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Specialist versus generalist investors: Trading off support quality, investment horizon and control rights☆

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ABSTRACT

We model an entrepreneur's selection of either an active (specialist) or a passive (generalist) investor for an innovative venture that requires external equity for startup and expansion financing. We assume that the specialist investor provides better support but has a shorter investment horizon than the generalist. We particularly focus on the entrepreneur's net present value (NPV)-maximizing contract, taking into account the specialist's potential moral hazard. This latter might try selling his claim in a secondary transaction to an uninformed outside investor, even though the project is unsuccessful and should be abandoned. We show that the entrepreneur may trade off crucial contract parameters when seeking external financing. Either type of investor may be preferable, contingent on the allocation of control rights, the investor's support quality and investment horizon, the chances of success, and the venture's expected liquidation value.

Chris Myers, CEO of BodeTree:

"There are two types of investment capital out there: dumb money and smart money. Dumb money isn't meant to be a pejorative term. Instead, it simply refers to the type of investment capital that isn't necessarily industry-specific. With dumb money, investors are betting on the track record, personality, and experience of the entrepreneur, without taking into consideration special knowledge of the industry the business is operating in. Early-stage friends and family rounds generally fall into this category [...] Smart money, on the other hand [...] represents the kind of capital that also brings unique industry knowledge and experience to the table [...] For entrepreneurs, these smart money investors are incredibly valuable, because they bring a specific and often seasoned insight to your operations."[1]

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[1] https://www.forbes.com/sites/chrismyers/2015/09/10/three-things-to-look-for-in-a-venture-capital-firm/#28f0a72b50d0.

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1. Introduction

If an entrepreneur requires outside financing for an innovative startup, she can choose between various sources of capital, including friends and family, banks, public subsidies, crowd funding, business angels, or professional venture capital firms. All of these alternatives differ with respect to the typical financing volumes, terms, duration, cost for the entrepreneur, and support provided by the financier during the relationship. We can assume that friends and family, public investors, banks, or "the crowd" are relatively passive and generalist investors who do not take a substantial role in supporting and controlling the venture, unlike venture capitalists or business angels. The latter two are usually strongly involved in supporting and monitoring their investees. They have particular investment skills and experience and are often deemed to be "active investors" (e.g., Cumming, 2006). Although both types of investors are similar with respect to their investment behavior, business angels tend to invest in smaller companies than venture capitalists, and in an international comparison, their activity is more strongly determined by socio economic and cultural characteristics (Cumming and Zhang, 2017). Nevertheless, both types of investors' contributions and specialized knowledge can be powerful encouragements to entrepreneurs and may help in achieving important milestones. However, these advantages come at a cost: specialized investors – but notably venture capitalists – might have shorter investment horizons than the generalists. They are inclined to divest prematurely, mainly because of two reasons.

The first reason is given by the organizational form of venture capital funds. Most commonly they are structured as limited partnerships where institutional investors, i.e. the limited partners, contribute capital to these partnerships, which are managed by venture capitalists (the general partners). Although the limited partners are usually long-term investors, as discussed in Lerner and Schoar (2004), the partnerships have an average term of ten years after which they are liquidated. Their lifetime is split into two sequences: the investment and harvesting periods. The funds' charters rule out add-on investments when the latter period is reached and it is the venture capitalists' task to divest the portfolio of existing assets. If the investee firms are not sufficiently mature and if it is not possible to pursue traditional divestments via an IPO or Trade Sale, then the partnerships' assets need to be sold in so-called secondary transactions to other investors or transferred to a trustee that will wind up the partnership at some future stage. Alternatively, the assets can be directly passed over to the limited partners. Conversely, institutional investors usually have no interest in holding shares in non-quoted companies and therefore prefer secondary transactions. The limited partnership structure has certain advantages as discussed by Gorman and Sahlman (1989), Sahlman (1990), Gompers and Lerner (1996 and 1999), and Kaplan and Strömberg (2003 and 2004), for example. In principle, the term is one of these advantages because it induces performance incentives. Nevertheless, it also imposes a strong disadvantage: the limited lifetime creates a hazard when the venture is not yet mature enough for a successful exit but needs expansion financing beyond the venture capitalist's fund lifecycle. In theory, it may be possible to extend the lifetime of a partnership; however this is at the discretion of the limited partners. Investors in these partnerships generally do not appreciate extensions and are reluctant to commit capital to successor funds if previous funds were not properly managed – which includes their timely liquidation. Consequently, the limited lifetime of an existing fund and the pressure of raising a new one can yield sub-optimal divestment decisions. Although premature, an exit signals "deal-making" capabilities to investors and this facilitates fund raising. So, even if the long-term perspective of an investee firm seems positive, a specialist investor might divest prematurely.

The second reason is caused by their specialization itself. Venture capital funds usually specialize across industries, stages of development, and geographical areas. Schwienbacher (2013) argues that specialized seed-stage investors closely monitor their investments and provide better support but that this comes with the disadvantage of a shorter investment horizon compared with that of a generalist investor. The shorter investment horizon results from the additional cost of funding entrepreneurial ventures over subsequent rounds. These costs arise from a current lack of expertise in later-stage financing, expected losses due to a reduction in future early-stage expertise, or reputational losses from style drifting (Cumming et al., 2009). The venture would therefore continue at a higher cost than with a generalist if a subsequent financing round were necessary. This would cause inefficient continuation, motivating a premature or preplanned exit (Cumming and Johan, 2008a and Cumming and Johan (2008b)) via a secondary transaction (Kandel et al., 2011, and Cornelli and Yosha (2003)).

Premature exits via secondary venture capital transactions have gained in importance in recent years and a market for direct exits and for trading fund interests has emerged, as described in Ibrahim (2012). Arcot et al. (2015) point out that this market is driven by the buying and selling pressure of some of the primary market participants. However, a whole new financial industry segment has been established in the meantime. The commercial data provider Preqin estimates a total amount of $34 billion to be under management by secondary funds, i.e. investment funds that focus solely on secondary transactions.[2] Nadauld et al. (2017) estimate the global market volume for secondary transactions to be even as high as $42 billion in 2014.[3]

The disadvantage caused by the specialist investor's selling pressure but also the advantage of superior support quality affects the relationship with the entrepreneur in several ways and motivates our paper: An entrepreneur has to make a financing decision at an early stage in her company's life cycle. The choice between the two types of investor (either a gen-

[2] http://www.preqin.com/docs/reports/Preqin-Special-Report-PE-Secondary-Market-March-2015.pdf.

[3] However, the estimates of Preqin and Nadauld et al. (2017) do not focus solely on the direct venture capital secondary market; they also include buyouts, other forms of private equity, and the market for fund stakes.

eralist or a specialist) has a long-term impact on the venture, both in terms of its economic success and the entrepreneur's personal wealth. Entrepreneurs therefore need to understand the benefits and shortcomings of each of the two types of investors and weigh them up against one another. Our paper contributes to this understanding.

We set up a two-stage model in which an innovative entrepreneurial venture requires external equity for startup and expansion financing. The entrepreneur has to select between two types of financial resources: generalist or specialized seed-stage investors. The specialized seed-investor systematically and prematurely sells his claim in a secondary transaction and consequently provides no information about the venture's quality. This quality depends on the entrepreneurial effort, which is boosted by the investor's support. Hence, it is higher if the venture is backed by the specialist investor. We determine the net present value (NPV)-maximizing contract for the entrepreneur, remembering that the specialist investor might be subject to a moral hazard: this investor could sell his claim to an uninformed outside investor in the secondary transaction even if the venture is a failure and should be abandoned. The decision to abandon can be made by either the financier or the entrepreneur, depending on who holds the controlling majority.

There are several equilibria in this game and we show that entrepreneurs can trade-off important contract parameters when seeking external financing. Our model's main contribution is to reveal that either generalist or specialist investors may be appropriate, depending on factors such as the allocation of control rights, the quality of investor support, the expansion capital required, the chances of success, or the venture's liquidation value. The mechanisms we discuss are not only relevant for the theory of entrepreneurial finance, but should be carefully considered by entrepreneurs who raise startup capital because they directly affect their returns from the intended venture. The equilibria point to another important insight for financing entrepreneurial activity: it is not always necessary for investors to have control over their investees and hence to be in a position to make liquidation decisions. Under certain circumstances, it is sufficient that the entrepreneur receives an incentive to abandon unsuccessful projects via a participation in the liquidation proceeds. This increases the project's NPV and protects outside investors against hold-ups. This is an important additional finding because it contradicts current practice in entrepreneurial finance transactions, where liquidation preferences usually direct most (or all) of the liquidation proceeds to the investors. Finally, our paper helps explain the market for secondary transactions. "Secondaries" are necessary for gaining liquidity and present successful track records to the limited partners of venture capital funds. The secondary market is not a market for lemons.

The paper is organized as follows: in the following section we rationalize our model and discuss related theory. Section three introduces the model. In section four, we derive the optimal contracts if investors (either generalist or specialist) have control over the venture. Section five repeats the analysis for the case in which the entrepreneur has control. In the sixth section, we compare the contract parameters, discuss our findings, and provide empirical predictions. The seventh section concludes. All proofs are provided in an online appendix to this paper.

2. Related models

Several studies have investigated the role of alternative and complementary sources of financing for entrepreneurial ventures. Schwienbacher (2007) develops a theory about the entrepreneur's choice of a financing strategy that focuses on a funding constraint of venture capital investors. These investors can only supply a relatively high financing volume due to the fix cost of project screening and the large amounts of funds under management that need to be diversified among a small number of investees. This requires a more advanced stage of development of the venture. Therefore, the entrepreneur needs to have either sufficient personal funds or the initial backing by business angels to bridge this equity gap. Depending on various model parameters, this may even lead to an inefficient postponement of the project's start. Elitzur and Gavious (2003) build a model in which a business angel finances the first round and a venture capital firm the second one. They point to the important role of angels in signaling to venture capitalists. Angel-backed ventures could be seen as firms whose founders opted for a viable firm, rather than choosing to "take the money and run." Hellmann and Thiele (2015) derive intuitive comparative statics on the impact of the level of competition between angels and venture capitalists. They note that their theory applies more generally to the relationship between early- and late-stage investors. Nevertheless, none of these three papers, unlike ours, models the difference in value-adding activities among the different types of investors and their impact on entrepreneurial effort and project NPV, respectively. In a similar setting, Andrieu and Groh (2012) examine the characteristics of bank-affiliated and independent venture capital firms. Their model cannot consider the allocation of control, however, but focuses on the uncertainty of financial constraints over the holding period. If the financial constraints are uncertain, the here-presented intuitive conclusions are impossible to derive.

