When and why do venture-backed companies obtain venture lending?

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Abstract

We consider informed early-stage VCs that decide how to finance their companies with uncertain prospects in the late stage. Good companies with less upside potential and higher liquidation value frequently turn to venture lending investors and VCs signal their type. These companies tend to use late-stage VC only if the fraction of good companies in the population is high. When companies benefit from monitoring and advice of late-stage VCs and if uncertainty is high, early-stage VCs prefer VC over venture lending. Empirical evidence from over 50,000 rounds in US venture-backed companies between 1995 and 2013 is consistent with these predictions.

Keywords: venture lending, venture capital, private information, high-growth entrepreneurial companies, stage financing

JEL Classification: G24, G32
1 Introduction

The reasons why high-growth entrepreneurial companies at the pre-revenue are poor candidates for debt financing are many. From the perspective of agency cost theories, debt gives rise to the asset substitution problem (Jensen and Meckling, 1976), may lead to underinvestment (Stulz, 1990) and may generate information costs for creditors (Harris and Raviv, 1990). These disadvantages of debt are particularly relevant in high-growth entrepreneurial companies, which face risky investment opportunities and a high likelihood of failure. Agency cost theories suggest that these disadvantages are traded off against benefits of debt. More specifically, debt mitigates agency problems between shareholders and managers, such as perk consumption (Jensen and Meckling, 1976) or overinvestment problem (Jensen, 1986). However, perk consumption and overinvestment do not seem to be crucial in high-growth entrepreneurial companies, in which managers typically hold large stakes, and which usually are not subject to the agency costs of free cash flows. Rather, high-growth entrepreneurial companies lack stable cash flows to serve and repay the debt. They typically have little assets-in-place to provide collateral to foreclose in the event of default. The theoretical literature on capital structure has demonstrated that companies with low levels of cash flows from operations and many growth opportunities rely on equity rather than debt (see Harris and Raviv, 1991 for a literature review).

At first sight, pecking order theory (Myers and Majluf, 1984) would conclude that high-growth entrepreneurial companies should prefer debt because the information asymmetry is large, making equity too expensive. However, more recent literature suggests that these companies face severe debt capacity constraints (Lemon and Zender, 2010), which limit their ability to borrow. Also, empirical evidence does not find much support for the pecking order theory.

The literature has used these arguments to explain equity-like contracts used in venture capital (VC) financing. With VC financing, entrepreneurial companies benefit from close monitoring and advice that VC investors offer in addition to the capital injection. For example, Hellmann and Puri (2002) demonstrate that venture capitalists play a significant role in the professionalization of entrepreneurial companies.

Although high-growth entrepreneurial companies seem to be poor candidates for debt financing, recent evidence suggests that, in combination with equity financing from VC firms,
these companies often receive loans. These loans come from institutions that specialize in venture lending (VL), i.e., in providing loans, but not close monitoring and advice, to entrepreneurial companies that traditional banks turn away. The aim of this paper is to contribute to our understanding of the reasons behind lending to young high-growth entrepreneurial companies with uncertain future prospects. Our model helps understand when and why these companies, that obtained VC in the early stage, turn to VL firms for funding their business growth instead of raising a new round of VC. We are also interested how the possibility to obtain VL in the late stage affects the availability of early-stage VC financing. To investigate these issues, we model the early-stage VC investor’s decision to turn either to a late-stage VC or to a VL investor to finance the next stage. The difference between a VC and a VL investor, which both have less information than the early-stage VC investor, rests not only in their financial claims (performance-dependent vs. fixed claim) and the dilutive effect these claims have on the early-stage VC investor’s stake, but also in the ability to increase the company value through monitoring and advice.

VL first appeared in the US in the 1970s (see Hardymon et al., 2005) and it has developed since then to a viable industry. Fischer and Rassenfosse (2013) estimate the size of the US VL industry to reach 3 billion USD in 2010 (about 1/8 of the US VC industry), with Silicon Valley Bank being the largest provider of VL (see Ibrahim, 2010). A descriptive study on European VL by British Private Equity and Venture Capital Association (BVCA, 2010) suggests that VL started to evolve much later in Europe than in the US, namely at the end of the 1990s and that venture lenders provided over 10% of venture money invested in 2007 in Europe. Despite the large importance of VL, we do not know much about the forces that shape it because this topic has remained almost completely unexplored by academic researchers. The existing research is limited to case investigations (Crawford, 2003; Hardymon and Leamon, 2001; Hardymon et al., 2005; Roberts et al., 2008) and studies based on interviews (Fischer and Rassenfosse, 2013; Ibrahim, 2010).

