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DEALING WITH VENTURE CAPITALISTS: SHOPPING AROUND OR EXCLUSIVE NEGOTIATION

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Dealing with Venture Capitalists: Shopping Around or Exclusive Negotiation

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Abstract

We study the optimal negotiation strategy of an entrepreneur who faces two investors with private information about his project's profitability. The entrepreneur derives a private benefit of control so that he cares not only about expected monetary profits, but also about the probability to obtain financing. If he contacts both venture capitalists simultaneously, the entrepreneur obtains high expected monetary profits. If he commits to a period of exclusive negotiation with one venture capitalist, he can increase the probability to obtain financing for riskier projects, but deal terms deteriorate. The optimal negotiation strategy results from this trade-off. We also solve for the equilibrium financial contracts and obtain implications for venture capitalists' portfolios and entrepreneurs' deals. The model predicts in particular that venture capitalists are more likely to finance projects with equity-like claims when projects are riskier and venture capitalists are more experienced. Also, high private benefit entrepreneurs are more likely to receive a single offer and to be financed by less experienced venture capitalists.
Keywords: deal flow, exclusive negotiation, venture capital, start-up financing, informed investors.
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1 Introduction

Exclusive negotiations are frequent in financial transactions: Boone and Mulherin (2007) estimate that half of major takeover transactions between 1989 and 1999 occurred through private negotiations with a single bidder. They are also prevalent in early stage financing. For instance, venture capitalists' term sheets sometimes include exclusive negotiation periods, whereby entrepreneurs commit not to initiate talks with other potential financial partners during a predetermined period. Relatedly, Hsu (2004) reports that about two-third of early-stage firms receive only one offer (but he does not measure the number of investors an entrepreneur negotiates with). Although such practices are hard to quantify in venture capital, they are an important issue for entrepreneurs searching financing.[1] Exclusive negotiation probably benefits financial partners who can temporarily be protected from competitive pressure. The objective of this paper is to understand how it can also benefit entrepreneurs and to investigate the consequences of entrepreneurs' negotiation strategy on equilibrium financial contracts, valuations, and matching between entrepreneurs and venture capitalists.

The question of whether a seller prefers competition over negotiation has already been discussed in the literature. In particular, Bulow and Klemperer (1996) establish that when sellers value monetary profits only, an auction with N bidders always dominates negotiation with (N-1) bidders. This is hard to reconcile with observed exclusive negotiations. Our premise is that entrepreneurs in search of funds are not interested in monetary profits only. They also derive a private benefit when successfully funding their projects. These private benefits can reflect entrepreneurs' satisfaction to see their idea implemented, or their future reputation gains if the venture succeeds. Success can then increase entrepreneurs' perceived talent, and give them access to better job opportunities. We incorporate this assumption in a model of competition among asymmetrically informed venture capitalists (hereafter VCs). More experienced VCs are able to generate more precise information

[1] See for instance the case study "Traction Ventures", E428, Stanford Graduate School of Business, for an illustration of entrepreneurs' dilemma between extending exclusive negotiation periods and negotiating with multiple potential investors.

on the value of the entrepreneur's venture. This affects the expected profits the entrepreneur can capture when several VCs compete to finance his project, as well as the probability to get funded. Because they care also about expected private benefits, entrepreneurs might choose another fund raising strategy. Our analysis builds on this fundamental insight.

Specifically, we consider a venture capital industry composed of two VCs with different screening abilities. The entrepreneur can choose one of two negotiation strategies to raise funds. Either he decides to shop for deals, and approaches the two venture capitalists simultaneously. Investors then offer menus of financial contracts. After observing his rival's offer, each investor subsequently chooses which financial contract to maintain from his menu. The sequential nature of the shopping around strategy allows to sustain pure-strategy equilibria according to the level of risk of the entrepreneurial venture. Riskier projects are financed by the experienced VC, who acquires an equity-like claim. Less risky projects are financed either by the inexperienced or the experienced VC. The inexperienced VC then acquires a debt-like claim. In both equilibria, VCs who provide funding at equilibrium earn strictly positive expected profits. A nice feature of these equilibria is that they characterize different situations of financial intermediation. The first equilibrium fits well with early-stage financing and venture capital: projects are particularly risky, investors who finance those ventures have better screening abilities and acquire equity claims. The second equilibrium corresponds to more standard entrepreneurial financing, whereby all types of financial intermediaries can provide funding. Interestingly, less experienced investors prefer to finance those ventures with debt.

The alternative strategy is for the entrepreneur to start exclusive talks with one venture capitalist, delaying the possibility to contact another venture capitalist later. At the equilibrium, the entrepreneur accepts any offer at the exclusive negotiation stage. The reason is that when negotiation fails after a period of exclusivity, subsequent investors infer bad news about the project quality and do not compete effectively. The entrepreneur's expected utility then reduces to his expected private benefit. This result confirms the intuition that exclusive negotiation is detrimental to entrepreneurs if one considers monetary profits only. However, the probability to obtain funding is large which can be appealing for high private benefit entrepreneurs.

The optimal negotiation strategy then results from a trade-off between monetary profits and the probability to get funded. Exclusive negotiation arises with high risk, high private benefit entrepreneurs. In all other situations, entrepreneurs prefer to shop around, but the nature of financial contracts, and the type of VCs they match with depends on the nature of their projects. Experienced VCs finance all types of projects, and acquire equity for the riskier ones. Inexperienced VCs only finance less risky projects, and acquire debt. The contribution of the paper is therefore two-fold. Firstly, we endogenously relate the type of financial contract issued to the characteristics of financial intermediaries. An important question in the literature is what makes venture capital different from traditional financial intermediation. We show that when investors with different screening ability compete with each other, riskier projects are financed with equity, and by the more able investors. Secondly, our paper is the first to provide a theoretical framework to understand when entrepreneurs find it optimal to engage in exclusive negotiation or to implement competition.

This gives rise to a number of new empirical predictions on VCs portfolio and deal flow, as well as on entrepreneurs' financial deals. An implication of the model is that inexperienced VCs should have a higher deal flow, and attract more entrepreneurs with riskier projects and higher private benefits than experienced VCs. Also, VCs are more likely to finance projects with equity-like claims when projects are riskier and VCs are more experienced. Regarding entrepreneurs, we expect first-time entrepreneurs to receive less offers on average than serial entrepreneurs, holding project risk constant. In addition, single offers are more likely to come from less experienced VCs which is consistent with empirical evidence. Last, pre-money valuations should be lower when entrepreneurs engage in exclusive talks, and receive only one offer at a time. The interest of our analysis is to explain why entrepreneurs optimally choose to relinquish bargaining power to VCs.

The paper is organized as follows. Next section presents the related literature. Section 3 describes the model and derives the first-best level of investment. Section 4 studies the outcome of the "shopping around" game. Section 5 derives the equilibria of the "exclusive talks" game. Section 6 studies the optimal negotiation strategy of the entrepreneur, and explores the empirical implications of our model. Section 7 discusses the robustness of our results to some alternative assumptions. Section 8 concludes and proofs are provided in the appendix.

2 Related literature

Our paper is directly linked to the literature on competition between financial intermediaries with asymmetric information. Our shopping around game builds on the sequential setting of Broecker (1990), and extends it to the case in which investors have different signal precisions, and can design optimal financial contracts. The sequential game allows to obtain pure-strategy equilibria while mixed-strategy equilibria typically prevail in simultaneous competition games with discrete signals.[2] A novelty of our analysis is to derive the optimality of debt or equity claims according to the level of risk of projects, and to match financial contracts with investors' characteristics. Other papers study situations of informed investors and focus on the optimal contract design between investors and entrepreneurs: Inderst and Mueller (2006) consider a monopolistic informed investor, and show that the optimal financial claim depends on the bargaining power of the entrepreneur. We complement their analysis by explicitly considering competition. Axelson (2007) and Garmaise (2007) consider informed competitive investors, but study the case in which the firm can set ex ante the type of contract issued (Axelson (2007)), or the valuation rule used by the entrepreneur (Garmaise (2007)). Our paper takes the view that in early-stage financing, investors decide which contracts to offer. In addition, a distinctive feature of our analysis is that we endogenize what type of investors' competition the entrepreneur prefers to implement. This question is particularly

[2]See Rajan (1992), Sharpe (1990), Thakor (1996), von Thadden (2005), or Hauswald and Marquez (2003) for various models of auctions between informed investors, and Milgrom and Weber (1982) for a general auction setting.

relevant when investors cannot spot easily new investment opportunities.