Other related models have been discussed by De Bettignies and Brander (2007); Ueda (2004), and Winton and Yerramilli (2008). These papers compare "ordinary" bank debt with venture capital financing. Ueda (2004) assumes that a venture capitalist has better skills for evaluating projects than a bank manager, but he can also expropriate the entrepreneur's idea after learning about the details. However, Ueda (2004) does not acknowledge the abandonment option, nor does she elaborate on control rights or the differences among investors with respect to their investment horizon and support quality. De Bettignies and Brander (2007) argue similarly to us, that the management contribution of a venture capitalist is favorable for venture development. However, the entrepreneur needs to surrender partial ownership and this dilutes her incentive to provide effort. With bank finance, the entrepreneur keeps full control and has the appropriate incentive to exert effort. In equilibrium, venture capital tends to be preferred to bank finance if a venture capitalist's support quality is high and the entrepreneur's productivity is low. Yet, this paper does not consider the option to abandon and the potential moral hazards among investors

in subsequent financing rounds. To our knowledge, Winton and Yerramilli (2008) is the only contribution that incorporates the investment horizon and the option to abandon. However, the authors do not consider the possibility that early-stage sponsors may actively support their investees and thus increase the likelihood for success, nor do they discuss the impact of control allocation.

Our model builds on the work of Rajan (1992) and Aghion and Bolton (1992). In Rajan (1992), an entrepreneur can choose financing from a bank or an arm's length investor. The bank obtains private information and may subsequently liquidate the project. Unfortunately, this also alters the allocation of the surplus between the bank and the entrepreneur in the case of a successful project. The arm's length investor does not ask for control rights and is less costly. Rajan (1992) finds considerable ambiguity regarding the benefits to both investors and entrepreneurs in trading off the efficient continuation decisions of banks against the less costly alternative. However, Rajan (1992) does not consider the effect of support on the project's NPV and, hence, does not capture an important aspect of entrepreneurial financing relationships. Similarly, Aghion and Bolton (1992) studied the optimal allocation of control rights to entrepreneurs and investors. Their two-staged model is based on the idea that some of the future decisions about a project cannot be determined in the initial contract and that entrepreneurs and investors might have conflicting interests with respect to the future of the venture. Therefore, a trade-off in the allocation of control rights arises: If voting equity is issued, then the entrepreneur gives up her discretion, the preservation of which is actually of high value to her. If the entrepreneur raises debt, then the full ownership is preserved in principle, but bankruptcy might yield the exact inverse scenario: the complete loss of control. However, this model also ignores the potential support of investors, which increases the venture's NPV. Our paper shows that the models presented by Rajan (1992) and Aghion and Bolton (1992) can be extended in this respect.

Schwienbacher (2013) model is the closest model to ours. He shows that entrepreneurs trade off the efficient continuation of projects with a generalist against the value creation with a specialist investor. Our model extends this analysis because we introduce an additional area of moral hazard: We assume that the seed-stage specialist investor sells the project to an expansion investor in a secondary transaction. Unlike us, Schwienbacher (2013) does not include the question about optimal control over the venture, and our model therefore adds to the discussions on the abandonment of failing ventures contingent on the allocation of control rights.

3. The model

3.1. The investment environment

We consider a risk-neutral world with no discounting. A penniless entrepreneur has an innovative venture that attracts many potential outside investors. She has unique technological knowledge and is irreplaceable.[4] The project lasts two periods and does not qualify for traditional debt financing because of its innovative and intangible nature. The venture requires seed capital I_0 at $t = 0$ and expansion money I_1 at $t = 1$ in exchange for a cash flow right δ in the company. Instead of continuing the project at the interim stage ($t = 1$) and providing expansion financing, it can be abandoned, which yields liquidation proceeds L. If the project is continued, it either qualifies for selling at R after the expansion period, i.e., $t = 2$, or it needs to be written off. The probability for successfully selling the venture depends on the state of nature determined at the interim stage. We distinguish two states of nature: If the state of nature is favorable, then the divestment generates a cash flow R with probability 1. If the state of nature is unfavorable, then there is still a chance to receive payoff R at probability q, or otherwise 0 with probability $(1 - q)$.

We require that it is optimal to abandon the project when the state is unfavorable and to continue when the state is favorable:

$$R - I_1 > L$$

$$qR - I_1 < L$$

In the case of liquidation, the investor cannot recover his investment cost, i.e.,$-I_0 + L < 0$. However, the investor insists on a liquidation preference (which will be discussed subsequently) in order to minimize his loss. The incentive for the investor is $R > I_0 + I_1$.

Whether or not the favorable state is reached at the interim stage depends on the effort e provided by the entrepreneur. She can exert between zero and full effort and makes this decision during the seed period. For simplicity, we define the probability of reaching a good state to be equal to the effort, i.e., $e \in [0; 1]$. Effort is costly and we denote the cost in the following way:

$$cost(e) = c\frac{e^2}{2}$$

[4] As in Aghion and Bolton (1992); Rajan (1992), and Hart and Moore (1994), we also place the bargaining power with the entrepreneur, assuming a competitive capital market in which the entrepreneur extracts all the surplus. However, the observation of boom and bust cycles in entrepreneurial finance markets challenges this assumption. The ability to extract the surplus may shift between investors and entrepreneurs depending on who is in short supply. As we discuss in Section 6, in our model, a change in bargaining power does not affect the general trade-off.

Figure 1: Timeline of the model

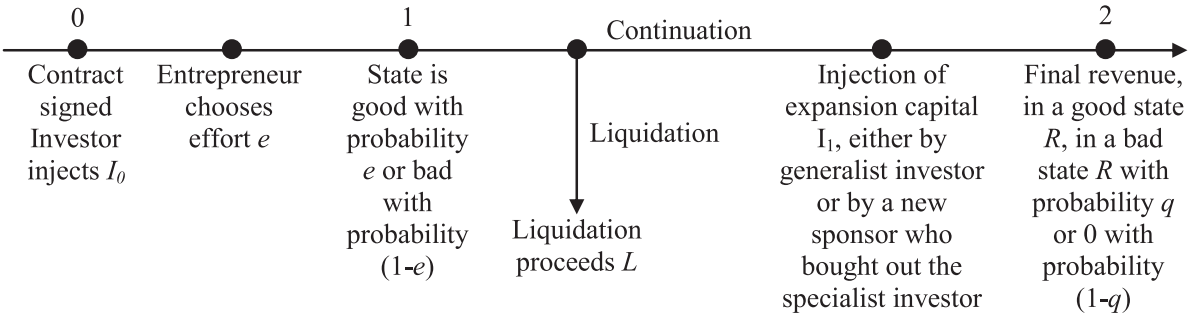

Fig. 1. Timeline of the model.

In this setting, the entrepreneur has full bargaining power due to the uniqueness of her project and makes a take-it-or-leave-it offer to an investor. We differentiate two types of investors. First, there is a generalist investor who can provide long-term capital, denoted by the subscript $_G$. Second, there is a specialized seed-phase venture capitalist with a shorter investment horizon, denoted by the subscript $_S$. Such a distinction is well-grounded by earlier publications on the venture capital industry, such as Bygrave and Timmons (1992); Florida and Kenney (1988); Robinson (1987), and Elango et al. (1995).

The specialist venture capitalist divests at $t = 1$ in a secondary transaction. The generalist investor can back the venture through the seed and expansion stages. Both investors also provide support to the investee and monitor it, although the support quality differs. We expect that this support leads to higher entrepreneurial effort and an improved likelihood of success and model the effect by introducing the entrepreneur's costs of effort. These costs are denoted by c_G and c_S, respectively. This directly follows the models proposed by Biais and Casamatta (1999); De Bettignies and Brander (2007) and Andrieu and Groh (2012). The two parameters might not be exogenous, as discussed in Hellmann (2002), but contingent on other model determinants. However, to capture the two-dimensional moral hazard in the simplest way and to derive intuitive predictions, we require them to be exogenous and ex-ante determined. We assume that the specialized venture capitalist is a "hands-on" investor who is more actively involved than the generalist in the management decisions of his investees. The specialized investor also has superior experience in building and developing start-up ventures. He provides higher quality support and tighter monitoring. The specialist therefore provides stronger motivation to the entrepreneur, thus lowering her unit cost of effort, i.e., $c_S < c_G$. At the end of the seed stage, the entrepreneur and the investor are privately informed about the state of the project and the party that holds the majority of the board seats decides whether the project should be continued or abandoned.

Continuation requires expansion capital I_1, which is not supplied by the specialized investor because he exits at $t = 1$. Since the venture capitalist knows ex ante about this, he requires a security that is valued P_S at $t = 1$ when he divests.[5] Such a claim can be structured as convertible preferred equity with an accruing (non-cash) dividend. This provides some protection, being senior to common equity, and an a priori defined minimum expected return to the investor. Convertible preferred equity has emerged as the standard financing security in the U.S. venture capital industry (Kaplan and Strömberg, 2003). As comprehensively discussed e.g. in Lerner and Schoar (2005) and Cumming and Johan (2013), the same securities are not necessarily used to structure venture capital transactions in other countries. Alternatives mainly result from different legal and tax regimes, and from the quality of law enforcement. However, all structures share common principles: they aim to keep agency costs low, to be flexible, to allocate voting rights, save taxes, and provide upside potential to the investor while maintaining downside protection at the same time. P_S therefore presents the price for a single security or for the bundle of securities required to preserve the described claim for the specialist investor.

The new expansion investor takes over the shares of the seed-stage venture capitalist and also needs to inject I_1 at the same time.[6] Alternatively, the claim of the specialist investor could be structured as redeemable preferred equity. In this case, the investor could call for his claim to be redeemed and thus, force an exit. Technically, the venture would need to issue new shares and sell them to the expansion investor at $(P_S + I_1)$. The capital raised would be used to redeem the specialist investor's claim and as expansion funds. This alternative specification would not alter the equilibria in our model. The generalist investor does not have a limitation on his investment horizon. He can stay with the venture throughout the seed and expansion stages and can contribute I_0 and I_1. He expects to be rewarded at the project's maturity.

Fig. 1 represents the game:

[5] We assert that all agents are rational and use their information for decision making. At $t = 0$, the entrepreneur perfectly estimates the price the expansion investor will pay according to the information set the new agent will receive. This is strictly equivalent to negotiating this price at $t = 1$. Therefore, renegotiation at $t = 1$ would not change the initial contract parameters.

[6] This assumption rules out the possibility that the outside investor could buy out the first one and then wind up the company prior to injecting I_1.

