{N^SF} + (\alpha R - C) \stackrel{\text{def}}{=} \bar{B}^{SF}$. Thus, when $B \in [\bar{B}^{N^SF}, \bar{B}^{SF}]$ supportive financing is the only solution. When $B \in [0, \bar{B}^{N^SF}]$ supportive financing yields more than non-supportive financing ($V > v$) but $V$ must be shared with the supportive financier whereas $v$ is not shared with the non-supportive financier. However, any bargaining outcome (see, e.g., Binmore, Shaked, and Sutton, 1989) must ensure that the entrepreneur earns at least $v$ under supportive financing since the entrepreneur obtains $v$ if bargaining stops (non-supportive financing is feasible). Hence, whatever $B \in [0, \bar{B}^{SF}]$, supportive financing is chosen. Personal resources are useless. This conclusion does not hold under moral hazard, as the next section shows.

**ANALYSIS OF THE CONTRACTS**

The objective of this section is to examine the impact of the entrepreneur's personal wealth on bargaining. To this end, the entrepreneur's alternatives in terms of source of financing under moral hazard are first explored.

**Non-Supportive Versus Supportive Financing**

First consider non-supportive financing (see Holmström and Tirole, 1997). Let the financier receive $S$ in case of success of the project. The sharing rule of cash flows must ensure that the entrepreneur is diligent. It requires that the entrepreneur's utility when exerting proper effort is higher than his utility when exerting insufficient effort:

$$ p_h(R - S) - B \geq p_l(R - S). $$

Equation (1) implies that the entrepreneur's share of cash flows in case of success of the project, $(R - S)$, must be sufficient to encourage effort. Denote $A^*$ the entrepreneur’s
financial contribution to the project (with \( A^* \leq A \)). The contract must also ensure that the non-supportive financier breaks even:

\[
 p_h S - (I - A^*) \geq 0. \tag{2}
\]

Combining (1) and (2) shows that entrepreneur’s cost of effort must be limited, i.e., \( B \leq \frac{\delta p}{p_h} [p_h R - I + A^*] \), to obtain financing. Note that investing \( A^* = A \) is best in terms of incentives. Indeed, the lower the external resources used, the smaller the amount that must be paid back to the non-supportive financier. In turn, the higher the share of cash flows that the entrepreneur receives when the project succeeds. Besides, \( v \geq 0 \) requires \( B \leq B^{NSF} \). The feasibility frontier of non-supportive financing is characterized below:

**Definition 1** Let \( B^*_A^{NSF} \equiv \min \left\{ \frac{\delta p}{p_h} [p_h R - I + A]; \overline{B^{NSF}} \right\} \) denote the entrepreneur’s maximum cost of effort compatible with non-supportive financing, i.e, non-supportive financing is possible if \( B \leq B^*_A^{NSF} \).

Supportive financing is the alternative to non-supportive financing. Again, the contract must ensure that the entrepreneur exerts proper effort. Provided the supportive financier is also diligent, which raises the probability of success by \( \alpha \), it requires:

\[
 (p_h + \alpha)(R - S) - B \geq p_l (R - S). \tag{3}
\]
For given $A^*$ invested by the entrepreneur and for given cost of effort $B$, sharing $V^S$ while verifying (3) is equivalent in expectation to leaving to the entrepreneur a minimum stake of:

$$(p_h + \alpha) \frac{B}{\delta p + \alpha} - B - A^*, \text{ where } \delta p \overset{\text{def}}{=} p_h - p, \text{ or:}$$

$$\frac{p_l B}{\delta p + \alpha} - A^*. \quad (4)$$

Conditional on (3) being verified, the supportive financier exerts proper effort if:

$$(p_h + \alpha) S - C \geq p_h S. \quad (5)$$

Sharing $V$ while satisfying (5) is equivalent to leaving to the supportive financier a minimum stake of:

$$\frac{p_h C}{\alpha} - (I - A^*). \quad (6)$$

Both (4) and (6) constrain the negotiation. The bargaining game has a unique sub-game perfect equilibrium detailed in the following Proposition:

**Proposition 1** Suppose that:

Case (i): Non-supportive financing is possible. Provided that the stake that must be left to the supportive financier for incentive purposes is lower than $\frac{(1-\pi)(V-v)}{2-\pi}$ while the stake that must

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8 Bargaining is over the NPV of the project. Provided that this NPV is positive, the entrepreneur and the supportive financier both break even.
be left to the entrepreneur for incentive purposes is lower than \( \frac{(1-\pi)V+\nu}{2-\pi} \), the bargaining game has a unique sub-game perfect equilibrium where the entrepreneur earns \( \frac{V+(1-\pi)\nu}{2-\pi} \).

Case (ii): Non-supportive financing is impossible. This is the limiting case of (i) as \( \nu \to 0 \).