Our emphasis on the trade-off between exclusive negotiation and competition is also linked to the auction-negotiation trade-off of Bulow and Klemperer (1996). Our analysis shares their result that an auction maximizes the expected monetary revenue of the seller. But in our setting, the entrepreneur also enjoys a private benefit, and therefore sometimes favors exclusive negotiation. An interesting feature of our setting is that when competition is efficient, it is not necessarily preferred by the entrepreneur. This is because the more experienced venture capitalist is able to capture part of the profits. This induces the entrepreneur to prefer exclusive negotiation that increases the probability to obtain financing when private benefits are high. This in turn leads to inefficiently high investment. Hellmann (2007) studies the optimal negotiation process chosen by an entrepreneur to obtain resources, assuming that investors can only be contacted sequentially. We consider instead the trade-off between simultaneous and sequential contacts.

In our model, entrepreneurs can perfectly identify potential financial partners, and their matching with a given partner results from their endogenous choice. Sørensen (2007) and Hong et al (2012) propose alternative models of matching in which better firms are associated with more experienced VCs because both attributes are complement. In their models, entrepreneurial projects' quality is public information and they do not study the asymmetric information bargaining process between VCs and entrepreneurs. Relatedly, Inderst and Mueller (2004) consider a search model according to which the probability to contact a partner depends on a matching technology, and on the relative supply and demand for venture capital. One result of their analysis is that venture capitalists make higher profits when competition is not too intense. This is consistent with our result that profits are higher for a venture capitalist with superior information.

The current paper is also related to the literature on venture capital financing. A major difference is that we focus on venture capitalists' screening role, rather than on their monitoring and valueadded activities.[3] The fact that some venture capitalists are more experienced than others has also been largely documented. Papers have explored how the level of experience of venture capitalists changes their behavior. Bottazzi, Da Rin, and Hellmann (2008, 2009) find that more experienced venture capitalists, and venture capitalists operating in "better" legal systems are more actively involved in their portfolio firms. Experience also affects the decision to syndicate (Lerner (1994), Hopp and Rieder (2011), Casamatta and Haritchabalet (2007), Cestone, Lerner, and White (2007)) or the decision to exit (Gompers (1996)). None of these studies aims at understanding how heterogeneity in experience affects the nature of competition in the industry or the type of financial contract offered by venture capitalists.

3 The model

3.1 Investment project and returns

We consider a standard corporate finance model. An entrepreneur is endowed with a one-period innovative project that entails high potential returns, together with a high level of uncertainty. To capture these features, we make the following assumptions.

Firstly, the project return is risky. The future cash flow $\tilde{R}$ is R^S in case of success, and $R^F < R^S$ in case of failure, with $(R^F, R^S) \in \mathbb{R}^2_+$. Also, the probability of success depends on the quality of the project which can be good (G) or bad (B). Success occurs with probability $p > 0$ if the project is good, and with probability $p' = 0$ if the project is bad.[4] Last, the project requires an initial outlay $I > R^F$.

Secondly, there is some uncertainty regarding the true quality of the project. Initially, all agents share the same prior belief that the project is good, denoted q_0. To fit the situation of early-stage financing, we consider that the project is unprofitable based on prior beliefs. Assuming risk-neutral

[3] See Schmidt (2003), Renucci (2008), Repullo and Suarez (2004), or Casamatta (2003) on the advising role of venture capitalists, and Chan, Siegel and Thakor (1990), Hellmann (1998), Dessì (2005) or Cestone (2006) on the control and monitoring exerted by venture capitalists.

[4] The assumption that $p' = 0$ is used to lighten algebraic expressions without loss of generality.

agents, and normalizing the riskless interest rate to zero, this implies

$$NPV_0 \equiv q_0 p R^S + (1 - q_0 p) R^F - I < 0 < p R^S + (1 - p) R^F - I.$$

The left-hand side states that the project net present value conditional on prior beliefs (denoted NPV_0) is negative, and the right-hand side states that the net present value of the G-type project is positive.

3.2 The venture capital industry

The entrepreneur is cash-poor, and must raise I from investors. Because $NPV_0 < 0$, he cannot raise funds from traditional investors, and turns to venture capitalists. Thanks to their experience at financing early stage ventures, VCs are able to (imperfectly) infer the quality of new projects.[5] We assume that VCs perform investment analyses and observe at no cost a signal related to the project's true quality.[6] This signal can be either high ($s = H$) or low ($s = L$) and its precision depends on venture capitalists' expertise α:

$$Pr(s = H | G, \alpha) \quad = Pr(s = L | B, \alpha) \quad = \alpha,$$

where $\alpha > \frac{1}{2}$. After observing their signal, VCs update their belief on the project quality using Bayes' rule. We denote $q(s_\alpha)$, the posterior probability that the quality of the project is good given that a VC with experience α has observed a signal s, and $NPV(s_\alpha)$ the corresponding net present value, conditional on the signal s.

The industry is heterogeneous, with some experienced VCs of type $\alpha = e$ and some inexperienced VCs of type $\alpha = i < e \leq 1$. This assumption captures realistic features of the industry, where some well-known and reputable venture capital funds compete with newer, less established funds.

[5] There is large empirical evidence that venture capitalists are able to obtain specific information on their portfolio investments: see e.g. Sahlman (1988, 1990), Fenn, Liang and Prowse (1995), Gompers (1995), or Kaplan and Strömberg (2004).

[6] Our analysis is immune to the introduction of costly signals: We discuss this issue in section 7.

We assume that there are two VCs in the economy, one experienced (VC_e) and one inexperienced (VC_i).

We specify now the evolution of the project NPV conditional on signals. Firstly, any VC is sufficiently experienced so that the project NPV becomes positive conditional on observing a high signal. Were this not true, VC screening would be useless. Therefore:

$$NPV(H_e) > NPV(H_i) > 0$$
$$\Leftrightarrow q(H_e)pR^S + (1 - q(H_e)p)R^F - I > q(H_i)pR^S + (1 - q(H_i)p)R^F - I > 0.$$

Secondly, to focus on the most interesting case, we assume that when screening by two VCs generates two opposite signals, the experienced VC's signal determines the sign of the project NPV. Extending the above notations to two signals, this means:

$$\begin{cases} NPV(H_e, L_i) = q(H_e, L_i)pR^S + (1 - q(H_e, L_i)p)R^F - I & > 0 \\ NPV(H_i, L_e) = q(H_i, L_e)pR^S + (1 - q(H_i, L_e)p)R^F - I & < 0. \end{cases}$$

From the investors' point of view, it is therefore optimal to undertake the project if and only if the experienced VC has observed a high signal. Note that in our model, experience only affects venture capitalists' screening ability. It would be plausible to also assume that experience allows venture capitalists to be more actively involved in their portfolio, thereby increasing the value of these new ventures. We discuss in section 7 the consequences of this additional assumption.

3.3 Entrepreneur's utility

The entrepreneur is risk neutral. On top of monetary payments, he enjoys a private benefit B if the project succeeds. This assumption is in line with the literature on entrepreneurship, which considers the satisfaction derived from being an entrepreneur as one of the determinants of entrepreneurship. Blanchflower and Oswald (1992) document from survey data the existence of non pecuniary benefits in entrepreneurship. In a similar spirit, Hamilton (2000) and Moskowitz and

Vissing-Jorgensen (2002) find low monetary returns on entrepreneurial investments, and interpret these results as evidence of the existence of private benefits. In our setting, the private benefit is only enjoyed in case of success. This can reflect a possible "stigma of failure" incurred by entrepreneurs who do not succeed (see Landier (2005)), or equivalently the reputation gains enjoyed by the entrepreneur if the firm goes on.[7] Therefore the utility of the entrepreneur is written

$$\begin{cases} U_E = & R_E^S + B, \quad \text{in case of success,} \\ U_E = & R_E^F, \qquad\quad \text{in case of failure,} \end{cases}$$

where $R_E^{\cdot}$ denotes the entrepreneur's return according to the state of nature. For plausibility, we assume that B is not too large, so that it is optimal to implement the project if and only if VC_e observes a high signal:

$$NPV(H_i, L_e) + q(H_i, L_e)pB < 0.$$

The next two sections detail the extensive form of each game, and analyze the outcome of each negotiation strategy. Throughout the paper, our equilibrium concept is perfect Bayesian equilibrium.

4 Shopping around

Under this strategy, the entrepreneur contacts simultaneously the two VCs, who can offer a menu of contracts to finance the entrepreneur. A financial contract offered by VC_α, with $\alpha \in \{i, e\}$, is denoted $(\mathbb{1}, \gamma_\alpha)$ where $\mathbb{1} = 1$ if I is invested and 0 otherwise, and $\gamma_\alpha = (R_\alpha^F, R_\alpha^S)$ represents VC_α's payoff in the cash flow space (R^F, R^S). We assume that if no investment takes place, the VC cannot have a claim on the final cash flow : any strictly positive payoff implies $\mathbb{1} = 1$. Similarly, the null contract $(0, 0)$ implies $\mathbb{1} = 0$. We drop the indicator when unnecessary to lighten notations.