3.2. First-best solution

In this game, the NPV of the project in the first-best equilibrium is

$$-I_0 + e(R - I_1) + (1 - e)L - c_S\frac{e^2}{2}.$$

The social optimum is attained if the surplus is maximized. The optimal level of effort is such that

$$\max_e -I_0 + e(R - I_1) + (1 - e)L - c_S\frac{e^2}{2}$$

We denote e^{FB} the first-best solution to this equation. To maximize the surplus, it needs to be $e^{FB} = \frac{R-I_1-L}{c_S}$[7]. For consistency, we also assume that $e^{FB} < 1$:

Assumption 1. $R - I_1 - L < c_S$.

This assumption is required because the level of effort is equal to the probability of reaching a good outcome which is smaller than 1. It normalizes the cost of one unit of effort as being higher than the final revenue minus the expansion investment and the opportunity cost of not liquidating (i.e., L).

We distinguish two principal control structures for the venture in order to determine the optimal contracts: either the entrepreneur or the investor holds the majority of seats on the board and controls the company. We note that the allocation of control rights is not related to the financial structure. The separation of control from the financial structure is important: for any given sharing arrangement regarding a venture's cash flows, it is possible to allocate the control rights independently. This is a common characteristic in U.S. VC financing relationships and is comprehensively discussed in Kaplan and Strömberg (2003). The financial claims, investor's rights, board composition, and particularities with respect to voting power and potential shifts are precisely defined in the contractual work of a VC transaction. The most important agreements and amendments include the Certificate of Incorporation, the Stock Purchase Agreement, the Voting Agreement, and the Investor's Rights Agreement. Amongst many other things the contractual work specifies the characteristics required in our model. The Certificate of Incorporation describes the classes of stock issued by the venture and the particular rights attached. With the Share Purchase Agreement, the venture and the investor fix the conditions of when, where, and at what price the investor will buy which type of stock. The Voting Agreement sets forth the venture's board size, its composition, and contingencies. The majority of seats on the board, held either by the entrepreneur or the investor, provides the holder with discretion regarding ceasing the venture's activity and winding it up. Specific information and monitoring rights, among others, are designated in the Investor's Rights Agreement.

4. Optimal contracts if the investor controls

We initially assume that the investor has the controlling power over the venture, which also entitles him to liquidate it. The entrepreneur selects between the specialized and generalist investor and trades off the contract parameters that provide her the highest benefit. We derive and analyze the optimal contracts with both investors.

4.1. Backing by a generalist investor

The generalist is able to accompany the venture through the seed and expansion phases and stages the investments I_0 and I_1 according to the project requirements. Therefore, he receives a cash flow right δ in the venture, which determines a fraction of the proceeds from selling it δR. Since we assume that the investor controls the company, he may decide about its continuation at the interim stage. He learns about the venture's state during the seed phase and this information determines the continuation decision.

Let us first assume that the state of the project is unfavorable in $t = 1$. If the project is continued, the investor can expect $\delta qR - I_1$. If liquidated, he receives the liquidation preference L_G. We assume $L_G = L$ and verify this later. Since $qR - I_1 < L$, the investor winds up the business.

We now analyze the state if the project is favorable in $t = 1$. In this case, liquidation is not appropriate because it is loss-creating $L_G - I_0 \leq L - I_0 \leq 0$, while continuation offers $\delta R - I_1$. Nevertheless, to motivate an investment in the venture at $t = 0$, the investor requires to at least break even on average, i.e.,[8]

$$e(\delta R - I_1) + (1 - e)L_G - I_0 \geqslant 0 \qquad (PC)$$

The entrepreneur anticipates this behavior and calculates her profit by solving:

$$\max_{\delta,e,L_G} e(1 - \delta)R + (1 - e)(L - L_G) - c_G\frac{e^2}{2}$$

[7] We assume that $R - I_1 - L > 0$ and thus, $e^{FB} > 0$.

[8] If this condition is true, then $\delta R - I_1 > 0$ as $L_G < I_0$.

The maximization program is thus the following:

$$\max_{\delta,e,L_G} e(1-\delta)R + (1-e)(L-L_G) - c_G\frac{e^2}{2}$$

$$s.t.\, e \in \text{argmax} e(1-\delta)R + (1-e)(L-L_G) - c_G\frac{e^2}{2}$$

$$s.t.\, e(\delta R - I_1) + (1-e)L_G - I_0 \geqslant 0$$

This contract is possible if the expected payoff is large compared with the costs. The following assumption describes this

Assumption 2. $R - I_1 - L \geqslant 2\sqrt{c_G(I_0 - L)}$

This assumption requires the expected revenue in good outcomes (net of the expansion investment I_1 and the opportunity cost of liquidation L) to be high enough to cover the loss from liquidation in bad outcomes. At the same time, the unit cost of effort c_G needs to remain below a certain threshold.

Proposition 1. *If the entrepreneur selects the generalist investor, she will sign a contract such that*

$$\delta^* = \frac{R + L + I_1 - \sqrt{(R - I_1 - L)^2 + 4c_G(L - I_0)}}{2R}$$

$$L_G = L$$

Corollary 1. *Then the entrepreneur provides an effort* $e^* = \frac{R - I_1 - L + \sqrt{(R-I_1-L)^2 + 4c_G(L-I_0)}}{2c_G}$, *which is less than first-best.*

With a generalist investor, optimal continuation decisions are made (liquidations only occur in bad outcomes), but the level of support is not good enough to reach the optimal equilibrium. The entrepreneur is allocated zero if the venture is liquidated in order to give her a high-powered incentive to exert effort. The entrepreneur's effort is determined by the unit cost of effort related to the quality of support: the better the support quality (i.e., c_G is low), the more the entrepreneur is incited to work. The term $R - I_1 - L$ is also an important determinant in encouraging this effort, because it represents the net profits generated in good outcomes. The term $L - I_0$ is another encouraging determinant. It represents the value gain net of the initial investment in the case of liquidation. The higher the gain, the smaller the investor's loss, which boosts the NPV of the project earned by the entrepreneur.

4.2. Backing by a specialized investor

The specialist does not back the venture through the expansion phase and aims to sell his stake at the interim stage. The contract signed at $t = 0$ needs to set the values for the investor's liquidation preference L_S, his claim P_S, and the fraction of his cash flow right δ.[9] At the interim stage, the investor is privately informed about the state of the project (i.e., good or bad). Since we assume that he holds the majority of the control rights, he decides whether to liquidate the venture or to sell at P_S to the expansion investor.

If it is $P_S < L_S$, this implies that the investor always liquidates the venture independently of a good or bad state. He receives his liquidation preference L_S in return for the initial investment I_0. However, we require that $L - I_0 < 0$. Hence, this would be loss-making and the investor would never invest ex ante. Consequently, this assumption is false and it needs to be $P_S > L_S$.

Accordingly, the specialized investor contributes I_0 and prefers selling his shares in a secondary transaction at $t = 1$ for price P_S. However, he only accepts ex ante to invest if this condition is true:

$$P_S - I_0 \geqslant 0 \qquad (PC)$$

Since the specialized investor never liquidates the venture but systematically sells his stake,[10] the expansion financier cannot infer the venture's success based on the pooling equilibrium that is reached. He computes his expected payoff by assessing the probability of a good or a bad state. According to our definition, the probability that the venture is not a lemon is equal to the entrepreneur's effort e. Therefore, the secondary transaction can only happen if

$$e\delta R + (1-e)\delta qR - I_1 - P_S \geqslant 0 \qquad (PC)$$

[9] We assume that δ is initially negotiated between the investor and the entrepreneur and is then proposed to the second investor at the interim stage against paying P_S. The cash flow stake is determined according to the information set that the second investor will have. The second investor may only accept or reject the proposed transaction. This approach is strictly equivalent to negotiating the price with the second investor at the interim period.

[10] We assume that, even if liquidation never occurs in this context, the entrepreneur would contractually receive zero liquidation proceeds. This prevents opportunistic behavior with the entrepreneur walking away because, as we show subsequently, she expects a positive value $(1-\delta)qR$ in bad outcomes if the project is continued. The entrepreneur would therefore not walk away from the project as this would force its liquidation.

The entrepreneur maximizes her profit by solving

$$\max_{\delta,e,P_S} e(1-\delta)R + (1-e)(1-\delta)qR - c_S\frac{e^2}{2}$$

Then, the maximization program is

$$\max_{\delta,e,P_S,L_S} e(1-\delta)R + (1-e)(1-\delta)qR - c_S\frac{e^2}{2},$$

$$s.t.\, e \in \operatorname{argmax} e(1-\delta)R + (1-e)(1-\delta)qR - c_S\frac{e^2}{2},$$

$$s.t.\, e\delta R + (1-e)\delta qR - I_1 - P_S \geqslant 0,$$

$$s.t.\, -I_0 + P_S \geqslant 0.$$

The following assumption derives the parameters of the optimal contract:

Assumption 3. $\Delta_i = \left[\frac{R^2}{c_S}(1-q)^2 + qR\right]^2 - 4\frac{R^2(1-q)^2}{c_S}(I_0+I_1) \geq 0$ and $\sqrt{\Delta_i} \geq -R\left[\frac{R(1-q)^2}{c_S} + q\right]$.

This assumption defines the mathematical conditions for the investor's cash flow right to be above zero and smaller than one. The expansion investor needs to cover a potential loss (in bad outcomes) and there is an economic restriction with respect to the share of the sales proceeds that this investor may obtain. More specifically, this assumption requires the final revenue R to be sufficiently high compared to the unit cost of effort c_S and the total amount invested $(I_0 + I_1)$. It also requires q , the probability of unexpectedly receiving a positive cash-flow in bad outcomes, to remain below a certain threshold. The right side of the assumption is verified for reasonable values (otherwise the entrepreneur would find shirking too attractive).

Proposition 2. *If the entrepreneur selects a specialized investor, she signs a contract such that*

$$P_S = I_0$$

and

$$\delta^* = \frac{1}{2} + \frac{c_S(qR - \sqrt{\Delta_i})}{2R^2(1-q)^2},$$

$$\text{with } \Delta_i = \left[\frac{R^2}{c_S}(1-q)^2 + qR\right]^2 - 4\frac{R^2(1-q)^2}{c_S}(I_0+I_1).$$

This contract yields inefficient continuation of the project in its unfavorable state because, similar to the problem described in Kandel et al. (2011), the investor has no incentive to wind it up. The total output $qR - I_1$ at project maturity is smaller than what would have been obtained if the investor had decided to liquidate (i.e., L). However, the specialist investor needn't consider this because the uninformed outsider buys him out at P_S. Therefore, he always prefers to sell his stake and not disclose his private information. In the optimum, he receives a payoff equal to his initial investment and independent of the state of nature.[11]

Corollary 2. *The entrepreneur provides the following level of effort:*

$$e^* = \frac{(1-q)R}{2c_S}\left(1 - \frac{c_S(qR - \sqrt{\Delta_i})}{R^2(1-q)^2}\right)$$

This effort is less than first-best.