The intuition for Proposition 1 is the following. The entrepreneur’s pay-off from bargaining is increasing in \( \nu \), the entrepreneur’s gains if bargaining stops and contracting with a non-supportive financier is possible. Naturally, when this opportunity is absent, the entrepreneur’s pay-off is reduced. Besides, the higher the probability that a rival threatens to set foot on the entrepreneur’s targeted market niche, the higher the probability that the entrepreneur will be forced to end up bargaining. Thus the higher the probability that the supportive financier will be left with 0. It leads the supportive financier to make concessions in the negotiation. Thus, the entrepreneur’s pay-off increases in \( \pi \).

Proposition 1 also states conditions for a sub-game perfect equilibrium to exist. These conditions determine the feasibility frontier of supportive financing. The frontier, represented in Figure 1, is defined below.

Insert Figure 1 about here

**Definition 2** Let \( C^{SF}_A(B) \) denote the supportive financier’s maximum cost of effort compatible with supportive financing for a given entrepreneur’s cost of effort \( B \), i.e, supportive financing is possible on \( \{B \geq 0; C \geq 0; C \leq C^{SF}_A(B)\} \).
The general shape of the frontier\(^9\) reflects that motivating the entrepreneur conflicts with motivating the supportive financier. Indeed (3) and (5) show that granting the entrepreneur a large share of cash flows when the project succeeds fosters the entrepreneur’s incentives but automatically diminishes the supportive financier’s incentives, and vice versa. Thus, broadly speaking, supportive financing is feasible for high values of \(C\) if \(B\) is low, and reciprocally.

More specifically, it is worth commenting on the impact of \(A\) on the frontier. Suppose that \(B\) is low. As for feasibility of supportive financing, having the opportunity to access non-supportive financing is a handicap. Indeed, such a lever raises the entrepreneur’s share of the NPV, which conflicts with the minimum stake that must be left to the supportive financier for incentive purposes. This handicap must be cope with as long as \(B \leq B_{A=0}^{NSF}\) since non-supportive financing is feasible even if the entrepreneur is poor (i.e., \(B_{A=0}^{NSF} > 0\) as Definition 1 shows). However, a financial contribution to the project of \(A^* = 0\) by the entrepreneur then extends feasibility. The intuition is the following. Reducing the entrepreneur’s financial contribution to the project increases the supportive financier’s contribution for a given investment \(I\). Accordingly, the supportive financier’s share of cash flows when the project succeeds can be raised. Thus, the supportive financier faces higher-powered incentives to exert proper effort. And supportive financing is feasible for higher values of \(C\).

When \(B > B_{A=0}^{NSF}\), non-supportive financing is feasible (until \(B_{A=0}^{NSF}\)) for rich entrepreneurs only. Thus, to extend feasibility, the entrepreneur is better off claiming that \(A\) is low and, in the limit, that \(A = 0\) even though \(A\) might actually verify \(A > 0\). It eliminates the lever in the negotiation.

Until \(B\) reaches some threshold (higher than \(B_{A=0}^{NSF}\)) the minimum stake that must be left to the supportive financier for incentive purposes still restrains feasibility. Again, a financial contribution to the project of \(A^* = 0\) by the entrepreneur extends feasibility.

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\(^9\) The frontier’s precise shape is detailed in the Appendix.
When $B$ exceeds this threshold, the large minimum stake that must be left to the entrepreneur for incentive purposes now conflicts with the sharing rule of cash flows resulting from the bargaining game. Then, it is best for the entrepreneur to contribute $A^* = A$ to the project. Just like in the non-supportive financing case, investing fewer assets would restrain feasibility.

The next proposition characterizes the conditions under which one type of financing is preferred to the other.\(^\text{10}\)

**Proposition 2** Supportive financing is optimal on $\{B \geq 0; C \geq 0; C \leq C^\text{SF}_A (B); C \leq \alpha R - 1 - \pi v\}$. Non-supportive financing is optimal on $B \geq 0; C \geq 0; B \leq B^\text{NSF}; C > C^\text{NSF,FB} \cup B \geq 0; C \leq B \leq B^\text{NSF}; C \leq C^\text{NSF}; C > \alpha R - 1 - \pi v$.

Proposition 2 summarizes that the entrepreneur opts for supportive financing in the following three cases. In the first case, non-supportive financing is feasible and works as a lever when bargaining, so that the entrepreneur earns more under supportive financing. It corresponds to the darkest coloured area in Figure 1. In the second case, (i) supportive financing is possible if non-supportive financing is not feasible, but is impossible if otherwise and (ii) supportive financing yields more to the entrepreneur than non-supportive financing (i.e., $\frac{V}{2 - \pi} \geq v$, or $C \leq \alpha R - (1 - \pi) v$). It corresponds to the part of the second-darkest coloured area that lies on the top of the area described in the first case. In the third case, non-supportive financing is not feasible. It corresponds to the part of the second-darkest coloured area that lies on the right of $B^\text{NSF}_A$.