Several studies that deal specifically with financing entrepreneurial ventures model these companies’ choice between VC and bank finance. Winton and Yerramilli (2008) find that VC is optimal when the liquidation value is low, but returns are high if the venture turns successful, if the company development strategy is highly uncertain and the success probability is low. De Bettignies and Brander (2007) model a situation in which both VC investor and the entrepreneur provide effort and a two-sided moral hazard problem arises. They
demonstrate that companies prefer VC over bank finance when VC investors can provide a high level of management support. Our paper is related to these studies, but it differs since we model the early-stage VC investor decision – whether to turn to a late-stage VC or a VL investor to finance company growth – in the framework of staged financing and not the one-off company decision between debt or equity.

We believe that our modeling captures several empirically observed patterns in financing entrepreneurial companies as well as institutional details of VC and VL investing that the above mentioned studies have ignored. First, our model explicitly takes into account that entrepreneurial companies typically obtain financing in several stages (Sahlman, 1990). Second, we consider that, rather than taking the exclusive decision between VL and VC, entrepreneurial companies that obtain VL typically obtain VC as well (Hardymon et al., 2005; Ibrahim, 2010). Third, in our model, the company is financed by a VC investor in the early stage and the VL investor may join in the late stage. Existing research on VL in the US suggests that the VC investor usually comes first, while the VL investor follows (Hardymon et al., 2005; Ibrahim, 2010). In Europe, the above mentioned BVCA (2010) study maps 123 VL deals in 2007 and shows that a typical company that obtains VL gets VC in the first round and VL in the second round; only 18 VL deals took place in the first round. Fourth, by modelling the VC decision, we acknowledge that VC investors are equipped with extensive control rights that allow them to determine or at least co-determine who will be the new investors in the next stage.

Our paper suggests that in the perfect information case, i.e., when the late-stage investors are able to observe the same signal about the entrepreneurial company as the early-stage VC, the early-stage VC would prefer another VC round to a VL round. This is because the late-stage VC would also provide monitoring and advice that may increase company value. In the asymmetric information case, i.e., when the early-stage VC investor has more precise information about the future growth prospects of the portfolio company than the potential new investor, the early-stage VC investor may strictly prefer VL to VC. We derive the financing choice in the late stage from a signaling model with a varying fraction of good and bad companies in the population. Early-stage VC investors prefer to signal the high quality of their companies and ask for VL particularly for companies with less attractive growth opportunities and higher liquidation values. These companies tend to use VC (without signaling) only if the fraction of good companies is high. If a company has a high upside,
a low liquidation value and/or if the late-stage VC investor is capable to add large value through monitoring and advice, early-stage VC investors prefer VC to VL. The model also implies that when companies face high uncertainty, early-stage VC investors turn rather to a VC than to a VL partner in the late stage.

Beyond shedding light on the rationales behind the emerging VL industry, this paper also demonstrates that a viable VL industry may lead to an increase in the number of companies that obtain early-stage VC. This is because early-stage VC investors are more willing to invest in entrepreneurial companies ex-ante, knowing that if the company turns out not to be a particularly attractive investment in the late stage, it can still provide some positive returns to the early-stage VC upon exit after the second round of financing.

The model generates a number of empirical predictions, which we test by analyzing a sample of 50,623 financing rounds in 12,629 US venture-backed companies in the period 1995-2013. We track the financing choice (VC versus VL) and find a widespread use of VL: 28.7% of the sample companies obtained at least one VL round. In the empirical analyses we relate the financing choice to the factors discussed above. The results lend support to the predictions derived from the model.

This paper is organized as follows. We briefly describe how VC industry operates in Section 2. Section 3 sets up the model under perfect information. Section 4 introduces the choice of financing as a possible signal in the case of asymmetric information. We describe the data and present some descriptive statistics in Section 5. We present our empirical analyses in Section 6. Section 7 concludes.