The corollary expresses the effort provided by the entrepreneur. She exerts effort that is less than first-best.

[11] In the optimum, parameter P_S verifies our initial assumption $P_S - I_0 \geqslant 0$.

4.3. Comparison of the two financing alternatives

We note that financing by a specialized early-stage investor incurs a disadvantage if he has the controlling majority. Unsuccessful projects might not be abandoned but instead could receive additional resources because the investor has an incentive to sell a lemon instead of liquidating the venture. However, we also maintain that support quality is important and that this sponsor might take better care of his investments. This encourages the entrepreneur to exert greater effort and increases the likelihood of success. Therefore, we first compare the investor's impact on the project's NPV. Given that all participation constraints are binding in the optimum, the entrepreneur receives the full NPV. The following proposition describes the condition that makes the generalist investor the better choice[12]:

Proposition 3. *The NPV created with a generalist investor is higher than with a specialist investor if*

I. $R - L - I_1 > \sqrt{2c_G\gamma(e_S)}$ *and*

$e_G \geqslant \frac{R-I_1-L-\sqrt{(R-I_1-L)^2-2c_G\gamma(e_S)}}{c_G}$,

with $\gamma(e_S) = e_S R + (1-e_S)qR - I_1 - L - c_S\frac{e_S^2}{2}$.

Hence, there is a trade-off for the entrepreneur between support quality and possible inefficient continuations. The proposition shows that the first determinant of the entrepreneur's choice is the value of $I_1 + L$. The higher these opportunity costs of continuation, the more attractive the generalist investor becomes. The second determinant is the comparative level of support and monitoring quality $\frac{c_S}{c_G}$. The closer it is to 1, the smaller the difference in support and monitoring quality between the two types of investors. If it approaches 1, the comparative advantage of the specialist is overcompensated by the additional NPV from inducing optimal continuation decisions together with a generalist.

The proposition highlights that either type of financier may be preferable, each under certain conditions. Most importantly, inefficient continuation decisions can be compensated by higher support and monitoring quality, whereas the benefits of appropriate liquidation diminish with lower investor activity.

5. Optimal contracts if the entrepreneur controls

Now we require the entrepreneur to have controlling power over the venture and discretion as to whether to continue or liquidate the project at $t = 1$. We derive the optimal contracts with both investors and discuss incentives to liquidate if it is appropriate.

5.1. Backing by a generalist investor

If the entrepreneur chooses the generalist investor, there is no impact on the above-discussed equilibrium, independent of her controlling stake. If the project's state is good at $t = 1$, then both parties will agree to continue developing the venture to maturity. If the state is bad, then she is obliged to liquidate the venture for two reasons. First, the investor will refuse to invest I_1 since he knows the bad state of the project. Second, any new outside investor will refuse to buy out the generalist because he infers that the first investor only sells in a bad state. Since liquidation is forced by the impossibility of raising expansion money I_1, the situation does not change if the entrepreneur has a potential private benefit from continuing the venture as, discussed, for example, in Marx (1998). Therefore, the entrepreneur decides optimally and continues the project in good states and liquidates in bad states.

5.2. Backing by a specialized investor

We assume that the specialized investor exits the venture at the interim stage, a point at which both the entrepreneur and the investor know about the project's state of nature. If it is continued, then the specialist needs to be bought out by an outside investor in a secondary transaction given the conditions established in the initial contract. The second investor can only take or leave this offer. If the entrepreneur decides to liquidate, then the proceeds L are shared between the two parties, also in accordance with the initial contract conditions.

We show the two equilibria that characterize the entrepreneur's actions. In the first, she replicates the pooling equilibrium obtained when the investor holds the controlling majority. In the second, she makes optimal continuation decisions; that is, she liquidates in bad states of nature.

[12] For the following propositions, we do not refer to the model primitives for simplicity and clarity. Closed form solutions for the primitives are often either non-existing or not appropriate for presentation. For intuitive interpretation, we present the important trade-offs for reasonable parameter values in several figures.

5.2.1. Contract preventing liquidation

Not to liquidate is a reasonable strategy for the entrepreneur if it is always more attractive for her to continue the venture. In this case, her incentive constraint must be

$$(1-\delta)qR \geqslant L_E \qquad (IC),$$

with L_E denoting the liquidation proceeds for the entrepreneur and $L = L_S + L_E$. We require that this condition be true.[13] The entrepreneur will then maximize her profit by solving

$$\max_{\delta,e,P_S} e(1-\delta)R + (1-e)(1-\delta)qR - c_S\frac{e^2}{2}$$

The outside investor does not know about the state of nature at $t = 1$ before entering into the transaction. He therefore calculates his expected profit and invests if and only if

$$e\delta R + (1-e)\delta qR - I_1 - P_S \geqslant 0 \qquad (PC)$$

Since the specialist always sells at $t = 1$, he initially required:

$$P_S - I_0 \geqslant 0 \qquad (PC)$$

We note that these constraints yield the same maximization program as if the investor held the majority of the board seats. Consequently, the parameters of this contract are the same. The following proposition summarizes this finding:

Proposition 4. *When the entrepreneur holds the controlling majority, a contract with a specialized investor is possible that incentivizes her to never liquidate the venture. The contract parameters are equal to those if the investor holds the majority.*

It is evident that the entrepreneur prefers to continue in bad outcomes because she expects a higher cash flow $(1-\delta)qR$ compared to the proceeds that she would receive if the venture were liquidated. The continuation decision is as if the specialist investor were in control: bad projects are never liquidated.

5.2.2. Contract allowing liquidation

More important than the contract that prevents liquidation is the one that allows optimal continuation decisions and eliminates the inefficiency of the previous contract.

We assume that it is preferable for the entrepreneur to liquidate the project if its state is unfavorable:

$$L_E \geqslant (1-\delta)qR \qquad (IC)$$

This rules out inefficient continuation and the expansion investor can rely on the good state of the venture. For his investment, he needs:

$$\delta R - I_1 - P_S \geqslant 0 \qquad (PC)$$

The seed investor knows that the project will be abandoned if the state of nature is bad and he requires his expected profit to be:

$$eP_S + (1-e)L_S - I_0 \geqslant 0 \qquad (PC)$$

The resulting maximization program is thus the following:

$$\max_{\delta,e,L_e,P_S} e(1-\delta)R + (1-e)L_E - c_S(e^2/2),$$

$$s.t. e \in \text{argmax} e(1-\delta)R + (1-e)L_E - c_S(e^2/2),$$

$$s.t. L_E \geqslant (1-\delta)qR,$$

$$s.t. \delta R - I_1 - P_S \geqslant 0,$$

$$s.t. eP_S + (1-e)L_S - I_0 \geqslant 0.$$

Here, the entrepreneur's strategy is the same as with a generalist investor, regardless of the uninformed outside expansion investor who steps into the transaction. However, there is a notable difference between the two contracts: In the venture's bad state, the entrepreneur receives $L_E^* = 0$ liquidation proceeds with a generalist investor. This is ruled out with the specialist investor, given that one necessary condition is $L_E \geqslant (1-\delta)qR$. It also implies that the liquidation proceeds L (which are

[13] This incentive constraint is easily fulfilled by setting $L_E = 0$.

exogenous) need to be sufficiently large to meet the incentive constraint $L \geqslant (1-\delta)qR = L^t$. If not, the contract is impossible. The contract parameters must be as follows:

Proposition 5. *If the entrepreneur holds the controlling majority of the venture, a contract is possible which incentivizes her to continue the project in good states and to liquidate in bad states. The parameters of this contract are:*

$$\delta^* = \frac{R + L + I_1 - 2L_E - \sqrt{(R - I_1 - L)^2 + 4c_S(L_S - I_0)}}{2R},$$

$$P_S = \frac{R - I_1 + L - 2L_E - \sqrt{(R - I_1 - L)^2 + 4c_S(L_S - I_0)}}{2},$$

and

$$L_E^* = (R - I_1 - P_S)q \text{ and } L_S = L - L_E^*.$$

Corollary 3. *With this contract, the effort provided by the entrepreneur is* $e^* = \frac{R - I_1 - L + \sqrt{(R - I_1 - L)^2 + 4c_S(L_S - I_0)}}{2c_S}$, *which is below the first-best effort.*

This contract allows the entrepreneur to optimally decide about the venture's continuation. However, it does not replicate the first-best equilibrium since she will receive some of the liquidation proceeds. Sharing the abandonment value is necessary to incentivize her to liquidate in bad states of the venture, but it reduces her willingness to exert effort.

5.3. Comparison of the two financing alternatives

We show that the contract with the generalist investor yields the same parameters and the same decision-making behavior regardless of a shift in decision power. Equivalent to the investor, the entrepreneur decides optimally about the project's continuation and liquidates in bad states.

As with the specialized investor, there are two possible contracts. The first is characterized by the incentive to never liquidate the project. Hence, the entrepreneur replicates the decision of the specialist (if he holds the majority of the voting rights), leading to the same inefficiency: bad projects are continued instead of being liquidated. However, it is possible to design a second contract that eliminates this inefficiency. In this situation, the entrepreneur needs to be better off with liquidation than with continuation. She must receive a payoff equivalent to the opportunity cost of liquidating: $L_E^* = (1 - \delta)qR$, where $(1-\delta)qR$ is her share of the exit proceeds that she can still receive by chance, even if the venture's state is bad. Nevertheless, we realize that the less the entrepreneur receives in an unfavorable state, the more she is encouraged to exert effort to turn the venture into a success. Therefore, she provides less than first-best effort with this contract. We recall that in the first-best case, the entrepreneur has no claim on the abandonment value L.

6. Comparative statics and discussion

We have derived four outcomes with optimal contracts for the entrepreneur, contingent on the allocation of the control rights in the game and the choice of investor. All of them are below the first-best level because either the contract incites inefficient continuation or lower support quality decreases the likelihood for success and, hence, the project's NPV.

Independently of the allocation of the decision power over the venture, the project will always be efficiently liquidated in its bad state if it is backed by a generalist investor. This is based on the principle that the generalist will refrain from providing expansion capital in the project's bad state and likewise cannot sell his claim to an outsider. Any potential new investor would infer the venture to be a lemon. However, we assume that the level of support provided by the generalist financier is lower than that of the specialist and, therefore, the first-best NPV is not reached.