\(^{10}\) See Ueda (2004) for a detailed analysis of the choice between venture capital financing and bank financing when venture capitalists are better than banks at evaluating projects but can steal ideas from entrepreneurs. Also see Renucci (2000) for the same type of choice when effort provision from venture capitalists and entrepreneurs is plagued by moral hazard.
Non-supportive financing is optimal in two cases. First, when supportive financing is not feasible. Second, when supportive financing is feasible, but $C > \alpha R - (1 - \pi)\nu$. It corresponds to the lightest coloured area in Figure 1. Otherwise, the project cannot be funded. It corresponds to the white area in Figure 1.

The Impact of the Entrepreneur's Personal Wealth on Bargaining

Consider non-supportive financing. Recall that $B_A^{NSF} \equiv \min \left\{ \frac{\delta p}{p_h} [p_h R - \nu + A]; B^{NSF} \right\}$. It is straightforward that feasibility is extended when the level of personal wealth that the entrepreneur can invest in the project increases, as long as $A < \left( \frac{\nu}{\delta p} \right) (p_h R - \nu)$. In Figure 1, a higher $A$ shifts the feasibility frontier of non-supportive financing to the right. Since the opportunity to resort to non-supportive financing is endogenous and depends on $A$, the outcome of the negotiation with a supportive financier also depends on $A$. It contrasts with the benchmark case where personal resources are useless. In terms of percentage of the NPV, the entrepreneur earns $\frac{1 + \nu (1 - \pi)}{2 - \pi}$ if non-supportive financing is feasible, and $\frac{1}{2 - \pi}$ if not. What is important here is that it is the personal wealth that the entrepreneur decides to show up to the supportive financier that matters, rather than the wealth the entrepreneur actually invests in the project. Indeed, under supportive financing, entrepreneurs may optimally not invest all their wealth in the project (e.g., $A^* = 0$ when $C$ is high as discussed above), whereas they should do so under non-supportive financing. But personal wealth makes credible the fact that entrepreneurs can resort to non-supportive financing. It enables entrepreneurs to earn more when bargaining with supportive financiers. Phrased differently, I expect a positive relation between the terms of the contract the entrepreneur negotiates and the wealth he shows up. The latter differs from the personal resources he invests in the project (or could commit to transfer to the financier in case of problem, such as collateral). It leads to the following prediction:
**Prediction 1** For a given financial contribution to their project, entrepreneurs who show up they are rich obtain a higher percentage of the NPV than poor entrepreneurs when bargaining with supportive financiers.

The present paper highlights a new role for personal resources. This new role can be empirically assessed by including an explanatory variable capturing the net worth evidenced by entrepreneurs in regressions estimating how gains are shared between entrepreneurs and, e.g., venture capitalists. Data required to examine this issue are: (i) The business plans of all the projects funded by a given supportive financier (or several supportive financiers), and (ii) the net worth evidenced by each entrepreneur (e.g., on the form of bank accounts, etc.).

**DISCUSSION AND CONCLUSION**

In this paper, I show how entrepreneurs obtain better deals when bargaining with supportive financiers if they have the opportunity to resort to non-supportive financing. This opportunity is endogenous in the sense that entrepreneurs who give evidence of their wealth have an edge over poor entrepreneurs. Thus, they obtain better deal terms than poor entrepreneurs. This result holds true even if they do not invest all their wealth in the project under supportive financing. But personal wealth makes credible the opportunity to resort to non-supportive financing.

A couple of remarks are in order regarding the robustness of the results. First, the bargaining process used in this paper builds on Rubinstein’s (1982) strategic approach of bargaining where players make offers and counteroffers, and behave non-cooperatively. The seminal setting is modified along two major dimensions. Firstly, moral hazard constrains bargaining.
It limits access to the outside opportunity. Secondly, the current setting takes into account that potential entry by a competitor obliges entrepreneurs to stop negotiation with supportive financiers. This embodies the exogenous shock imagined by Binmore, Rubinstein and Wolinsky (1986). It allows entrepreneurs to leverage the opportunity to address non-supportive financiers when bargaining with supportive financiers. Alternative settings sharing this natural feature would let the result about the impact of the entrepreneurs’ personal wealth unchanged. For instance, one could assume that there is no exogenous shock but players discount time, and entrepreneurs face a positive probability to opt out to contract with non-supportive financiers (see Sutton (1986) for a general result). Also, the central result of the paper would remain if the bargaining outcome were given by the axiomatic approach of bargaining derived by Nash (1950, 1953). Unlike the strategic approach, the axiomatic approach defines the solution to the bargaining problem on the basis of a set of properties that it must naturally satisfy.