After receiving offers, the entrepreneur can shop for deals, and show offers to competitors. In turn, each VC has the right to withdraw any offered contract before the entrepreneur's final choice.

[7] Note that results do not change if one assumes that B is obtained also in case of failure.

The assumption of removable offers captures standard industry procedures, whereby VCs propose term sheets that can be used by entrepreneurs to shop around. Such term sheets are typically non binding (i.e. they can be removed). More precisely, the game considered is the following:

1. The two VCs privately observe their signal and make non binding offers, represented by menus C_α of contracts γ_α.
2. The entrepreneur shows (or not) each VC's menu of offers to his competitor.
3. Each VC chooses which offer(s) to maintain.[8]
4. The entrepreneur chooses his preferred remaining offer.

4.1 Preferences and contracts

To solve this game, it is useful to define a VC's maximum bid contract when he observes a high signal, $\hat{\gamma}_\alpha$. It is a contract such that a VC's profit when financing the entrepreneur with probability one (after a high signal) is equal to his reservation payoff. VC_i's reservation payoff is simply zero when not participating. Any contract $\hat{\gamma}_i = (\hat{R}_i^F, \hat{R}_i^S)$ verifies

$$q(H_i)p\hat{R}_i^S, +(1 - q(H_i)p)\hat{R}_i^F - I = 0 \tag{1}$$

$$\text{with} \qquad \hat{R}_i^S \leq R^S \text{ and } \hat{R}_i^F \leq R^F. \tag{2}$$

Conditions (2) reflect the fact that the entrepreneur is cash-poor. Denote Γ_i the set of all contracts $\hat{\gamma}_i$. Because $NPV(H_i) > 0$, Γ_i is not empty.

Proceed as before to determine the set of VC_e's maximum bid contracts. A difference is that VC_e's reservation payoff is not zero because the project has a positive value when VC_e observes a high signal *whatever* VC_i's signal. His reservation payoff, denoted $\underline{\Pi}(VC_e)$, is therefore his profit when

[8] To model in a simple way the fact that VC_α can withdraw all offers, we assume that the set C_α always contains the null contract.

he bids (R^F, R^S) and finances the project only when $s_i = L$:

$$\underline{\Pi}(VC_e) \equiv Pr(L_i|H_e)\left[q(H_e, L_i)pR^S + (1 - q(H_e, L_i)p)R^F - I\right]. \quad (3)$$

Any contract $\hat{\gamma}_e = (\hat{R}_e^F, \hat{R}_e^S)$ verifies

$$q(H_e)p\hat{R}_e^S + (1 - q(H_e)p)\hat{R}_e^F - I = \underline{\Pi}(VC_e) \quad (4)$$

$$\text{with} \qquad \hat{R}_e^S \leq R^S \text{ and } \hat{R}_e^F \leq R^F.$$

Again, we denote Γ_e the set of all contracts $\hat{\gamma}_e$.

The following lemma defines each VC's preferred contract in his competitor's indifference set, when he observes a high signal.

Lemma 1 *When $s_e = H$, VC_e's preferred contract in the set Γ_i is $\hat{\gamma}_i^e = \left(\frac{I - q(H_i)pR^S}{1 - q(H_i)p}\ ,\ R^S\right)$. When $s_i = H$, VC_i's preferred contract in the set Γ_e is $\hat{\gamma}_e^i = \left(R^F\ ,\ \frac{\underline{\Pi}(VC_e) + I - (1 - q(H_e)p)R^F}{q(H_e)p}\right)$.*

Lemma 1 states that, among all contracts in Γ_i, VC_e prefers the contract with the highest payoff in the success state. The reason is that VC_e's signal is more precise than that of VC_i. When he observes a high signal, he is more optimistic than VC_i ($q(H_e) > q(H_i)$). He therefore prefers the contract $\hat{\gamma}_i^e$ that "load" most on the success state.[9] Symmetrically, VC_i is more pessimistic than VC_e, and prefers the contract $\hat{\gamma}_e^i$ with the highest payoff in the failure state.

Similarly, the entrepreneur's preferred contract depends on his belief. If he has no information about the distribution of states, he prefers the contract that pays him R^F in case of failure, among contracts in Γ_i (resp. Γ_e). This is because VC_i (resp. VC_e) is more optimistic about the probability of success than the entrepreneur. If at the opposite, the entrepreneur is more optimistic than VC_i (resp. VC_e), he prefers the contract in Γ_i (resp. Γ_e) that maximizes his payoff in the success state. This happens for instance if the entrepreneur believes that both VCs have observed a high signal.[10]

[9]This contract can entail a negative payoff in the failure state. If negative payoffs are ruled out, for some parameter values, VC_e's preferred contract is to obtain 0 in the failure state, and a positive payoff in the success state.

[10]Therefore, when the entrepreneur has to choose among two contracts, his valuation rule depends on his equilibrium belief.

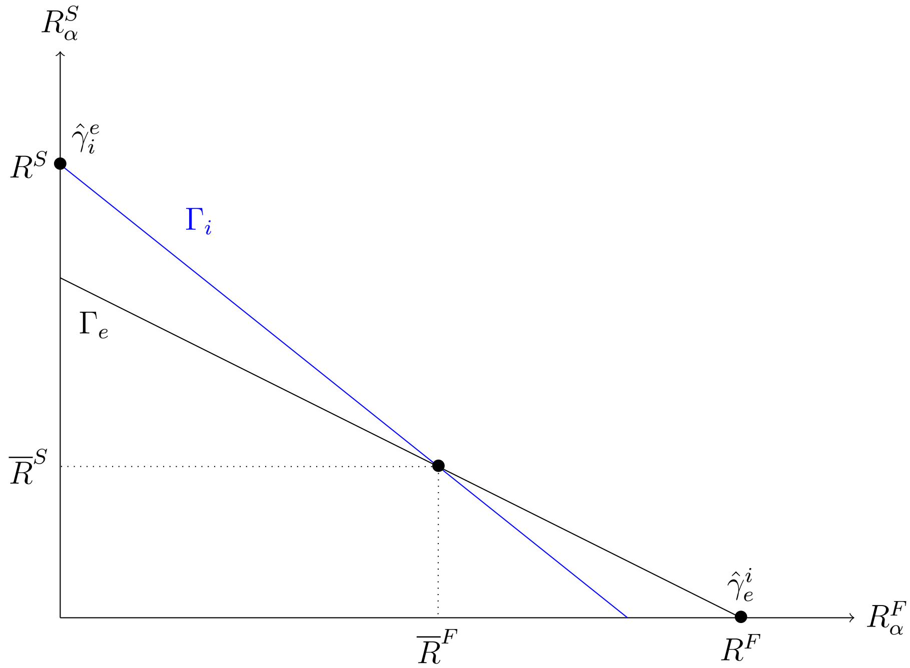

Figure 1: VCs' indifference curves when $\overline{R}^F < R^F$

Figure 1 represents Γ_e and Γ_i in the space (R^F_α, R^S_α). The figure reads as follows. Any contract above Γ_e (resp. Γ_i) grants VC_e (resp. VC_i) a profit greater than his reservation payoff. Also, the relative slopes of Γ_e and Γ_i reflect VC_e's informational advantage. As mentioned earlier, VC_e is more optimistic than VC_i when he observes a high signal. He is therefore willing to pay a lower price to obtain an additional unit of return in the failure state. Last, see that at point $\hat{\gamma}^e_i$, VC_e's expected profit is strictly larger than $\underline{\Pi}(VC_e)$. Therefore, there exists a contract $(\overline{R}^F, \overline{R}^S)$ at the intersection of Γ_i and Γ_e such that each VC obtains his reservation payoff. When this contract is feasible, i.e. when $\overline{R}^F < R^F$, we obtain the symmetric result that VC_i's preferred contract $\hat{\gamma}^i_e$ grants him a strictly positive profit. It is easy to see that the contract $(\overline{R}^F, \overline{R}^S)$ is not feasible if and only if

$$R^F \leq I - \frac{q(H_i)}{q(H_e) - q(H_i)} \underline{\Pi}(VC_e). \tag{5}$$

Condition (5) can be interpreted as follows. If the return that can be pledged to the venture capitalist in the failure state is too small, VC_i suffers from having a less precise signal, and requires a higher return in the success state to maintain a constant (zero) profit. In that case, all contracts in Γ_i

offer VC_e a profit strictly larger than his reservation payoff (i.e. any contract in Γ_i is such that $\hat{R}_i^F \leq \overline{R}^F$). At the opposite, when R^F is large, it is possible to offer contracts granting a large payoff in the failure state to the venture capitalists. These contracts are preferred by VC_i, and provide VC_e a profit strictly smaller than his reservation payoff. This second case is illustrated in Figure 1 by the fact that the Γ_i curve is below the Γ_e curve for contracts satisfying $R_\alpha^F \geq \overline{R}^F$.