If the entrepreneur selects the specialist investor, then the allocation of control rights makes a difference. In the case where the investor has discretion, he will inefficiently continue the project in its unfavorable state because he has no incentive to wind it up. We reach a pooling equilibrium in which the investor always sells at P_S to an uninformed outsider and does not disclose his private information. In the optimum, he receives a payoff equal to his initial investment and independent of the project's state of nature.

If the control rights are allocated to the entrepreneur, the equilibrium becomes more complex. Two situations are possible: In the first one, the entrepreneur replicates the above pooling equilibrium, which yields the inefficient continuation of bad projects. In the second situation, she makes optimal continuation decisions. Therefore, the entrepreneur needs an incentive, such as receiving a payoff in unfavorable states equal to her reserve utility (i.e., the expected value of continuing a bad project). However, this requires certain parameter values because the liquidation proceeds need to be above a threshold $L \geqslant (1-\delta)qR = L^t$. In principle, this favors the alternative of allocating the control rights to the entrepreneur as she would make efficient liquidation decisions. Yet, providing her with a fraction of the liquidation proceeds likewise encourages shirking. Therefore, the project's NPV decreases and we conclude that none of the alternatives dominates.

Another important topic of discussion is our simplifying assumption that negotiation power is allocated to the entrepreneur. Renucci (2014) explicitly models bargaining power as being a consequence of the investor's personal wealth. Inderst and Müller (2004) question the "traditional" contracting model and develop a theory for efficient surplus sharing. Cumming and Johan (2008) empirically demonstrate the influence of bargaining power on cash flow allocation and control rights. We therefore need to reconsider its allocation in our model. This assumption was initially inspired by requiring the entrepreneur to have an outstanding idea capable of attracting many potential investors. Conversely, if the supply of capital was in fact short, then investors would hold the bargaining power. This would nevertheless have no impact on the resulting equilibria as it would only transfer the project's NPV to the investors.

- The generalist investor will always favor liquidating bad projects whether or not he has bargaining power. Without bargaining power, this investor can threaten the entrepreneur by refusing to refinance the project, thus forcing liquidation. With bargaining power, the generalist investor will liquidate bad projects at the interim stage. The only change with respect to an alternative allocation of negotiation power would be a transfer of the project's NPV to the generalist investor. However, this does not affect the equilibrium.
- Similarly, a specialist investor with negotiation power and control rights would not liquidate bad projects at the interim stage because this would be loss-making. Hence, the only effect of an alternative allocation of negotiation power would be the transfer of the project's NPV to the investor. Again, this does not affect the equilibrium.
- If the specialist investor has negotiation power but no control rights, the equilibrium remains the same. In this case, it is no longer possible, however, to agree on a contract in which the controlling entrepreneur would liquidate. The price P_S to buy out the investor at the interim stage would increase incrementally by the project's NPV, which would be captured by the investor.

As a result, a shift of bargaining power simply transfers wealth from the entrepreneur to the investor(s) but does not change the equilibria.

We note that the initial contract solves any disagreement by setting the parameters accordingly. In all possible cases (whoever the investor is and whoever holds control) no contract party would disagree with the original contract settings (because we derive optimal strategies using backward induction). Since the participation constraints are defined in such a way that investors are incentivized to invest in the venture earning an average of zero, in a competitive market the contract parties will always agree to the initial setting at signing. Nevertheless, the contract parties might disagree at a later stage and ask for renegotiation. However, all contracts are renegotiation-proof because they could only be renegotiated if all parties would be better off and it is impossible for even one participant to improve her or his position:

- The generalist investor will always prefer the project to be liquidated to avoid higher expected losses. If the specialist investor has control rights, he will always prefer selling at the interim stage (i.e., maintaining a pooling equilibrium strategy) because this avoids liquidation losses. It is impossible to offer this investor a higher value to incentivize him to liquidate because $L < I_0 = P_S$.
- If the entrepreneur is in control and if the liquidation proceeds are low, the entrepreneur will prefer to continue bad projects because she will always be better off. The entrepreneur effectively earns a higher expected value: a share of the final sales proceeds R if the project unexpectedly becomes successful (with probability q). If the liquidation proceeds are high, then the entrepreneur will be incentivized to liquidate.

All trade-offs depend on the model primitives and we discuss this subsequently in more detail. We first derive propositions for the most important model implications. Next, several figures present additional mechanics. For these comparisons, we define the following notation: The superscripts ^{E} and ^{I} denote the allocation of the decision power to the entrepreneur and the investor, respectively. The subscripts $_G$ and $_S$ denote the generalist and specialist investors, as previously defined.

6.1. Level of effort

Entrepreneurial effort is a central feature of our model. The more the entrepreneur is incentivized, the greater her effort will be. Her effort increases the likelihood of success and enhances the project's NPV. Nevertheless, in any of the possible contracts, her effort is always below first-best, as we have shown. We assume that the support quality of the generalist investor is lower than that of the specialist and this reduces her incentive to work. If she selects a specialized investor and relinquishes control, then the quality of the support rises, but inefficient continuation decisions destroy value and make shirking more attractive. Even if the entrepreneur selects the same investor but keeps control, her effort will remain below the first-best. Unsuccessful projects are liquidated then, but this requires an incentive for the entrepreneur equal to her reserve utility, whereas she would receive nothing in the first-best situation. The following proposition compares the level of effort for both possible allocations of decision power and with respect to the parties' cash flow rights:

Proposition 6. *The level of effort provided by the entrepreneur with a specialist is higher in the case where she has the controlling power if and only if:*

$$\delta_S^I > \delta_S^E$$

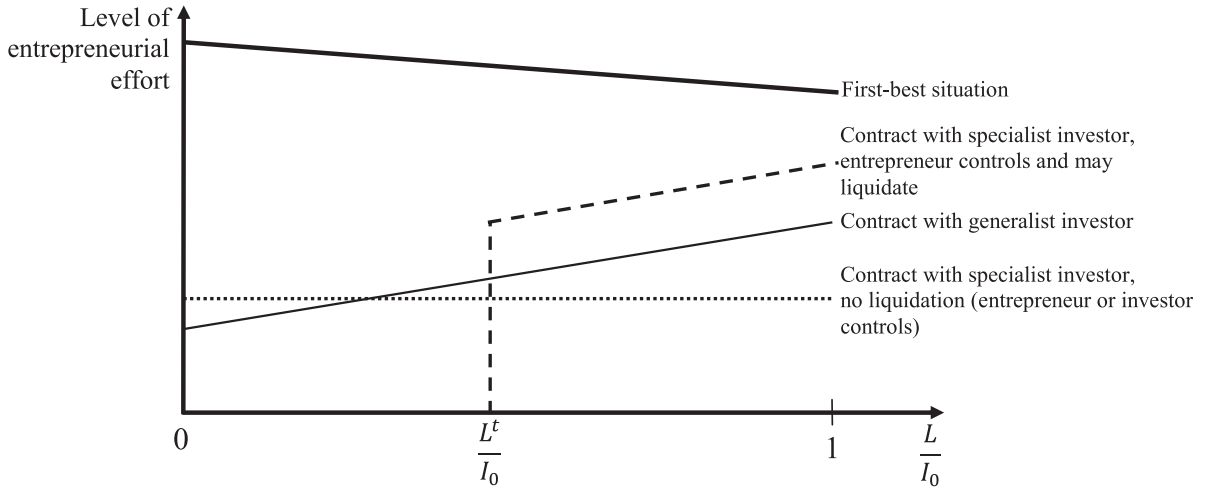

Fig. 2. Entrepreneurial effort contingent on the venture's liquidation proceeds based on the contract and control right allocation.

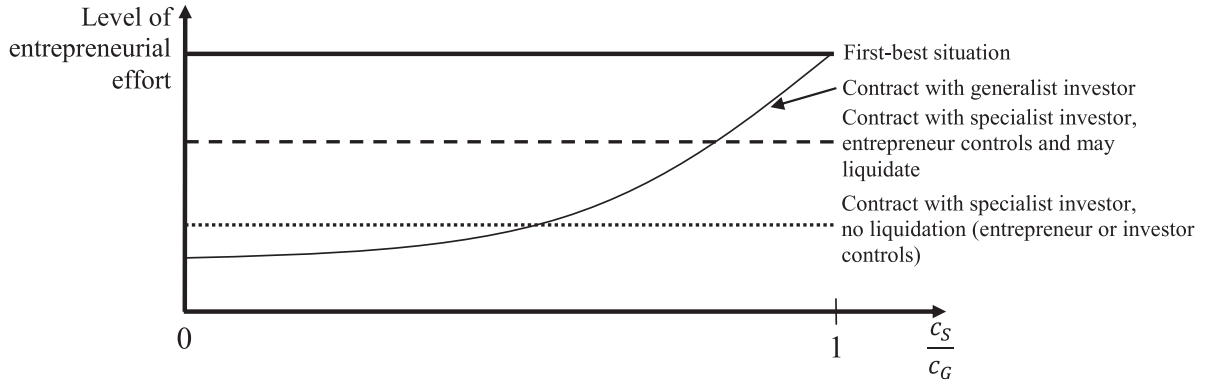

Fig. 3. Entrepreneurial effort contingent on the difference in the quality of the investors' support (cS/cL) at a given level of cS and based on the contract and control right allocation (Remark: It is a requirement for the presented equilibria that the liquidation proceeds be above L^{t}t).

Hence, the level of entrepreneurial effort will be higher if she has control than if she does not only if she has higher cash flow rights. We subsequently illustrate the levels of effort encouraged by the possible contracts and the main variables of the model (i.e., the recovery rate, the difference in the support quality of both investors, and the expansion capital).

Fig. 2 presents the first-best effort and the levels of effort according to the different contracts and contingent on the liquidation proceeds. The first-best effort decreases with higher liquidation proceeds, as we have already shown by $e^{FB} = \frac{R-I_1-L}{c_S}$. If the venture is backed by the specialized investor and if liquidation is ruled out, then the level of effort is independent of the potential liquidation proceeds. Continuing with what we discussed above, the contract with the specialist investor that allows liquidation is only possible if she controls the venture and if the liquidation proceeds are above a threshold L^t. In this case, she may exert higher effort relative to a contract with the generalist investor. Entrepreneurial effort increases with the recovery rate if the entrepreneur chooses the generalist investor or if she controls the venture. In both scenarios, the increase in the liquidation proceeds does not make shirking more attractive to her. The greater the liquidation proceeds, the smaller the potential loss for the investor in a bad state of nature. This lowers his required cash flow rights, leaving a larger stake for the entrepreneur and thus encouraging her to exert effort.