Second, in the paper, the entrepreneurs’ and the supportive financiers’ actions are complements (more specifically, the supportive financier’s help is vain if the entrepreneur does not exert proper effort). By assuming a Cobb-Douglas technology, Repullo and Suarez (2004) also posit that efforts are complements. Alternative assumptions have been made when modelling double-sided moral-hazard in a venture capital context. For instance Casamatta (2003) posits that actions are substitutes. It is worth noting that the prediction would be immune to such an alternative assumption. Indeed, two features matter for the prediction to hold. First, entrepreneurs who evidence their wealth have an easier access to non-supportive financing, a feature that would not be affected by this change in assumptions. Second, it is

11 There is a third point of departure from the seminal setting: Entrepreneur can opt out. The aim of this assumption is to have a consistent setting: If entrepreneurs have the opportunity to address non-supportive financiers when a potential rival threatens to enter the market, this opportunity should also exist when this threat is absent. However, as shown in Proposition 1, the entrepreneur never opts out in equilibrium.

12 Under the conditions specified by Binmore, Rubinstein and Wolinsky (1986), the Nash bargaining solution and the generalized Nash bargaining solution are shown to coincide with those given by the strategic approach.

13 Inderst and Müller (2004) study a variety of technologies.
optimal in some circumstances that the entrepreneur does not invest all his personal wealth in the project to let the supportive financier contribute a sufficient amount of money in order to motivate her. This second feature would not be modified either.

Third, while non-supportive financing sometimes prevails under moral hazard in the paper, supportive financing is optimal in the benchmark case. Assuming a fixed cost of writing complex contracts such as the ones venture capitalists and entrepreneurs sign, or letting $C \geq \alpha R$ would make non-supportive financing sometimes optimal in the benchmark case. However, this case was ignored since it does not make it possible to investigate the issue under consideration here: Either non-supportive financing would be feasible under moral hazard so that entrepreneurs would optimally contract with non-supportive financiers and there would be no bargaining, or it would not be feasible and non-supportive financing could not be used as a lever when bargaining with supportive financiers.

One could challenge the feasibility of testing the prediction derived above about the role of the entrepreneurs’ personal wealth. Indeed, access to venture capitalists' files (i.e., the contracts they sign, bank statements of entrepreneurs' net worth, etc.) is necessary. However, recent research by, among others, Kaplan and Strömberg (2003) or Cornelli, Kominek and Ljungqvist (2010) suggests that internal strategic data are now available.

Finally, I leave for future research the analysis of the impact of different bankruptcy laws on the bargaining outcome. Bankruptcy laws differ in terms of the ability banks have to seize entrepreneurs’ personal assets. The higher this ability, the easier the entrepreneurs’ access to non-supportive financing. This feature should represent an advantage when bargaining with supportive financiers.
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APPENDIX

A. Proof of Proposition 1

For the sake of brevity, the entrepreneur is denoted by $E$ in what follows; the supportive financier is denoted by $SF$; the non-supportive financier is denoted by $NSF$. Let $m_E$ and $M_E$ be the infimum and the supremum of equilibrium payoffs to $E$ in the game in which $E$ plays first. Let $m_{SF}$ and $M_{SF}$ be the infimum and the supremum of equilibrium payoffs to $SF$ in the companion game in which it is $SF$ who plays first. Let $a_{SF}$ (respectively, $a_E$) be the minimum stake that must be left to $SF$ (respectively, $E$) for incentive purposes.

Firstly, suppose that non-supportive financing is possible. The following inequalities hold:

\[ m_E \geq \max\{a_E, V - (1 - \pi)M_{SF}\} \quad (7) \]
\[ M_E \leq V - \max\{a_{SF}, (1 - \pi)m_{SF}\} \quad (8) \]
\[ m_{SF} \geq \max\{a_{SF}, V - [\pi \times V + (1 - \pi)\max\{v, M_E\}]\} \quad (9) \]
\[ M_{SF} \leq V - \max \{ a_E, \pi \times v + (1 - \pi) \max \{ v, m_E \} \}. \] (10)

Inequality (I) follows from (i) the fact that \((1 - \pi)M_{SF}\) is the most that \(SF\) can get from refusing an offer. Indeed, if \(SF\) refuses \(E\)'s proposal, two cases can occur. With probability \(\pi\), \(E\)'s potential competitor shows up which forces \(E\) to stop bargaining and contract with \(NSF\), leaving \(SF\) with 0. With probability \((1 - \pi)\), bargaining continues, it is \(SF\)'s turn to make a proposal, and \(SF\) obtains at most \(M_{SF}\) by definition. Besides, (ii) \(E\) never makes offers that grant him less than \(a_E\). If it were the case, \(E\) would not exert proper effort. The probability of success of the project would decrease to \(p_l\) and \(E\) would have to share with \(SF\) less than \(v\) (i.e., what \(E\) earns when contracting with \(NSF\)). Thus, in equilibrium, \(E\) cannot earn less than \(\max \{ a_E, V - (1 - \pi)M_{SF} \} \).