4.2 Equilibrium

The following proposition presents pure strategy equilibria of the shopping around game.

Proposition 1 *When condition (5) holds, there exists a pure-strategy equilibrium such that VC_e ultimately maintains the contract $\hat{\gamma}_i^e$ when he observes $s_e = H$, and the null contract when he observes $s_e = L$, and such that VC_i ultimately maintains the null contract whatever his signal. When condition (5) does not hold, there exists a pure-strategy equilibrium such that VC_i ultimately maintains the contract $\hat{\gamma}_e^i$ when he observes $s_e = H$, and the null contract when he observes $s_e = L$, and such that VC_e ultimately maintains (R^F, R^S) when $s_e = H$ and the null contract otherwise.*

Two different financing regimes arise. When R^F is small, the equilibrium is sustained by the following strategies. Whatever the signal observed, VC_i offers the same menu of two contracts: the null contract, and the entrepreneur's preferred contract on Γ_i when he infers two high signals. But on the equilibrium path, VC_i only maintains the null contract. VC_e offers a menu of three contracts: the null contract, his preferred contract on Γ_i ($\hat{\gamma}_i^e$), as well as the entrepreneur's preferred contract on Γ_i. When $s_e = L$, VC_e only maintains the null contract. When $s_e = H$, VC_e only maintains $\hat{\gamma}_i^e$. The intuition for that result is the following. When R^F is small, any contract acceptable for VC_i yields strictly positive profits for VC_e because of his information advantage. VC_i's strategy is therefore to offer his best possible contract to prevent deviations from VC_e. For this threat to be credible, VC_i proposes the entrepreneur's preferred contract in Γ_i, so that VC_i's offer is indeed chosen against any profitable offer by VC_e. This contract is withdrawn at the equilibrium, which allows VC_e to ultimately offer his preferred contract in Γ_i. Symmetrically, to prevent deviations from VC_i, VC_e also offers the entrepreneur's preferred contract in Γ_i: this second contract is withdrawn if VC_e observes no deviation.

This highlights two interesting features of our equilibrium. Firstly, the presence of VC_i forces VC_e to offer a contract that leaves VC_i indifferent between participating or not. This limits the profits that VC_e can extract thanks to his informational advantage. Secondly, since when R^F is small VC_i never finances the entrepreneur at equilibrium, VC_e is able to select his preferred contract among all contracts that make VC_i indifferent. That VC_e is able to offer $\hat{\gamma}_i^e$ is not straightforward, because this contract a priori leaves room for deviations that are profitable both for VC_i and for the entrepreneur. VC_e is able to prevent these deviations by offering a menu of contracts (including his preferred contract and the entrepreneur's preferred contract in Γ_i) thereby forcing VC_i to remove any investment offer. It is worthwhile mentioning that the equilibrium contract is different if VC_e is restricted to offer only one contract (along with the null contract). This point, and the resulting equilibrium, are discussed at the end of the section.

The second financing regime corresponds to the case when R^F is large. The above described equilibrium cannot be sustained anymore because when VC_i offers the entrepreneur's preferred contract in Γ_i, VC_e is better off not offering a competitive bid.[11] VC_i can exploit this situation to increase his expected profit, up to the point at which VC_e is indifferent between participating or not. As a consequence, the equilibrium contract now lies in Γ_e. At the equilibrium, VC_e offers the entrepreneur's preferred contract in Γ_e to prevent deviations from VC_i. When observing no such deviations, VC_e withdraws this offer, and maintains only the monopoly offer (R^F, R^S). The entrepreneur is therefore financed by VC_i when $s_i = H$, and by VC_e when $s_i = L$ and $s_e = H$.

In our equilibria, VCs have different project valuations because they cannot infer their rival's signal before making their decision to maintain an offer. This allows to draw an analogy with Bertrand competition games with asymmetric costs. In these games, the typical equilibrium entails that the low cost firm serves the whole market at a price equal to its competitor's marginal cost. In our model, this translates into the fact that accepted contracts lie on the reservation profit line of the

[11]Recall that in that case, VC_e offers the monopoly contract and finances the entrepreneur when $s_e = H$ and $s_i = L$.

"high cost" venture capitalist.[12] It is well known that other equilibria can arise in this setting, with equilibrium prices strictly lower than the highest marginal cost. This corresponds in our setting to one VC offering a contract that grants him less than his reservation payoff, were this contract chosen at equilibrium. The following corollary states that such equilibria cannot be sustained in our setting.

Corollary 1 *Consider any pure strategy equilibrium such that VCs offer the same menu regardless of their signal. When condition (5) holds, any non null contract offered at equilibrium is on Γ_i. When condition (5) does not hold, any non null contract offered at equilibrium is on Γ_e or is the monopoly contract.*

Corollary 1 characterizes what contracts can be offered when initial offers do not convey information to competitors. See first that the entrepreneur cannot obtain a more favorable contract than those granting VC_i (or VC_e, when (5) does not hold) his reservation payoff. In our setting, a venture capitalist cannot offer a contract below his reservation profit line, because of the two stage structure. Consider the case in which (5) holds. For any such contract to be offered at equilibrium, VC_i must be willing to maintain this contract (at the last stage) if he observes that VC_e deviates. This is clearly not a best response (VC_i makes negative expected profits with contracts below Γ_i), which allows VC_e to deviate in the first place. Therefore the existence of a second decision stage eliminates the dominated strategies these equilibria typically rely upon. Next, because of competition, there cannot be an equilibrium in which the entrepreneur is ultimately financed with a contract that is strictly "above" Γ_i. That is, VC_e cannot earn a profit higher than that provided by $\hat{\gamma}_i^e$ because VC_i would deviate.

[12] When condition (5) does not hold, VC_e's reservation payoff is higher than his profit when competing with VC_i. VC_e then becomes the "high cost" firm.

4.3 Debt or equity offers ?

In order to determine what financial contracts are offered at equilibrium, we need to discuss whether the equilibrium presented in Proposition 1 is unique.[13] When condition (5) holds, it is possible to sustain equilibria in which *any* contract on Γ_i is ultimately offered by VC_e.[14] However, such equilibria rely on the rather unappealing assumption that VC_i has different responses to different contracts offered on his indifference curve. In particular, for a contract $\gamma^* \neq \hat{\gamma}_i^e$ to be offered at equilibrium by VC_e, it has to be the case that VC_i threatens to maintain $\hat{\gamma}_i^E$ following any offer $\gamma \in [\hat{\gamma}_i^e, \gamma^*)$, and to remove it following any offer $\gamma \in [\gamma^*, \hat{\gamma}_i^E]$. If we assume instead that VC_i has the same response to all contracts offered on his indifference curve, only $\hat{\gamma}_i^e$ can be ultimately offered to the entrepreneur. To be able to explore the properties of the equilibrium financial contracts, we maintain this assumption in the remainder of the paper.

Interestingly, the existence of two different financing regimes allows to relate the type of financial contracts traded at equilibrium to the intrinsic characteristics of the entrepreneur's project, as stated in the following corollary.

Corollary 2 *When condition (5) holds, VC_e acquires an equity-like claim. When condition (5) does not hold, VC_i acquires a debt-like claim, and VC_e's claim is indeterminate.*

The proof of corollary 2 is immediate. Recall that when (5) holds, VC_e ultimately offers $\hat{\gamma}_i^e = \left(\frac{I-q(H_i)pR^S}{1-q(H_i)p}\ ,\ R^S\right)$. This contract pays proportionally more in the success state than in the failure state. This implies that it cannot be replicated by a debt, or a convertible debt claim. Instead, it can be replicated by a mix of equity and stock options. For that reason, we loosely refer to it as an equity-like claim. When (5) does not hold, VC_i offers $\hat{\gamma}_e^i = \left(R^F\ ,\ \frac{\underline{\Pi}(VC_e)+I-(1-q(H_e)p)R^F}{q(H_e)p}\right)$, which pays proportionally more in case of failure, and can be replicated by a straight debt contract, but

[13] Note that we do not consider equilibria in which VCs initially offer different menus following different signals: such equilibria would immediately reveal VCs' information to their rival and boil down to symmetric information Bertrand competition, reducing both VCs' expected profit to zero. VCs would then prefer either to coordinate on the equilibria presented in Proposition 1 or to implement a one-stage auction.