Figure 3 relates the entrepreneurial effort to the difference in the support quality $\frac{c_S}{c_G}$ of the two investors at a given level of c_S.

The figure illustrates the effect on entrepreneurial effort if the generalist increases his support quality up to the level of the specialist. The first-best effort and both contracts with a specialized investor are not affected because they do not depend on c_G. However, the entrepreneurial effort if backed by the generalist increases with his support quality. If his quality reaches that of the specialist, then the entrepreneurial effort may even become first-best.

Last, we analyze entrepreneurial effort with respect to the required expansion capital I_1.

Fig. 4 illustrates how the entrepreneurial effort decreases with the amount of required capital for all contracts because, as the need for financial resources rises, so do the cash flow rights required by the investors. This lowers the NPV for the entrepreneur and she will be less prepared to exert effort. The contract with the specialist investor allowing liquidation always

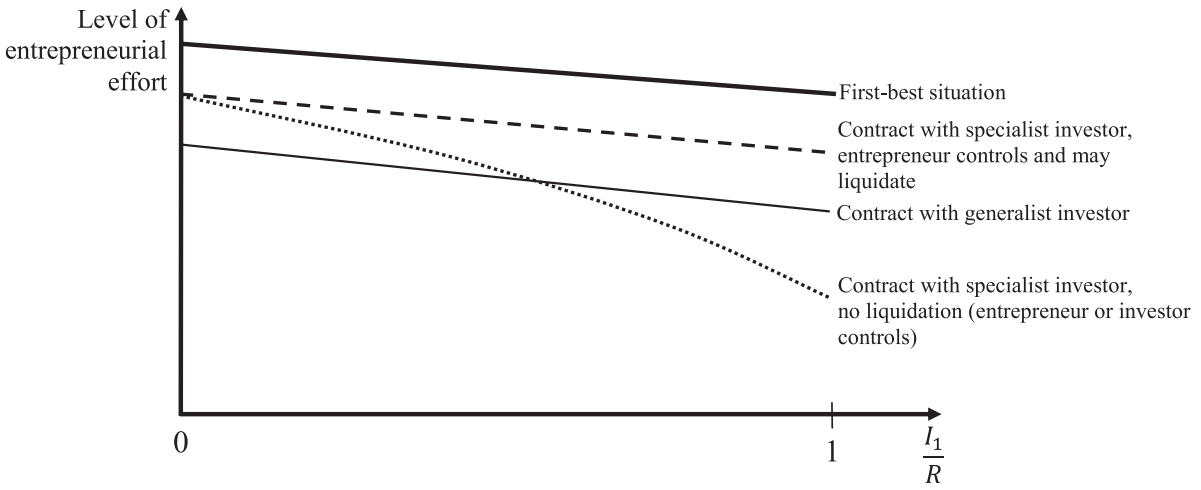

Fig. 4. Entrepreneurial effort contingent on the required expansion capital I1 and based on the contract and control right allocation.

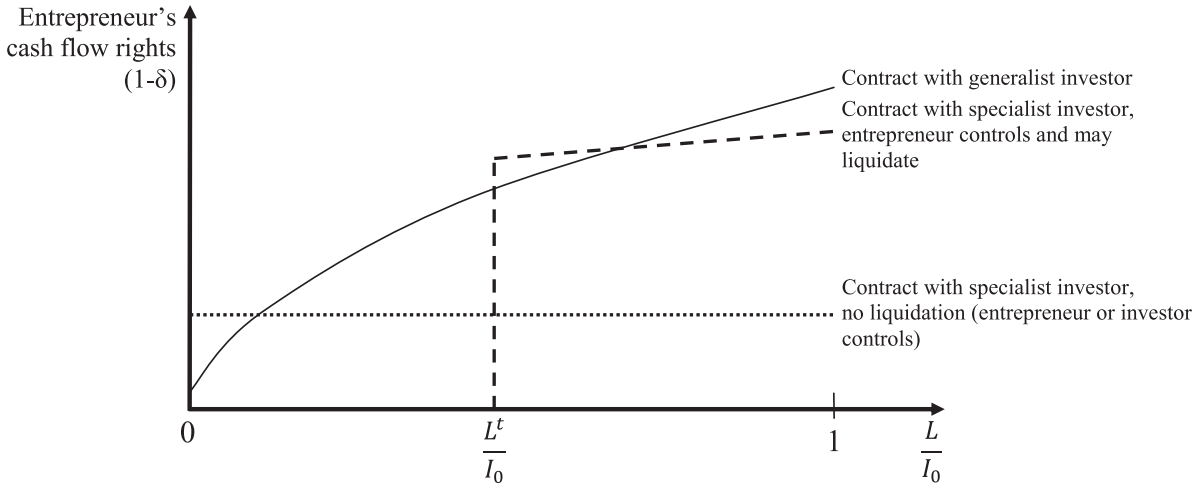

Fig. 5. Entrepreneur's cash flow rights $(1-\delta)$ contingent on the liquidation proceeds and based on the contract and control right allocation.

encourages greater effort than the contract with the generalist investor.[14] If liquidation is prevented, then entrepreneurial effort may be higher or lower compared with the effort with the generalist.

6.2. Cash flow rights for the entrepreneur

A second central model feature is the allocation of cash flow rights to the entrepreneur and investor. Fair allocation ensures that the entrepreneur is rewarded for her effort and the investor for putting capital at risk. Both parties benefit from the investor's support, which enhances the entrepreneurial effort and the project's NPV.

Proposition 7. *The entrepreneur's cash flow rights with a specialist are higher in the case where she has discretion about the project continuation if and only if:*

$$e_S^I < (1-q)\left[e_S^E + \frac{L_S^E}{c_S}\right]$$

The proposition shows that for reasonable values of q, and if the level of effort when the entrepreneur decides is sufficiently high,[15] then the entrepreneur receives more cash flow rights if she controls.

Fig. 5 presents the entrepreneur's cash flow rights over the recovery ratio according to the possible contracts.

[14] Remark: At reasonable levels of c_S and c_L.

[15] Remark: This is likely to be the case due to the absence of inefficient continuation decisions.

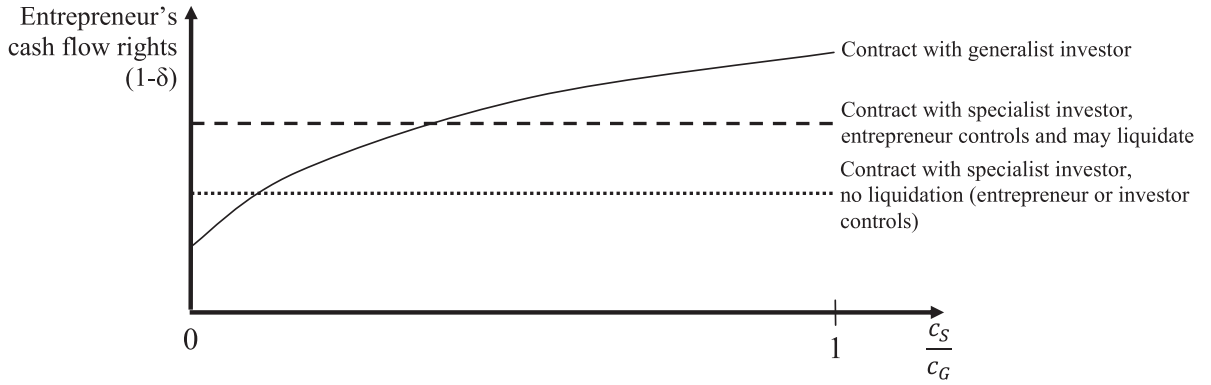

Fig. 6. Entrepreneur's cash flow rights $(1-\delta)$ contingent on the difference in the quality of the investors' support (cS/cL) at a given level of cS and based on the contract and control right allocation.

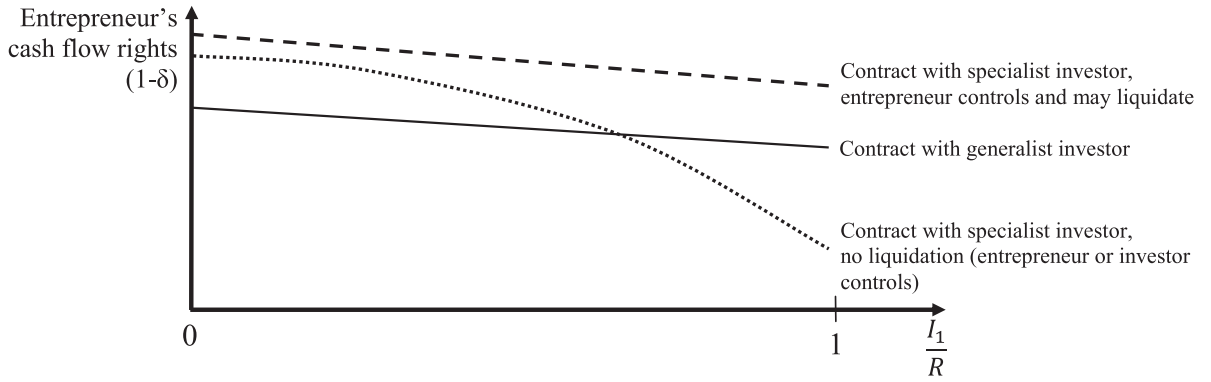

Fig. 7. Entrepreneur's cash flow rights $(1-\delta)$ contingent on the required expansion capital I1 and based on the contract and control right allocation.

The figure reveals that liquidation proceeds do not impact the contract with a specialized investor who controls, simply because the venture is never liquidated. If liquidation were possible, we assume that higher proceeds would decrease the investor's required cash flow rights. The rationale is as follows: The liquidation proceeds lower the investor's losses in bad states of nature. Hence, the investor demands less compensation in the favorable state, leaving greater cash flow rights to the entrepreneur. There is an additional effect with the generalist investor: Since all of the liquidation proceeds flow to the investor, the entrepreneur is highly incentivized to avoid liquidation by expending much effort.

Fig. 6 presents the relationship between the entrepreneur's cash flow rights and the difference in support quality of the two investors according to the possible contracts at a given level of c_S.

The figure shows that if the entrepreneur is backed by a specialist investor, then her fraction of the cash flow rights will be higher with a contract allowing liquidation compared with a contract preventing it. If she is backed by a generalist, her stake in the venture can be smaller or larger than with a specialist, depending on the difference in support quality. If the generalist can provide support as good as that of the specialist, he will be the better choice.

Fig. 7 shows the entrepreneur's cash flow rights over the required expansion capital I_1.