Inequality (8) follows from the fact that, in equilibrium, \(SF\) must get at least \(\max \{ a_{SF}, (1 - \pi)m_{SF} \} \). Indeed, (i) \(E\) never offers \(SF\) less than \(a_{SF}\) because it would jeopardize \(SF\)'s incentives to work, decreasing to at most \(p_h\) the probability of success of the project. Thus, \(E\) would have to share with \(SF\) at most \(v\) (i.e., what \(E\) earns when contracting with \(NSF\)). Besides, (ii) \(SF\) obtains at least \((1 - \pi)m_{SF}\) by refusing \(E\)'s opening offer. Indeed, with probability \(\pi\), \(E\)'s potential competitor shows up, which forces \(E\) to stop bargaining, leaving \(SF\) with 0. With probability \((1 - \pi)\), bargaining continues and \(SF\) obtains at least \(m_{SF}\) by definition. Thus, \(E\) earns at most \(V - \max \{ a_{SF}, (1 - \pi)m_{SF} \} \) in equilibrium.

Inequality (9) follows from the fact that (i) \(E\) can get at most \(\pi \times v + (1 - \pi) \max \{ v, M_E \} \) by refusing \(SF\)'s offer. Indeed, \(E\)'s potential competitor shows up with probability \(\pi\), which forces \(E\) to stop bargaining and contract with \(NSF\), leaving \(E\) with \(v\). With probability \((1 - \pi)\), \(E\) chooses the best solution between opting out (then, \(E\) obtains \(v\)) and continuing bargaining (then, \(E\) obtains at most \(M_E\) by definition). Besides, (ii) \(E\) refuses any sharing rule that allocates him more than \(V - a_{SF}\) because it would not leave \(SF\) with enough cash flows.
to motivate her to exert proper effort. Since the probability of success of the project would be \( p_h \) instead of \( p_h + \alpha \), \( E \) should share \( v \) and so would obtain less than when contracting with NSF. Thus, SF earns at least \( \max\{a_{SF}, V - [\pi \times v + (1 - \pi) \max \{v, M_E\}]\} \) in equilibrium. Inequality (10) follows from the fact that, in equilibrium, \( E \) must get at least \( \max \{a_E, \pi \times v + (1 - \pi) \max \{v, m_E\}\} \). Indeed, (i) SF never offers \( E \) less than \( a_E \) because it would jeopardize \( E \)’s incentives to work. \( E \) would not accept this offer since the probability of success of the project would be \( p_i \) instead of \( p_h + \alpha \), leaving him to share with SF less than \( v \) (i.e., what he earns by contracting with NSF). Besides, (ii) \( E \) obtains at least \( \pi \times v + (1 - \pi) \max \{v, m_E\} \) by refusing SF’s offer. Indeed, with probability \( \pi \), \( E \)’s potential competitor shows up, which forces \( E \) to stop bargaining and contract with NSF, leaving \( E \) with \( v \). With probability \( (1 - \pi) \), \( E \) chooses the best solution between opting out (then, \( E \) obtains \( v \)) and continuing bargaining (then, \( E \) obtains at least \( m_E \) by definition). Thus, SF earns at most \( V - \max \{a_E, \pi \times v + (1 - \pi) \max \{v, m_E\}\} \) in equilibrium.

Let us distinguish between four cases.

Case 1: \( a_{SF} \leq (1 - \pi)m_{SF} \) and \( a_E \leq \pi \times v + (1 - \pi) \max \{v, m_E\} \). The system given by (7), (8), (9), and (10) can be rewritten as:

\[
\begin{align*}
m_E & \geq \max\{a_E, V - (1 - \pi)M_{SF}\} \quad (7a) \\
M_E & \leq V - (1 - \pi)m_{SF} \leq V - a_{SF} \quad (8a) \\
m_{SF} & \geq \max\{a_{SF}, V - [\pi \times v + (1 - \pi) \max \{v, M_E\}]\} \quad (9a) \\
M_{SF} & \leq V - [\pi \times v + (1 - \pi) \max \{v, m_E\}] \leq V - a_{E} \quad (10a)
\end{align*}
\]

First, suppose that \( v \leq m_E \). Substitute \( M_{SF} \) verifying \( M_{SF} \leq V - [\pi \times v + (1 - \pi) \ m_E \] given by (10a) into \( m_E \geq V - (1 - \pi)M_{SF} \) obtained from (7a). It leads to \( m_E \geq \frac{V + (1 - \pi)v}{2 - \pi} \).
Substitute $m_{SF}$ verifying $m_{SF} \geq V - \left[\pi \times v + (1 - \pi)M_{E}\right]$ given by (9a) into $M_{E} \leq V - (1 - \pi)m_{SF}$ obtained from (8a). It leads to $M_{E} \leq \frac{V + (1 - \pi)v}{2 - \pi}$. Since $m_{E} \leq M_{E}$:

$$m_{E} = M_{E} = \frac{V + (1 - \pi)v}{2 - \pi}. \tag{11}$$

Substitute $M_{E}$ verifying $M_{E} \leq V - (1 - \pi)m_{SF}$ given by (8a) into $m_{SF} \geq V - \left[\pi \times v + (1 - \pi)M_{E}\right]$ obtained from (9a). It leads to $m_{SF} \geq \frac{V - v}{2 - \pi}$. Substitute $m_{E}$ verifying $m_{E} \geq V - (1 - \pi)m_{SF}$ given by (7a) into $M_{SF} \leq V - \left[\pi \times v + (1 - \pi)M_{E}\right]$ obtained from (10a). It leads to $M_{SF} \leq \frac{V - v}{2 - \pi}$. Since $m_{SF} \leq M_{SF}$:

$$m_{SF} = M_{SF} = \frac{V - v}{2 - \pi}. \tag{12}$$

Next, suppose that $M_{E} > v > m_{E}$. Substitute $M_{SF}$ verifying $M_{SF} \leq V - v$ given by (10a) into $m_{E} \geq V - (1 - \pi)M_{SF}$ obtained from (7a). It leads to $m_{E} \geq \pi V + (1 - \pi)v$. It contradicts $v > m_{E}$ since $V > v$. Finally, suppose that $v \geq m_{E}$. Combining $m_{SF} \geq V - v$ given by (9a) and $M_{SF} \leq V - v$ obtained from (10a) gives $m_{SF} = M_{SF} = V - v$. Using this value, observe that (7a) and (8a) imply $\pi V + (1 - \pi)v \leq m_{E} \leq M_{E} \leq \pi V + (1 - \pi)v$. Thus, $m_{E} = M_{E} = \pi V + (1 - \pi)v$. It contradicts $v \geq M_{E}$ since $V > v$. Using the computed values of $m_{E}, M_{E}, m_{SF},$ and $M_{SF}$ given by (11) and (12), it remains to observe that Case 1 occurs when $a_{SF} \leq \frac{(1 - \pi)(V - v)}{2 - \pi}$ and $a_{E} \leq \frac{(1 - \pi)v + v}{2 - \pi}$.

Case 2: Suppose that $a_{SF} \leq (1 - \pi)m_{SF}$ and $a_{E} > \pi \times v + (1 - \pi) \max \{v, m_{E}\}$. The system given by (7), (8), (9), and (10) can be rewritten as:

$$m_{E} \geq \max\{a_{E}, V - (1 - \pi)M_{SF}\} \tag{7b}$$

$$M_{E} \leq V - (1 - \pi)m_{SF} \leq V - a_{SF} \tag{8b}$$

$$m_{SF} \geq \max\{a_{SF}, V - [\pi \times v + (1 - \pi) \max \{v, M_{E}\}]\} \tag{9b}$$

$$M_{SF} \leq V - a_{E} < V - [\pi \times v + (1 - \pi) \max \{v, m_{E}\}]. \tag{10b}$$
First, suppose that \( v \leq m_E \). Substitute \( M_{SF} \) verifying \( M_{SF} \leq V - a_E \) given by (10b) into \( m_E \geq V - (1 - \pi)M_{SF} \) obtained from (7b). It leads to \( m_E \geq \pi V + (1 - \pi)a_E \). Substitute \( m_{SF} \) verifying \( m_{SF} \geq V - [\pi \times v + (1 - \pi)m_E] \) given by (9b) into \( M_E \leq V - (1 - \pi)m_{SF} \) obtained from (8b). It leads to \( M_E \leq \frac{V + (1 - \pi)v}{2 - \pi} \). Thus, \( \pi V + (1 - \pi)a_E \leq m_E \leq M_E \leq \frac{V + (1 - \pi)v}{2 - \pi} \). It requires \( a_E \leq \frac{(1 - \pi)v + v}{2 - \pi} \), which contradicts \( a_E > \frac{(1 - \pi)v + v}{2 - \pi} \) (the latter inequality obtained by combining \( a_E > \pi \times v + (1 - \pi)m_E \) and \( m_E \geq \pi V + (1 - \pi)a_E \)). Next, suppose that \( M_E > v > m_E \). It still holds that \( m_E \geq \pi V + (1 - \pi)a_E \). It is compatible with \( v > m_E \) if \( a_E < v \), which contradicts \( a_E > v \). Finally, suppose that \( v \geq M_E \). The proof is the same as just above. To summarize, Case 2 is not possible.