[14] When condition (5) does not hold, the only equilibrium contract offered by VC_i is $\hat{\gamma}_e^i$ because this is also the entrepreneur's preferred contract: VC_e cannot threaten to maintain a contract that is strictly preferred by the entrepreneur to $\hat{\gamma}_e^i$.

not by any equity-like claim. Last, when VC_e finances the entrepreneur, he reaps all gains in all states of nature, which can be replicated by a 100% equity contract, or a debt contract with a large repayment. VC_e's claim is then indeterminate.

These equilibrium financial contracts arise because VCs have different levels of experience, and private information. When projects are particularly risky (R^F is small), VC_e is able to exploit his superior information and offers his preferred contract, that pays more in the success state. When projects are less risky (R^F is large), VC_i can offer contracts that pay more in the failure state, which reduces VC_e's informational (and competitive) advantage. Finally, note that outside equity financing naturally emerges from our assumption on the venture capital industry. If all venture capitalists had the same level of experience, they would have the same preferences, and would be indifferent among financial contracts. Other analyses show that investors might prefer to acquire debt or equity according to the type of information they have (Inderst and Mueller (2006) or Habib and Johnsen (2000)). Our model is the first to derive outside debt or outside equity as an equilibrium feature of competition among investors.

4.4 The role of removable offers

Our choice to model competition with removable offers has a double advantage: firstly, it fits well with industry practice whereby term sheets are proposed but can be removed before final agreement. Secondly, it allows to obtain pure strategy equilibria which provide clear-cut results on the type of financial contracts offered at equilibrium. The existence of pure strategy equilibria relies on the same intuition as in Broecker (1990). The ability of VCs to withdraw offers alleviates the winner's curse which sustains pure strategies.[15] If VCs cannot offer menus of removable offers, only mixed strategy equilibria prevail, as analyzed in the literature of auctions between asymmetrically informed bidders.[16]

[15]In a different context of competitive screening, Hellwig (1987) also shows that adding a stage at which applications can be rejected allows to sustain pure strategy pooling equilibria. In Hellwig (1987), the additional stage helps to protect investors against deviations to attract only the best types. In our case, the additional stage helps to protect against the winner's curse.

[16]See Engelbrecht-Wiggans, Milgrom, and Weber (1983), Hauswald and Marquez (2003), or von Thadden (2005).

Another important assumption of our competition game is that VCs can offer menus of contracts. When condition (5) holds, this allows VC_e to ultimately offer his preferred contract in the set Γ_i. This is only possible because VC_e can offer several contracts in his initial menu. If instead VC_e is restricted to offer a single contract (on top of the null contract), he cannot offer $\hat{\gamma}_i^e$ any more because this contract triggers profitable deviations from VC_i. To prevent such deviations, VC_e is bound to offer the entrepreneur's preferred contract in Γ_i, which reduces VC_e's equilibrium profits.

5 Exclusive talks

Suppose now that the entrepreneur can commit to a period of exclusive talks with one VC, denoted VC_1, before trying to generate offers from another VC.[17] We model exclusive talks as the following two-stage bargaining game. In the first stage, the entrepreneur bargains with VC_1. The first stage is divided into an infinite number of time periods t ($t = 0, 1, 2, 3, ...,$). In each time period, the entrepreneur or VC_1 has the opportunity to move to a second stage by approaching the second VC, denoted VC_2. In that case, the "shopping around" game described in section 4 starts.

The timing of the first stage is the following:

1. At $t = 0$, VC_1 makes an offer. The entrepreneur accepts the offer, or terminates exclusivity, or

2. At $t = 1$, the entrepreneur makes a counteroffer. VC_1 accepts the offer, or terminates exclusivity, or

3. At $t = 2$, VC_1 makes an offer, and the game continues as defined at $t = 0$.

The second stage starts if one agent terminates exclusivity. The exclusive talk stage is thus modeled as a standard Rubinstein bargaining game with an option to terminate exclusivity. The original feature of our modeling is that the value of the exit option is endogenous. It depends on the second stage competition between the two VCs. We also assume that there is some cost in delaying

[17]Whether VC_1 is experienced or not depends on the optimal choice of the entrepreneur, and is determined at the end of the section.

negotiation. Precisely, when agents agree on a contract γ_1 at time t during the first stage, the entrepreneur obtains:

$$\beta^t \left(q(H_1)p(R^S - R_1^S + B) + (1 - q(H_1)p)(R^F - R_1^F) \right)$$

where $\beta < 1$ reflects entrepreneur's impatience.[18]

If one agent opts out at time t, the two agents obtain their outside option, i.e. their payoff in the shopping around stage. The key element to define these payoffs, and thus the issue of the exclusive talks period, is the belief that VC_2 assigns to the event that VC_1 has received a high signal when the game gets to the second stage. We assume that the entrepreneur cannot prove to VC_2 that he received a binding offer.[19] Thus VC_2 faces an inference problem: He can be approached either because the first venture capitalist observed a low signal or because exclusive negotiation breaks down. Denote δ the probability that VC_2 assigns to the event that exclusive negotiation breaks down. When $\delta = 1$, VC_2's initial belief about the project quality is equal to q_0, as in the shopping around game. When $\delta < 1$, VC_2 is a priori more pessimistic about the project quality: being contacted after a period of exclusive talks is in itself a negative signal. This modifies VC_2's equilibrium strategy and in turn, the entrepreneur's and VC_1's outside option payoffs. The next propositions characterize admissible equilibria.

Proposition 2 *There exists an equilibrium such that VC_1 makes an offer when $s_1 = H$ and no offer when $s_1 = L$, $\delta^* = 0$ and $\gamma_1^* = (R^F, R^S)$.*

When $\delta = 0$, an agreement with VC_1 occurs at $t = 0$ and exclusive negotiation succeeds. VC_2 believes that he is approached only when VC_1 has received a low signal, and that he faces no competing bid if he makes an offer. As a consequence, if VC_2 is VC_e, his best response is to offer $\gamma_e = (R^F, R^S)$ (monopoly offer), and if VC_2 is VC_i, his best response is to offer the null contract,

[18] Impatience ensures that the decision to accept an offer or to terminate exclusivity is taken at t=0 or t=1 of the first stage. Results do not change if VC_1 is also impatient.

[19] We solve the game under the assumption that VC_1 makes binding offers in the first stage, which cannot be transmitted to a competitor. Alternatively, we could assume that VC_1 always includes the null offer along with an investment offer at the exclusive talks stage. In that case, receiving an offer does not in itself convey information on VC_1's signal.

i.e. $\gamma_i = (0, 0)$. Because of VC_2's best response, VC_1 can capture the project NPV at the second stage. The outside option of the entrepreneur at $t = 0$ reduces to $\beta q(H_1)pB$ and the outside option of VC_1 is $NPV(H_1)$. In other words, the entrepreneur and VC_1's outside options are their *off the equilibrium path* payoffs given VC_2's belief that he is contacted only if $s_1 = L$. At the first stage, the entrepreneur and VC_1 both agree on a partition that leaves them at least their outside option.

Proposition 3 *There is no equilibrium such that VC_1 makes an offer when $s_1 = H$ and no offer when $s_1 = L$, and such that the entrepreneur terminates exclusivity with positive probability.*

When $\delta > 0$, VC_2 believes that exclusive negotiation breaks down at $t = 0$ with positive probability. An equilibrium with $\delta > 0$ can only exist if the second signal is valuable enough so that the surplus shared between VC_1 and the entrepreneur is larger at the second stage than at the first stage. Intuitively, this can only happen if VC_2 is VC_e. But, as illustrated in proposition 1, VC_e is able to capture part of the project surplus thanks to his informational advantage. We show in the appendix that, because of VC_e's market power, the entrepreneur and VC_1 always have an incentive to negotiate at the first stage. For that reason, exclusive negotiation never fails in our setting, and equilibria with $\delta > 0$ cannot be sustained.

Propositions 2 and 3 focus on separating equilibria (i.e. such that VC_1 makes a different offer when $s_1 = H$ and when $s_1 = L$). It is useful to discuss whether pooling equilibria can also be sustained. Observe first that, given that the project initial NPV is negative, such equilibria cannot be sustained if first stage negotiation succeeds with positive probability. We must therefore have $\delta = 1$ in which case the game boils down to the shopping around game. For that reason, we consider that these equilibria do not arise with exclusive talks.

Corollary 3 *If the entrepreneur decides to initiate exclusive talks, he always approaches VC_i first.*

The intuition of corollary 3 is straightforward. The entrepreneur's expected utility under negotiation is simply his expected private benefit, which is maximized when he contacts VC_i first, keeping a chance to be financed by VC_e later if $s_i = L$.[20]

[20]This result holds when the entrepreneur's expected private benefit does not depend on the VCs level of experience. Section 7 discusses how this result changes if VCs can add value to the venture.