In general, the higher the amount of required expansion capital, the more cash flow rights the entrepreneur needs to relinquish. If the investor's exposure increases, he will demand higher compensation. We note the entrepreneur needs to give up a large stake in her venture especially in the case of a contract preventing liquidation with high expansion financing requirements.

6.3. Comparison of NPVs

A third pivotal model feature is the NPV of the project because it is particularly important for the entrepreneur to assess the impact of her choice of investor and the control right allocation on her personal wealth. Therefore, we compare the NPVs generated with the two investors and according to the two possible allocations of control rights. We require that the investors compete in a competitive market and that the entrepreneur have full bargaining power. Consequently, she recovers the full NPV and weighs the comparative benefits of either investor including the question if she has to relinquish control.

We assume first that the entrepreneur contracts with a specialist. If the investor controls, then the project is never liquidated. This corresponds to a pooling equilibrium where bad projects are inefficiently continued. If the entrepreneur

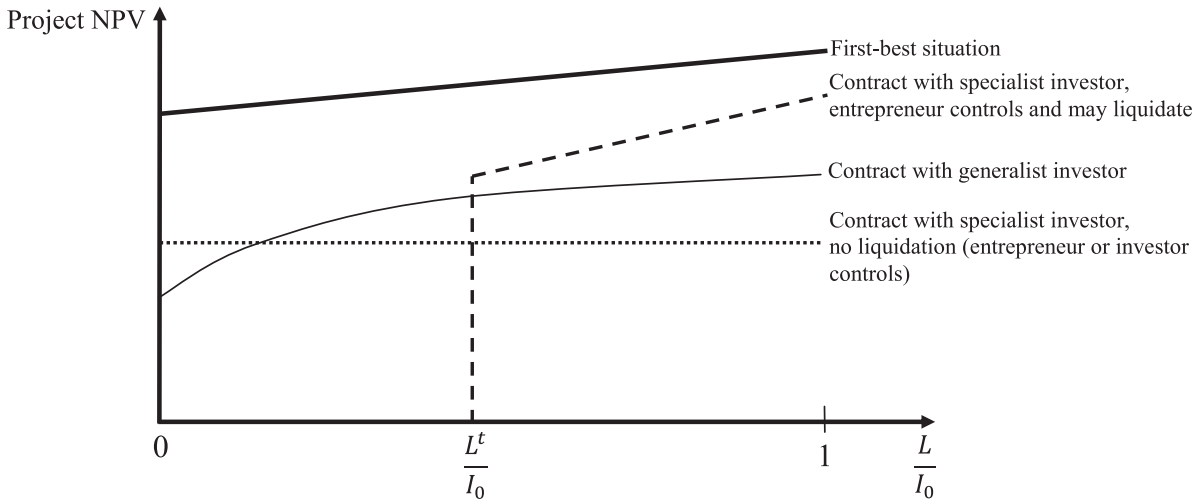

Fig. 8. Project's NPV contingent on the venture's liquidation proceeds and based on the contract and control right allocation.

controls, two situations are possible. In the first one, she perfectly replicates the former equilibrium. In the second one, she makes optimal continuation decisions and the NPV is higher. However, this situation requires large enough liquidation proceeds to give her an incentive to liquidate.

If the entrepreneur selects a generalist, the allocation of control rights has no impact. Whatever happens, the investor forces her to liquidate by refusing to inject additional capital in bad states of nature. Therefore, an optimal continuation decision is made because this signals the bad quality of the venture to any potential outside investor and prevents a new financing round. The generalist in fact has the abandonment option for the project and discretion about its future, independent of the formal allocation of decision power.

The following proposition summarizes this result:

Proposition 8. *With a specialized investor, if $L < L_t$, the entrepreneur is indifferent to having control rights. If $L \geq L_t$ the entrepreneur strives for control and actually has it. Comparatively, a generalist investor always has control.*

The following proposition sets up the determinants of the entrepreneur's choice of an investor:

Proposition 9. *If $L < L_t$, the entrepreneur prefers a generalist instead of a specialized investor if the conditions of Proposition 3 are met. If $L \geq L_t$, the entrepreneur prefers the specialist if and only if the following two conditions are true:*

I. $(R - I_1 - L)^2 \geqslant 2c_G\left[e_S^E(R - I_1 - L) - c_S\frac{(e_S^E)^2}{2}\right]$ *and*

II. $e_G \geqslant \frac{R - I_1 - L - \sqrt{(R-I_1-L)^2 - 2c_G\left[e_S^E(R-I_1-L) - c_S\frac{(e_S^E)^2}{2}\right]}}{c_G}$.

In both cases, optimal continuation decisions are made. With a specialist, and if the entrepreneur controls the venture, then she has an incentive to liquidate bad projects because she obtains an equal payoff as if she had decided to continue. With a generalist, it would be the investor who triggers the liquidation of bad projects. As above, the main determinants are the venture's recovery rate, the difference in the support quality of both investors, and the value of the required expansion capital.

Fig. 8 shows the entrepreneur's NPV over the liquidation proceeds of the venture.

Below the threshold L^t, liquidation is ruled out and either the generalist or specialist investor may be preferable, according to Figure 8. However, above the threshold, the contract allowing liquidation with the specialist maximizes the project's NPV.

In Fig. 9, we present the project's NPV contingent on the difference in the support quality of the two investors according to the possible equilibria at a given level of c_S.

We observe that, given a large difference in the support quality between the two investors, the generalist is less beneficial. However, if the difference diminishes, the NPV with the generalist investor reaches the first-best level. The figure also reveals that the NPV of the contract with the specialist that allows liquidation is above that of the contract that prevents it. Nevertheless, the NPVs of the possible contracts with the specialist investor are independent of the difference in support quality.

Last, in Fig. 10 we focus on the link between the NPV of the project and the required expansion money.

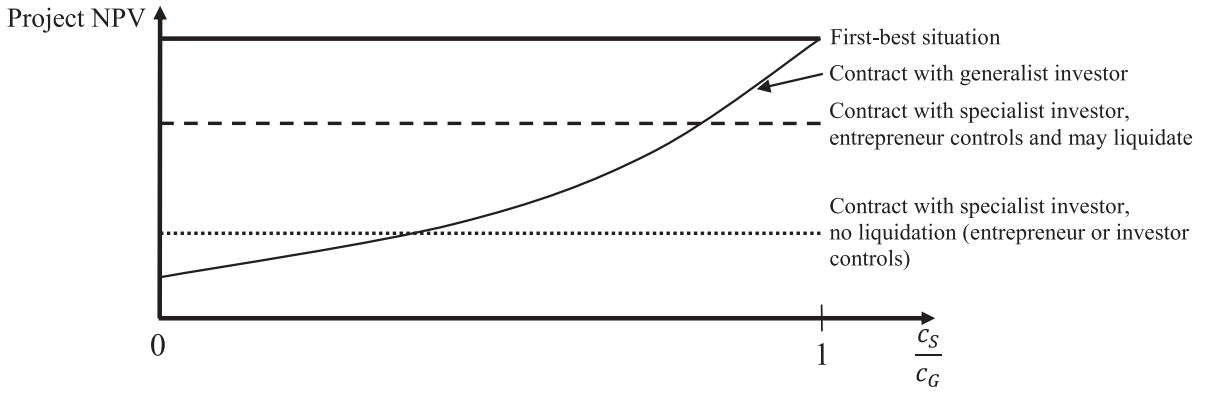

Fig. 9. Project's NPV contingent on the difference in the quality of the investors' support (cS/cL) at a given level of cS and based on the contract and control right allocation.

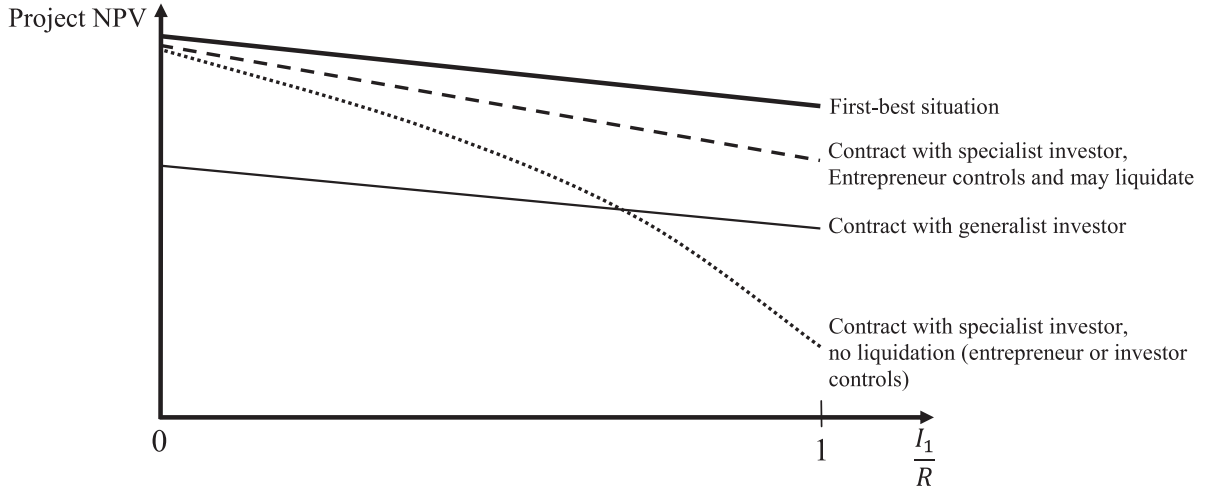

Fig. 10. Project's NPV contingent on the required expansion capital I1 and based on the contract and control right allocation.

In principle, the larger the expansion capital requirement, the lower the venture's NPV will be. We also point out that the contract with the specialist investor that prevents liquidation is inferior to all other possibilities if the venture's financing needs are great. Contrarily, if the expansion investment is low, then the project's NPV can approach the first-best level if the specialist investor is chosen.

6.4. Discussion

Previous work, such as that by Aghion and Bolton (1992), emphasizes that investors in startup corporations should have control to prevent entrepreneurs from extracting private benefits at the expense of their investors. The authors show that in some cases entrepreneurs need to relinquish control to receive outside financing. However, they do not include the improved performance of the venture resulting from the support of its investors. Our model deals with the support provided by the investors and the impact on the entrepreneurial effort and the venture's value. We reveal that, under certain conditions, as derived above, it is optimal to leave control to the entrepreneur. If the financier is a specialist and the liquidation proceeds are not too low, then the entrepreneur will make optimal continuation decisions, thus increasing the venture's value.