Case 3: \( a_{SF} > (1 - \pi)m_{SF} \) and \( a_E \leq \pi \times v + (1 - \pi) \max \{v, m_E\} \). The system given by (7), (8), (9), and (10) can be rewritten as:

\[
\begin{align*}
    m_E & \geq \max\{a_E, V - (1 - \pi)M_{SF}\} \\
    M_E & \leq V - a_{SF} < V - (1 - \pi)m_{SF} \\
    m_{SF} & \geq \max\{a_{SF}, V - [\pi \times v + (1 - \pi) \max \{v, m_E\}]\} \\
    M_{SF} & \leq V - [\pi \times v + (1 - \pi) \max \{v, m_E\}] \leq V - a_E.
\end{align*}
\]

First, suppose that \( v \leq m_E \). Substitute \( m_{SF} \) verifying \( m_{SF} \geq V - [\pi \times v + (1 - \pi)M_E] \) given by (9c) into \( M_E < V - (1 - \pi)m_{SF} \) obtained from (8c). It leads to \( M_E < \frac{V + (1 - \pi)v}{2 - \pi} \). Besides, substitute \( M_{SF} \) verifying \( M_{SF} \leq V - [\pi \times v + (1 - \pi)m_E] \) given by (10c) into \( m_E \geq V - (1 - \pi)M_{SF} \) obtained from (7c). It leads to \( m_E \geq \frac{V + (1 - \pi)v}{2 - \pi} \). It contradicts \( m_E \leq M_E \). Next, suppose that \( M_E > v > m_E \). The proof is the same as just above. Finally, suppose
that $v \geq M_E$. Combining $m_{SF} \geq V - v$ given by (9c) and $M_{SF} \leq V - v$ obtained from (10c)
leads to $m_{SF} = M_{SF} = V - v$. Replacing the computed value of $M_{SF}$ in (7c) gives $m_E \geq \pi V + (1 - \pi)v$. Combining with (8c) leads to $\pi V + (1 - \pi)v \leq m_E \leq M_E \leq V - a_{SF}$. It is not compatible with $a_{SF} > (1 - \pi)(V - v)$. To summarize, Case 3 is not possible.

Case 4: Suppose that $a_{SF} > (1 - \pi)m_{SF}$ and $a_E > \pi \times v + (1 - \pi) \max \{v, m_E\}$. The system given by (7), (8), (9), and (10) can be rewritten as:

\[
\begin{align*}
m_E & \geq \max\{a_E, V - (1 - \pi)M_{SF}\} \quad \text{(7d)} \\
M_E & \leq V - a_{SF} < V - (1 - \pi)m_{SF} \quad \text{(8d)} \\
m_{SF} & \geq \max\{a_{SF}, V - [\pi \times v + (1 - \pi)\max \{v, M_E\}]\} \quad \text{(9d)} \\
M_{SF} & \leq V - a_E < V - [\pi \times v + (1 - \pi) \max \{v, m_E\}] \quad \text{(10d)}
\end{align*}
\]

First, suppose that $v \leq m_E$. Substitute $M_E$ verifying $M_E \leq V - a_{SF}$ given by (8d) into $m_{SF} \geq V - [\pi \times v + (1 - \pi)M_E]$ obtained from (9d). It leads to $m_{SF} \geq \pi(V - v) + (1 - \pi)a_{SF}$. Combining with $a_{SF} > (1 - \pi)m_{SF}$ leads to $m_{SF} > \frac{V - v}{2 - \pi}$. Substitute $m_E$ verifying $m_E \geq V - (1 - \pi)M_{SF}$ given by (7d) into $M_{SF} < V - [\pi \times v + (1 - \pi) m_{E}]$ obtained from (10d). It leads to $M_{SF} < \frac{V - v}{2 - \pi}$. It contradicts $m_{SF} \leq M_{SF}$. Next, suppose that $M_E > v > m_E$. The proof is the same as just above. Finally, suppose that $v \geq M_E$. According to (9d) and (10d), $V - v \leq m_{SF} \leq M_{SF} \leq V - a_E$, which contradicts $a_E > v$. To summarize, Case 4 is not possible.

To conclude, there is a unique subgame perfect equilibrium. $E$ always proposes an agreement where $E$ earns $\frac{V + (1 - \pi)v}{2 - \pi}$ while $SF$ earns $\frac{(1 - \pi)(V - v)}{2 - \pi}$, accepts any proposal greater than $\frac{(1 - \pi)\pi + v}{2 - \pi}$.
and never opts out. SF always proposes an agreement where SF earns \( \frac{V-v}{2-\pi} \) while E earns \( \frac{(1-\pi)V+v}{2-\pi} \), and accepts any proposal greater than \( \frac{(1-\pi)(V-v)}{2-\pi} \). The outcome is that agreement is reached immediately on the division proposed by E. Conditions \( a_{SF} \leq \frac{(1-\pi)(V-v)}{2-\pi} \) and \( a_{E} \leq \frac{(1-\pi)V+v}{2-\pi} \) must be verified.

Secondly, suppose that non-supportive financing is impossible. Replace \( v \) by 0 in (7), (8), (9), and (10). The proof follows the same lines as above.