6 Equilibrium negotiation strategy and empirical predictions

We first analyze which negotiation strategy is chosen by the entrepreneur in equilibrium. To do this, we compare the entrepreneur's expected utility in both games, and obtain the following proposition.

Proposition 4 *The entrepreneur prefers to shop around if condition (5) does not hold, or if the level of private benefit B is not too large in the sense that:*

$$pB \leq \frac{Pr(H_e)(1-q(H_e)p)\frac{NPV(H_i)}{1-q(H_i)p}}{Pr(H_i)q(H_i) - Pr(H_e)q(H_e) + \beta Pr(L_i, H_e)q(L_i, H_e)}. \tag{6}$$

Otherwise, the entrepreneur prefers to engage in exclusive talks.

Proposition 4 implies that when the entrepreneur values mostly monetary profits, he prefers to shop around. The value of funded projects is larger, and the entrepreneur captures a large part of it thanks to competition. When the entrepreneur's private benefit becomes large, the entrepreneur cares more about the probability to obtain funding.[21] When projects are riskier, that is when they have a lower cash flow R^F, and therefore a higher variance (condition (5) holds), opting for exclusive talks guarantees that the entrepreneur is financed either when VC_i has a high signal, or when VC_e does. If he chooses instead to shop around, he only obtains financing when VC_e has a high signal. He then prefers exclusive talks.[22] When projects are less risky (in the sense that condition (5) does not hold), the entrepreneur has the same probability to obtain financing with the two negotiation strategies. He therefore prefers the one that gives him a higher monetary profit and always chooses to shop around. The following corollary explores the efficiency of the resulting investment.

Corollary 4 *When conditions (5) and (6) hold, investment is efficient. Otherwise there is overinvestment.*

[21] Note that the same effect arises if B is always obtained upon financing, rather than only in case of success. In that case, condition (6) becomes more restrictive and the entrepreneur chooses exclusive negotiation more often.

[22] This result arises because the entrepreneur cannot capture the project NPV when shopping around. Simple computations show that if this was the case, the entrepreneur would never engage in exclusive talks.

Corollary 4 is immediate. When either (5) or (6) does not hold, VC_i finances the entrepreneur with positive probability, while it is efficient to finance projects if and only if $s_e = H$.

Our analysis helps to shed new light on the determinants of VCs' deals with entrepreneurs. In particular, we can derive new empirical predictions relating entrepreneurs' private benefit and project characteristics to VCs' portfolio attributes and equilibrium deals. We detail below these predictions, confront them to existing evidence and provide additional tests of our theoretical framework.

6.1 Predictions on VCs' portfolio characteristics

A first insight of our model is that VCs' deal flow (i.e. the number of investment offers they receive) results from the optimally chosen negotiation strategy of entrepreneurs. Our model predicts that the level of deal flow varies with the experience of VCs, the type of entrepreneurial projects, and the level of private benefit of entrepreneurs. We are not aware of empirical studies on VCs' deal flow, but our theory is consistent with the following empirical hypotheses: if one considers a population of entrepreneurs distributed according to their level of private benefit and project risk, an implication of the model is that inexperienced VCs should have a higher deal flow (controlling for fund size, strategy and specialization). Also, inexperienced VCs should attract more entrepreneurs with riskier projects and higher private benefits than experienced VCs. To test this second hypothesis, the empirical challenge is to measure the level of private benefit of entrepreneurs. One possibility is to interpret private benefits as future reputation gains if the venture succeeds. Success makes entrepreneurs more visible, increases their perceived talent, and expands the set of future job opportunities.[23] Reputation gains (and private benefits) are thus likely to be higher for young entrepreneurs with no track record or media coverage.

We can also derive predictions regarding the type of financial contract offered to entrepreneurs. Firstly, VCs are more likely to finance entrepreneurs with debt-like claims when projects are less risky (i.e. have a higher liquidation value, which corresponds to R^F in the model) and when VCs are less experienced. Conversely, VCs are more likely to finance projects with equity-like claims

[23] Falato, Li, and Milbourn (2012) document that CEO pay includes a talent premium.

when projects are riskier and VCs are more experienced. Importantly, the prediction on financial contracts issued at equilibrium results from the combination of the level of risk of projects and the level of experience of VCs. In particular, the model does *not* predict that less experienced VCs are more likely to acquire debt-like claims to finance risky projects. Last, entrepreneurs with lower private benefits should issue more equity-like claims. These predictions are partially supported by empirical evidence. For instance, Kaplan and Stromberg (2003, 2004) do find that serial entrepreneurs are more likely to obtain liquidation rights, and have less performance-sensitive equity stakes, which is consistent with our prediction regarding low private benefit entrepreneurs. The novelty of our analysis is to offer more precise predictions relating different VCs and entrepreneurs' attributes. The joint consideration of these attributes has, to our knowledge, not been tested so far.

6.2 Predictions on entrepreneurs' financing deals

A result of the model is that high private benefit entrepreneurs are more likely to engage in exclusive negotiation, to contact less experienced VCs, and to receive only one offer. Therefore, we expect first-time entrepreneurs to receive less offers on average than serial entrepreneurs, holding project risk constant. Another result of the model is that single offers are more likely to come from less experienced VCs.[24] This second prediction is consistent with the empirical observations of Hsu (2004): the average level of experience of VCs is significantly lower when entrepreneurs receive a single offer, compared to when they receive several offers. Whether this effect prevails for high benefit entrepreneurs has not been tested.

We can also relate the average level of experience of VCs to projects' characteristics. When projects are riskier (i.e. R^F is smaller), the entrepreneur is more likely to be financed by VC_e.[25]

Last, at the exclusive negotiations equilibrium, VCs capture all monetary profits. This implies that

[24]While the first prediction could also arise in a simple model in which first-time entrepreneurs have a priori a lower probability of a good project, and therefore a lower probability to generate a high signal, the second prediction cannot emerge in such a setting.

[25]More precisely, when B is large, project risk does not affect the expected level of experience of VCs financing the entrepreneur. But when B is low, riskier projects are more likely to be financed by experienced VCs.

pre-money valuations should be lower when entrepreneurs engage in exclusive talks, and receive only one offer at a time. This effect is documented by Hsu (2004) who finds that pre-money valuations are significantly lower in single offer deals than in multiple offer deals. The interest of our analysis is to explain why entrepreneurs optimally choose to relinquish bargaining power to VCs.

7 Robustness

In our model, we highlight the screening role of VCs by assuming that they have a costless information generation technology. In reality, information acquisition is costly, which may refrain VCs from engaging in investment analyses when their prospects of financing a deal are low. This effect can arise in our model. If we introduce costly signals, we cannot sustain equilibria in which one VC has a zero probability to finance the entrepreneur's project (because he cannot recoup the cost of his signal). In that case the equilibrium of the shopping around game is modified as follows: when condition (5) holds, the equilibrium is in mixed strategy only (see Milgrom and Weber (1983), von Thadden (2004) or Hauswald and Marquez (2003)) and is such that VC_i provides financing with positive probability. In this equilibrium, both VCs make positive profits, and a costly signal does not impede their participation. Considering costly signals does not affect our other results since in all other equilibria, both VCs make positive profits.

Consider next the case in which VCs have to exert effort to improve the quality of their signal. If effort is continuous, then the first best levels of effort maximize total project surplus. With private information, the efficiency of the investment decision is less clearcut. In the shopping around game, VC_e is not able to capture all profit, and underinvests in information acquisition. In the exclusive talks game, VC_i captures all surplus, and may overinvest in information acquisition (because he is less experienced).

Also, considering that VCs can add value to the project after financing is realized can alter some of the results. In particular, in the exclusive talks game, the entrepreneur is less willing to approach VC_i first if we assume that VCs' experience increases the level of private benefit of the entrepreneur[26] or the probability of success of the venture. In turn, the entrepreneur is less likely to engage in exclusive talks.

8 Conclusion

In this paper, we investigate how competition takes place in the venture capital industry, resulting from entrepreneurs' negotiation strategy. We consider a model whereby a cash-poor entrepreneur decides whether to propose his project to two VCs at the same time or to initiate exclusive negotiation with one VC first. The two VCs extract private information on the true value of the project, but have different signal precisions. In addition, the entrepreneur enjoys non monetary benefits when his project succeeds. When deciding his optimal negotiation strategy, he cares about expected monetary profits, and about the probability to get funded.

A first insight of the model is that because of asymmetric information among VCs, the latter can capture positive profits even if the entrepreneur approaches both at the same time. In that case, he can be financed by the more or the less experienced VC, depending on the level of risk of the project. In particular, riskier projects can only be financed by experienced VCs. Also, because they have different assessments of the projects, VCs have different preferences over which financial contracts to acquire: the experienced VC is more likely to buy equity, while the inexperienced VC prefers to acquire debt, retaining then more liquidation rights. Last, because of imperfect competition, the entrepreneur may prefer to commit to exclusive talks to increase the probability to obtain financing. This occurs when his private benefit is high.