Our model shows that backing by a specialist investor does not systematically yield bad continuation decisions. To reach the first-best equilibrium, it is necessary to refuse any stake in the potential liquidation proceeds to the entrepreneur to highpower her effort. This motivates the use of liquidation preferences in entrepreneurial finance. However, the drawback of structuring these preferences is that if the investor does not control the company, then the entrepreneur will continue the project even if it should be abandoned because of the slight chance (expressed by our measure of probability q) that the venture still might succeed. We show that if the entrepreneur receives a fraction of the liquidation proceeds that equals her reserve utility (i.e., the expected profit of continuing the project), she will consistently liquidate bad projects. However, at the same time, granting liquidation proceeds to the entrepreneur reduces her incentive to exert effort. Hence, this imposes an additional trade-off in structuring entrepreneurial finance transactions. This finding adds to the existing literature

by demonstrating that entrepreneurs do not necessarily continue bad projects instead of liquidating them. Cestone (2014), for example, shows that it can be beneficial to allocate more control rights to entrepreneurs because even if investors' support improves entrepreneurial effort, their interference may also discourage the founders (e.g., if they force entrepreneurs to follow a different strategy). In a different context, Manso (2011) shows that compensation in the case of early failure motivates managers to innovate. Otherwise, they would prefer a conservative strategy. However, liquidation preferences do not only affect the discontinuation or strategy decisions of entrepreneurs, but they may also have an impact on the timing of projects. This is highlighted in Schwienbacher (2007), who finds that full liquidation preferences for investors are an appropriate tool to incentivize entrepreneurs not to delay a venture.

Our model does not include any non-pecuniary continuation benefits. If we were to consider these benefits, they would only impact the contract by assigning a higher stake in the liquidation proceeds to the entrepreneur to compensate for an increased reserve utility. One might also argue that the continuation benefits are rather small if a venture is performing poorly. Bascha and Walz (2001), Bayar and Chemmanur (2011), and Cumming (2008) have so far only investigated continuation benefits for well-performing ventures. To our knowledge, Marx's (1998) paper is the only one that assumes that continuation benefits might exist even when a venture is close to liquidation. Yet, these benefits are probably low because of the challenge of running a poorly performing startup. In addition, the entrepreneur's opportunity cost reduces these continuation benefits: A new, eventually more successful venture could be started based on the experience of failure that she has meanwhile gained.

In our model, the generalist investor has an important advantage and the allocation of control does not affect the derived equilibrium. The investor is able to provide expansion capital and there is no information asymmetry toward an additional outside investor. Due to his long-term investment horizon, it is impossible for him to sell a lemon prematurely because any new investor would understand that only unsuccessful ventures are for sale. For her startup financing decision, the entrepreneur should therefore thoroughly weigh the benefits and disadvantages of the two investors: the better support provided by the specialist against the effect of systematically better continuation decisions if a generalist is selected.

We refer to specialized and generalist investors in a general way but note that the group of specialized investors mainly consists of independent seed-stage venture capital funds and to some extent (professionally acting) business angels. Both types of players in the entrepreneurial finance market fit well to our model assumptions. The group of the generalist investors is more heterogeneous. For example, "friends and family" can back startups in early stages. However, there is not much public information available on them as a financial resource. One can nevertheless assume that their investment rationale is not conventional, but based on personal ties. Their investment horizon may be long but the willingness to wind up the venture if unsuccessful is probably limited. Therefore, "friends and family" do not correspond to important requirements of our model. Similarly, this is valid for government subsidies or government sponsored venture capital funds. Brander et al. (2010) find that these investors are weaker than independent venture capitalists or business angels in terms of their support to entrepreneurial ventures. They are rather long-term investors but probably also lack the characteristic of making efficient liquidation decisions. Lerner (2008) analyzes and describes the investment rationale of publicly sponsored venture capital funds: These investors have no incentive to wind up corporations because this usually destroys employment or violates other political goals - and this is not in the interest of their sponsors.

A third subgroup of generalist investors consists of banks or bank-affiliated venture capital firms. This group also fulfills our model's assumptions: Bottazzi et al. (2008) provide evidence that these investors are less active and successful with respect to supporting startups. Winton and Yerramilli (2008) note that they protect themselves quite well from spending additional resources when they receive signals that their investees are failing. Similarly, this seems to be valid for crowd financing. Although empirical evidence on this relatively young source of capital is not yet available in this respect, if the information on the actual state of the venture at the interim state ($t = 1$) is appropriately dispersed, then the crowd also matches our model assumptions about a generalist investor who liquidates efficiently.

6.5. Empirical predictions

Our model suggests several empirical predictions. For example, first-time independent seed-stage venture capital funds have substantial pressure to build up reputation. Gompers (1996) argues that the investors of these funds consider early exits as proofs of appropriate deal-making capabilities. But performance pressure is high not only for young and first-time funds. For independent funds of older vintages, especially those that are close to their termination, the pressure for exiting via secondary transactions may rise. Ibrahim (2012) describes the actors in secondary venture capital markets. He concludes, in line with Arcot et al. (2015), that gaining liquidity is their most important motivation, which justifies our model assumptions. He further observes that the secondary market is not a market for lemons. This claim is empirically supported by Puri and Zarutskie (2012), who find that venture capital failures are not camouflaged as secondary transactions. This is exactly what our model suggests: Constraint investors reduce their exposure to present a successful track record to their investors. Their divestitures include not only eventually failed startups but also promising but not yet mature ventures. Hence, our model helps explain the rise in the secondary market and we predict that it will reveal a mix of investment failures and successful exits, not different from that of the primary venture capital market.

Our model further proposes that it can be advantageous for specialist investors to leave some of the venture's potential liquidation proceeds to the entrepreneur. This raises the project's NPV but motivates shirking at the same time. The net effect might be positive or negative, depending on the quality of the investor's support, other determinants in our model,

and the possibility of delaying the project, as discussed by Schwienbacher (2007). Nevertheless, the current standard of venture capital financing structures is based on the use of convertible preferred equity providing a full liquidation preference to the investors. Venture capitalists eventually consider the highest possible recovery of their investment in the case of a failure more important than the incentivizing benefit of leaving some part of the proceeds to the entrepreneur. More sophisticated players might conclude that they increase their own NPV if the entrepreneur participates in the liquidation proceeds. This is especially valid for those venture capitalists who provide strong support and can therefore more easily compensate the negative effect of shirking. Empirical analyses of standard contractual conditions in venture capital-backed transactions related to the ventures' success might reveal this pattern.

The model also suggests that generalists would rather invest in asset-based ventures with higher potential liquidation proceeds, usually in traditional industries. This is in line with the prediction that specialists - to whom we assign better support - invest more frequently in innovative and risky startups where the benefits of superior support quality are presumably large and liquidation proceeds low.[16]

Another empirically testable prediction is that independent venture capitalists may follow riskier transactions toward the end of their funds' lifetime. If they cannot hold the exposure until the maturity of the venture and have to divest via a secondary transaction, then they are not affected by the final outcome of the project. This incentivizes risky behavior. Crain (2016) made a first step in revealing this effect. He finds that, conditional on having successfully exited some of the earlier transactions, venture capitalists tend to invest in riskier startups in later stages of their fund lifecycle.

Table 1 in the online appendix to this paper presents the testable hypotheses, existing research, and potential avenues for future research. We also provide guidance on the data required for subsequent research.

7. Conclusion

Entrepreneurs with promising ventures have access to various sources of capital. For their own good, they need to select the financier who contributes the highest benefit. Their benefit is primarily expressed by two aspects: What is the value of the venture and how much of it do they need to relinquish contingent on the chosen investor? The investor who provides capital at the lowest cost and does not require control might therefore be the preferred one. Passive investors, such as banks, bank-affiliated or government-sponsored venture capital funds, or the crowd, might be considered to be low-cost (i.e., at least lower than independent venture capital) sources of capital and they do not usually ask for particular controlling rights. Thus, they might be preferable sources of funding for new ventures. However, the literature on contracting in entrepreneurial finance generally supports the notion that investors should have control rights in order to prevent entrepreneurs from hold-ups. Moreover, a passive investor does not usually provide support other than financial to its investees, unlike business angels or venture capitalists. Support can add value to a venture and it thus increases the benefit for both the entrepreneur and the investor. Last, lack of support and control could also motivate the entrepreneur to shirk.

We address these issues, with particular focus on the investment horizon of investors, the support they provide, the allocation of control rights over the venture, and its impact on the efficiency of continuation decisions. We develop a two-staged model in which seed and expansion investments need to be made. We consider two types of investors: one, the generalist, is passive and has a long-term investment horizon, being able to finance the venture until its maturity. The other one, the specialist, is active but exits the venture at its interim stage.

Our model predicts several important results. First, generalist investors with a long-term investment horizon encourage optimal continuation decisions independently of the allocation of control about the venture. Even if the investor does not have the control, refusing to inject expansion capital if a venture performs below budget triggers its liquidation. Hence, passive long-term investors do not need to control the venture. Second, the first-best optimum will not be replicated if the generalist is not as skilled as a specialized active investor. One major advantage of business angels or venture capital firms is their active involvement in guiding, supporting and controlling their investees. According to our model, lower support quality yields less entrepreneurial effort, a lower likelihood of success and, hence, a lower NPV of the project. Third, our model suggests that active specialist investors have no incentive to liquidate ventures. We demonstrate that allocating control rights to the entrepreneur may reduce this inefficiency and that it is possible to design a contract such that the entrepreneur will liquidate a bad project if she has the discretion. However, this requires a participation in the liquidation proceeds, which simultaneously decreases her incentive to exert effort and therefore the project's NPV as well. Fourth, we show that in addition to the above-discussed mechanisms, the entrepreneur's cash flow rights are contingent on several of the model parameters. The combination of the venture's NPV and her stake in the exit proceeds determines the entrepreneur's wealth. For this reason, the entrepreneur has a particular interest in evaluating the best financing alternative with respect to our model parameters. Either the passive or the active investor is preferable, contingent on the support that is required, the necessary expansion money, the expected exit proceeds, the probability of success, the project's liquidation value, and her preparedness to relinquish control.

A future avenue of research could be to include the probability of an unobservable requirement to exit at the interim stage. This would be an interesting extension of our model that would introduce another level of information asymmetry and it seems promising to analyze the optimal contract in this context. Furthermore, as our model does not allow syndication

[16] The specialists would not liquidate according to our model and therefore their investment decision is independent of the potential liquidation proceeds.

of the two types of investors, it would be interesting to determine how the setting would change if it were possible to combine the comparative advantages of the two investors.

Supplementary material

Supplementary material associated with this article can be found, in the online version, at 10.1016/j.euroecorev.2017.10.012.

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