**B. Feasibility frontier of supportive financing**

First, suppose that non-supportive financing is possible. Combining the expression of the supportive financier’s minimum stake given by (6) and the condition given by part (i) of Proposition 1 leads to:

\[
C \leq \frac{(1-\pi)sR+\alpha-A^*}{\frac{\alpha R}{2-\pi}+\frac{p_h}{\alpha}}, \tag{13}
\]

while combining the expression of the entrepreneur’s minimum stake given by (4) and the condition given by part (i) of Proposition 1 leads to:

\[
C \leq \alpha R + \left[ \frac{\alpha R}{\alpha + \frac{p_h}{\delta p+a}} \right] \left[ p_h R - (1 - A^*) - \left( \frac{\alpha}{\delta p+a} \right) B \right]. \tag{14}
\]
Second, suppose that non-supportive financing is impossible. Combining the expression of the supportive financier’s minimum stake given by (6) and the condition given by part (ii) of Proposition 1 leads to:

\[ C \leq \left( \frac{1-\pi}{2-\pi} \right) \left( \frac{p_h+\alpha R-I+1-A^* - \frac{1-\pi}{2-\pi} B}{1-\pi} \right), \tag{15} \]

while combining the expression of the entrepreneur’s minimum stake given by (4) and the condition given by part (ii) of Proposition 1 leads to:

\[ C \leq (p_h + \alpha)R - I + \left( \frac{2-\pi}{1-\pi} \right) A^* - \left[ 1 + \left( \frac{2-\pi}{1-\pi} \right) \left( \frac{p_I}{\delta p+a} \right) \right] B. \tag{16} \]

It is straightforward that setting \( A^* = 0 \) extends feasibility if (13) or (15) bind, whereas setting \( A^* = A \) extends feasibility if (14) or (16) bind.

Start with low values of \( B \). Non-supportive financing is feasible even if the entrepreneur is poor: \( B_{A=0}^{NSF} > 0 \) as Definition 1 shows. Until \( B \) reaches \( B_{A=0}^{NSF} \), the frontier is given by (13) rather than (14). Indeed, (13) is more stringent than (14) as long as \( B \leq \left( \frac{\delta p+a}{p_h+\alpha} \right) \left( p_h R - I \right) \left( 1 + \frac{1}{1+\frac{p_h}{\alpha} \left( \frac{2-\pi}{1-\pi} \right)} \right) + A \). Observe that this threshold is higher than \( B_{A=0}^{NSF} \equiv \min \left\{ \frac{\delta p}{p_h} [p_h R - I + A]; B^{NSF} \right\} \), and a fortiori than \( B_{A=0}^{NSF} \).

When \( B > B_{A=0}^{NSF} \) and \( C \) is large, the entrepreneur can access supportive financing by claiming that \( A \) is low (and in the limit, that \( A = 0 \)), even though \( A \) might actually verify \( A > 0 \). Claiming that \( A > 0 \) would give the entrepreneur a lever in the negotiation since non-supportive financing is possible until \( B \) reaches \( B_{A=0}^{NSF} \). Such a lever would raise his share of the NPV, which would conflict with the minimum stake that must be left to the supportive
financier for incentive purposes. Thus claiming that $A$ is low is best. To see this, compare (13) and (15). Until $B$ reaches $\bar{B} \equiv \left(1 + \frac{p_h}{\alpha}\right)(p_h R - \ell) + A \left[1 + \frac{p_h}{\alpha} \frac{2 - \gamma}{1 - \gamma}\right]$, condition (15) binds. When $B$ is above $\bar{B}$, (16) binds.

To summarize, $C_A^{SF}(B)$ is given by (13) where $A^* = 0$ when $B < B_{A=0}^{NSF}$, by (15) where $A^* = 0$ when $B_{A=0}^{NSF} \leq B < \bar{B}$, and by (16) where $A^* = A$ when $B \geq \bar{B}$. 
The bold dotted lines represent the feasibility frontiers of non-supportive financing when $A = 0$ and when $A > 0$, respectively. The dashed lines represent the constraints given by the minimum stakes that must be left for incentive purposes to (i) the supportive financier when non-supportive financing is possible ($\text{Min } SF_{A = 0}^{\text{NSF}}$) and when non-supportive financing is impossible ($\text{Min } SF_{A' = 0}^{\text{NSF}}$), and to (ii) the entrepreneur when non-supportive financing is impossible ($\text{Min } E_{A' = A}^{\text{NSF}}$). The bold solid line segments represent the feasibility frontier of supportive financing. The plain line characterizes the values of $C$ for which the entrepreneur is indifferent between supportive financing (without lever) and non-supportive financing, i.e., $\frac{V}{2-\pi} = v$. The lightest coloured area shows where non-supportive financing is optimal. The darkest coloured area shows where supportive financing (with non-supportive financing as a lever) is optimal. The second-darkest coloured area shows where supportive financing (without lever) is optimal. The white area shows where the project cannot be funded.