The optimal negotiation strategy thus depends on the entrepreneur's private benefit and project's risk. The model predicts that more experienced VCs are more likely to finance riskier projects with equity-like claims. Also, high private benefit entrepreneurs are more likely to receive a single offer and to be financed by less experienced VCs.

[26] For instance, more experienced VCs can more easily introduce new partners in the future, thereby increasing the continuation value of the venture, as suggested in Hsu (2004).

Appendix

Proof of Lemma 1

Any contract $\hat{\gamma}_i^e = (R_e^F, R_e^S)$ in Γ_i verifies

$$\begin{aligned} \max_{R_e^F, R_e^S} \quad & q(H_e)pR_e^S + (1-q(H_e)p)R_e^F \\ \text{s.t.} \quad & R_e^F = \frac{I - q(H_i)pR_e^S}{1-q(H_i)p} \\ & R_e^S \leq R^S. \end{aligned} \tag{7}$$

Equation (7) together with $R_e^S \leq R^S$ ensures that $R_e^F \leq R^F$ since $NPV(H_i) \geq 0$. The above maximization programme rewrites

$$\begin{aligned} \max_{R_e^S} \quad & \frac{(q(H_e)-q(H_i))p}{1-q(H_i)p}(R_e^S - I) \\ & R_e^S \leq R^S. \end{aligned}$$

Since $q(H_e) > q(H_i)$, we obtain $\hat{\gamma}_i^e = \left(\frac{I-q(H_i)pR^S}{1-q(H_i)p}\ ,\ R^S\right)$. The contract $\hat{\gamma}_e^i$ is computed straightforwardly using the same procedure.

□

Proof of proposition 1

A strategy profile for VC_α is a menu C_α contingent on s_α, and a decision to maintain an offer γ_α in C_α contingent on s_α, and on his competitor's menu $C_{-\alpha}$. By assumption, $(0,0) \in C_\alpha$.

Our equilibrium concept is Perfect Bayesian Equilibrium.

Let us solve the game backwards and determine the decision to maintain an offer. Observe first that it is a dominant strategy for any VC_α to maintain $(0,0)$ after $s_\alpha = L$. Since $NPV(H_i, L_e) < 0$, VC_e optimally chooses $(0,0)$ when $s_e = L$. Anticipating this, it is a dominant strategy for VC_i to choose $(0,0)$ when $s_i = L$. Therefore agents' equilibrium belief is that VC_α observes $s_\alpha = H$ if $\gamma_\alpha \neq (0,0)$ is maintained.

Next, define $\mathcal{A}_i = \{\gamma_i \in [0, R^F] \times [0, R^S] : q(H_i)pR_i^S + (1 - q(H_i)p)R_i^F > 0\}$ and $\mathcal{A}_{-i}$ its complement. $\mathcal{A}_i$ represents the set of all contracts that VC_i strictly prefers to any contract in Γ_i when $s_i = H$, if $\gamma_i \in \mathcal{A}_i$ is accepted with probability one. Define equivalently $\mathcal{A}_e = \{\gamma_e \in [0, R^F] \times [0, R^S] : q(H_e)pR_e^S + (1 - q(H_e)p)R_e^F > \underline{\Pi}(VC_e)\}$ and $\mathcal{A}_{-e}$ its complement.

1) Assume first that condition (5) holds, and define $\hat{\gamma}_i^E = (R^F, \frac{I-(1-q(H_i)p)R^F}{pq(H_i)}) \in \Gamma_i$. The contract $\hat{\gamma}_i^E$ maximizes the entrepreneur's utility in Γ_i when he believes that $s_i = s_e = H$.[27]

Consider the following strategies.

- VC_e offers $C_e^*(s_e = H) = C_e^*(s_e = L) = \{(0,0); \hat{\gamma}_i^e; \hat{\gamma}_i^E\} \equiv C_e^*$, VC_i offers $C_i^*(s_i = H) = C_i^*(s_i = L) = \{(0,0); \hat{\gamma}_i^E\} \equiv C_i^*$ and the entrepreneur shows all offers.
- If $s_\alpha = L$, VC_α maintains $(0,0)$, $\forall \alpha \in \{e, i\}$.
- If $s_e = H$, VC_e maintains $\hat{\gamma}_i^e$ if $C_i = C_i^*$.
- If $s_i = H$, VC_i maintains $(0,0)$ if $C_e = C_e^*$.

We now show that these are equilibrium strategies. From our initial remark, any VC_α maintains $(0,0)$ when $s_\alpha = L$.

When $s_i = H$, if VC_i observes C_e^*, he is indifferent between maintaining $(0,0)$ and $\hat{\gamma}_i^E$ (given VC_e's equilibrium strategy to maintain $\hat{\gamma}_i^e$ if $s_e = H$). We therefore postulate that, on the equilibrium path, VC_i removes his offer.[28] Consider next VC_i's deviation $\gamma_i \in \mathcal{A}_i$, such that the entrepreneur strictly prefers γ_i to $\hat{\gamma}_i^e$ when he believes that $s_i = s_e = H$. Following this deviation, VC_e optimally maintains $\hat{\gamma}_i^E$, which is preferred by the entrepreneur to any contract $\gamma_i \in \mathcal{A}_i$. The deviation γ_i is then only accepted when $s_e = L$, yielding negative expected profits for VC_i.

Last, when $s_e = H$, VC_e cannot profitably deviate either. First, given lemma 1, $\hat{\gamma}_i^e$ maximizes VC_e's expected profit in C_e^*. Consider next a profitable deviation γ_e by VC_e. We necessarily have that $\gamma_e \in \mathcal{A}_i$. Following such a deviation, VC_i optimally maintains $\hat{\gamma}_i^E$.

2) Assume next that condition (5) does not hold. Observe that $\hat{\gamma}_e^i$ defined in lemma 1 is also the entrepreneur's preferred contract in Γ_e when he believes that $s_i = s_e = H$. Consider the following strategies.

[27] The entrepreneur is then very optimistic about the probability of success, and prefers contracts that pay more in the success state, i.e. that gives all revenue in state R^F to the VC.

[28] This is the standard assumption in asymmetric cost competition games: the high cost firm does not sell at equilibrium if the price is equal to its marginal cost.

- VC_e offers $C_e^* = \{(0,0); (R^F, R^S); \hat{\gamma}_e^i\}$, VC_i offers $C_i^* = \{(0,0); \hat{\gamma}_e^i\}$ and the entrepreneur shows all offers.

- If $s_\alpha = L$, VC_α maintains $(0,0)$, $\forall \alpha \in \{e, i\}$.

- If $s_e = H$, VC_e maintains (R^F, R^S) if $C_i = C_i^*$.

- If $s_i = H$, VC_i maintains $\hat{\gamma}_e^i$ if $C_e = C_e^*$.

Following the same argument as before, when $s_e = H$, if VC_e observes C_i^*, he weakly prefers to maintain (R^F, R^S).[29] In addition, VC_e cannot profitably deviate from C_e^* if he anticipates C_i^*. Indeed, VC_i maintains $\hat{\gamma}_e^i$ when $s_i = H$, which is preferred by the entrepreneur to any contract $\gamma_e \in \mathcal{A}_e$, given the entrepreneur's equilibrium belief that non null contracts are only maintained after high signals. Therefore, any deviation from VC_e in $\mathcal{A}_e$ is only accepted when $s_i = L$, which reduces VC_e's expected profit.

When $s_i = H$, VC_i cannot profitably deviate either. Choosing $\hat{\gamma}_i^e$ in the menu C_i^* maximizes VC_i's expected profit given lemma 1. Also, following any profitable deviation by VC_i, VC_e optimally maintains $\hat{\gamma}_e^i$.

□

Proof of corollary 1

Suppose (5) holds. Consider an equilibrium in which C_e includes $\gamma_e \in \{\mathcal{A}_{-i} - \Gamma_i\} \cap \mathcal{A}_e$. We show that an equilibrium such that γ_e is ultimately offered by VC_e cannot be sustained. Consider VC_e's deviation C_e' that includes $\gamma_e' = \gamma_e + \epsilon$, with ϵ small enough so that $\gamma_e' \in \{\mathcal{A}_{-i} - \Gamma_i\}$. To prevent this deviation, VC_i must offer γ_e in his menu, and maintain it following C_e'. The entrepreneur's choice is then to accept γ_e, which yields negative expected profits for VC_i. Therefore, $\gamma_e \in \{\mathcal{A}_{-i} - \Gamma_i\} \cap \mathcal{A}_e$ cannot be offered at equilibrium. Trivially, an equilibrium in which C_e includes $\gamma_e \in \mathcal{A}_i$ along with contracts in Γ_i cannot be sustained. Indeed, γ_e is preferred by VC_e if VC_i maintains $(0,0)$, which induces VC_i to deviate.

The same argument applies when condition (5) does not hold.

□

[29]Precisely, he strictly prefers to maintain (R^F, R^S) if his offer is not always chosen when both VCs maintain $\hat{\gamma}_e^i$. If his offer is always chosen, he is indifferent between maintaining (R^F, R^S) and $\hat{\gamma}_e^i$.

Proof of proposition 2

Consider the equilibrium candidate in which $\delta = 0$ and VC_1, whatever his level of experience, plays $\gamma_1 = \emptyset$ if $s_1 = L$, and $\gamma_1 = 0$ if $s_1 = H$.

We know from the Rubinstein's model (see for instance Muthoo (1999)) that in the presence of outside options, there exists a unique subgame perfect equilibrium (SPE) in which agreement is reached at time 0. In equilibrium, the negotiations do not break down in disagreement and players do not take up their outside option, which implies $\delta = 0$. However, the presence of outside options do influence the equilibrium partition: each player cannot obtain more than his outside option at the negotiation stage. Also, the SPE does not depend on which player makes the first offer at time 0.

Let us now determine the outside option payoffs when $\delta = 0$: VC_2 believes that any offer by VC_1 is accepted by the entrepreneur. If VC_2 is contacted at the second stage of the game, his equilibrium belief is thus that $s_1 = L$. Given his belief, he plays $\gamma_2 = (0, 0)$ if $s_2 = L$, and, if $s_2 = H$, he plays $\gamma_2 = (0, 0)$ if VC_2 is VC_i, or $\gamma_2 = (R^F, R^S)$ if he is VC_e. At the second stage, VC_1's optimal response is to undercut VC_2, offering for instance $\gamma_1 = (R^F, R^S - \epsilon)$ (if he is VC_i) or (R^F, R^S) (if he is VC_e). The outside option payoff of the entrepreneur then reduces to $\beta q(H_1)pB$ (if VC_1 is VC_e) or $\beta q(H_1)p(B+\epsilon)$ (if VC_1 is VC_i). VC_1 obtains $NPV(H_1)$ if he is VC_e and $NPV(H_1) - q(H_1)p\epsilon$ if he is VC_i.

The unique SPE share obtained by VC_1 converges to $NPV(H_1)$ and the entrepreneur only obtains his private benefit $q(H_1)pB$. At equilibrium, this translates into $\gamma_1 = (R^F, R^S)$.

□

Proof of proposition 3

Consider the equilibrium candidate in which $\delta > 0$ and VC_1 offers $\gamma_1 = (0, 0)$ if $s_1 = L$ and $\gamma_1 > 0$ if $s_1 = H$.

A necessary condition to sustain an equilibrium with $\delta > 0$ is that it is an equilibrium strategy to reject any profitable offer, i.e. any offer that gives the other party at least its outside option payoff. A necessary condition is thus that the joint surplus that the entrepreneur and VC_1 can share at the exclusive negotiation stage is smaller than their joint surplus if the second stage occurs. Were this not true, one party could make an offer such that she is indifferent between having her offer accepted or rejected. Then the other party would always prefer to accept the offer. We show below that this necessary condition cannot be satisfied.

1) Assume that the entrepreneur contacts VC_e first. The set of maximum bid contracts Γ_i now depends on δ. The higher δ, the more confident VC_i is about the project quality and about the occurrence of state R^S. Denote $q(H_i, \delta)$ the probability that the quality of the project is good given that VC_i has observed a high signal and given VC_i's belief δ, and $NPV(H_i, \delta)$ the corresponding project value. Since $NPV(H_i, 0) < 0$ and $NPV(H_i, 1) = NPV(H_i) > 0$, there exists $\hat{\delta}$ such that $NPV(H_i, \hat{\delta}) = 0$.

Clearly, any equilibrium such that $\delta > 0$ is such that $\delta \geq \hat{\delta}$ (otherwise, VC_i cannot make an offer, and there is no point in terminating exclusivity). Define $\Gamma_i(\delta)$ and $(\overline{R}^F(\delta), \overline{R}^S(\delta))$ the intersection of Γ_e and $\Gamma_i(\delta)$. We know from Proposition 1 that if $R^F \leq \overline{R}^F(\delta)$, the equilibrium of the shopping game is such that VC_e finances the entrepreneur if and only if $s_e = H$. The surplus that the entrepreneur and VC_e can share at the second stage is thus strictly smaller than $NPV(H_e) + q(H_e)pB$ because of the entrepreneur's impatience. This implies that VC_e can always propose γ_e such that he and the entrepreneur are both better off negotiating than going to the second stage. If $R^F > \overline{R}^F(\delta)$, the second period equilibrium is such that VC_i finances the entrepreneur if $s_i = H$ and VC_e finances the entrepreneur otherwise. Because a rent must be left to VC_i in this case, the joint surplus of the entrepreneur and VC_e is strictly smaller than in the case in which $R^F \leq \overline{R}^F(\delta)$, and the above reasoning goes through. The equilibrium candidate in which $\delta > \hat{\delta}$ does not exist.

2) Assume next that the entrepreneur contacts VC_i first. Their first stage surplus is: $NPV(H_i) + q(H_i)pB$. Define $\Gamma_e(\delta)$ the set of contracts such that VC_e is indifferent between offering a competitive bid, and offering the monopoly contract. Define now $\overline{R}^F(\delta)$ as the intersection of $\Gamma_e(\delta)$ and Γ_i. If $R^F \leq \overline{R}^F(\delta)$, we know from Proposition 1 that VC_e offers $\hat{\gamma}_i^e = \left(\frac{I - q(H_i)pR^S}{1 - q(H_i)p}, R^S\right)$ and finances the entrepreneur if and only if $s_e = H$. The second stage expected surplus of the entrepreneur and VC_i is thus

$$
\begin{aligned}
& \beta Pr(H_e|H_i)\left(q(H_e, H_i)p(R^S - R^S + B) + (1 - q(H_e, H_i)p)(R^F - \frac{I - q(H_i)pR^S}{1 - q(H_i)p})\right) \\
= \quad & \beta Pr(H_e|H_i)\left(q(H_e, H_i)pB + \frac{1 - q(H_e, H_i)p}{1 - q(H_i)p} NPV(H_i)\right) \\
< \quad & NPV(H_i) + q(H_i)pB.
\end{aligned}
$$

The equilibrium candidate in which $\delta > 0$ and $\hat{\gamma}_i \leq \hat{\gamma}_e(\delta)$ does not exist when $R^F \leq \overline{R}^F(\delta)$.

If $R^F > \overline{R}^F(\delta)$, we know from Proposition 1 that VC_i offers $\hat{\gamma}_e^i(\delta)$ and finances the entrepreneur with probability one (since $s_i = H$). The surplus that the entrepreneur and VC_i can share is thus the same at the two stages (and equal to $NPV(H_i) + q(H_i)pB$). Given the entrepreneur's impatience, they prefer to negotiate at the first stage, and no equilibrium with $\delta > 0$ exists.

□

Proof of corollary 3

If the entrepreneur approaches VC_i first, he is financed with probability $Pr(H_i) + Pr(H_e, L_i)$ while he is financed with probability $Pr(H_e)$ if he approaches VC_e first. See that:

$$Pr(H_i)q(H_i)+\beta Pr(H_e, L_i)q(H_e, L_i) = \beta Pr(H_e)q(H_e)+Pr(H_i, L_e)q(H_i, L_e)+(1-\beta)Pr(H_e, H_i)q(H_e, H_i)$$

which is larger than $Pr(H_e)q(H_e)$ if β is not too small, which we assume. Then, the entrepreneur contacts VC_i first.

□

Proof of proposition 4

When condition 5 holds, the entrepreneur's expected utility from shopping around is:

$$Pr(H_e)\left(q(H_e)pB + (1 - q(H_e)p)\frac{NPV(H_i)}{1 - q(H_i)p}\right) \tag{8}$$

When he initiates exclusive talks, he obtains:

$$Pr(H_i)q(H_i)pB + \beta Pr(L_i, H_e)q(L_i, H_e)pB. \tag{9}$$

Using equations (8) and (9), it follows that the entrepreneur prefers exclusive negotiation iff:

$$pB \geq \frac{Pr(H_e)(1 - q(H_e)p)\frac{NPV(H_i)}{1-q(H_i)p}}{Pr(H_i)q(H_i) - Pr(H_e)q(H_e) + \beta Pr(L_i, H_e)q(L_i, H_e)}. \tag{10}$$

□

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