2 Features of venture capital financing

Despite its modest size, VC industry has gave rise to many successful enterprises, which have produced major innovations, such as Google, Intel, Apple Computer, Microsoft, Cisco, Facebook, Skype, Sun Microsystems, Federal Express, Genentech and many others. VC investors provide capital to young innovative entrepreneurial companies that tend to have very risky return distributions and inexperienced management (e.g., Sahlman, 1990). These investments are plagued by substantial information asymmetries and agency problems. VC investors have developed several mechanisms them help them cope with these problems. Below, we summarize those features of VC financing and those mechanisms that are most
important to our paper.

One important mechanism is staging of investments (Sahlman, 1990), i.e., providing financing in rounds, conditional on milestones being met. Staging gives VC investors the option to revalue the project and to stop it. The threat of liquidation induces entrepreneur to work hard and mitigates the moral hazard behavior (Neher, 1999; Bergemann and Hege, 1998; Noeldeke and Schmidt, 1998). Staging may also help reduce the risk of adverse selection as those entrepreneurs that do not believe their projects are of high quality would not accept it. Consequently, staging may be employed as a signal that distinguishes good entrepreneurs from bad (Barry, 1994).

Another mechanism is syndication. Several papers argue that in later stages new investors join the early-stage VC investors and that such syndication may be a device to cope with information asymmetries and agency problems. For example, Fluck et al. (2005) demonstrate how the VC investor’s commitment to syndicate in later stages can alleviate the holdup problem that the entrepreneur faces. Admati and Pfleiderer (1994) argue that VC investors may take a suboptimal continuation decision when projects are financed in stages. In their model, syndication with outside VC investors in later stages may resolve this problem. Empirical evidence suggest that VC investors typically specialize in financing a particular development stage of companies. Consequently, when a company proceeds to the next development stage, it searches for new investors. Schwienbacher (2013) collects data on all VC funds raised between 2005 and 2011 in the United States and reports that 46.8% of the funds have an early-stage focus, 44.4% have a later-stage focus, and only 8.8% are generalists.

An important feature that distinguishes VC investors from VL investors is that the former offer, besides money, also monitoring and advice. Monitoring addresses problems of diverging incentives between founder managers and investors; advice aims at compensating the insufficient experience of the founder managers. VC investors provide professional advice in formulating the company strategy or in transforming the invention into a product. They have established networks which may be beneficial to introduce the company to potential suppliers and customers or to help hire key personnel. The active monitoring and advising role of VC investors has been explored in many papers that demonstrate that these activities add value. As an example, Hellmann and Puri (2002) find that VC investors play an important role in the professionalization of the companies they finance. In syndicated investments,
VC investors may combine their unique and potentially complementary resources (Bygrave, 1987; Manigart et al., 2006) and increase further the value-added over solo investors (e.g., Brander et al., 2002).

VC investors employ equity or equity-like instruments. Theoretical literature (e.g., Schmidt, 2003; Cornelli and Yosha, 2003) is dominated by the view that convertible securities, which let the VC investors participate on the company upside potential, but give them at the same time a liquidation preference if company performs badly, are the optimal form of VC finance. Also in older US-based empirical papers, convertible securities come out as the dominant form of financing in VC contracts (Kaplan and Stroemberg, 2003). Recent empirical papers that analyze data from other countries have changed this picture. For example, Cumming (2006) demonstrates that in Canada, VC investors mostly use common equity.

A final important feature, which the model builds on, is that VC investors do not obtain regular ongoing payments, such as dividends, from their portfolio companies. Rather, VC investors finance companies for a limited period of time and harvest at the exit (e.g., Black and Gilson, 1998; Cumming, 2008), when they sell their portfolio company to a strategic buyer via a trade sale or take it public in an initial public offering (IPO).

3 The model: perfect information

Consider a high-growth entrepreneurial company that has raised VC financing in the early stage. When the company needs the next stage of financing (one unit of capital is needed in the late stage), it still faces uncertain prospects. The uncertainty about the company prospects is resolved at the end of the late stage. As the company does not produce a positive cash flow at the end of the early stage, the late-stage investment must be financed from external sources. The early-stage VC investor, that has provided financing in the first stage, has small funds and therefore does not have enough capital to finance the necessary investment. Many other potential capital providers that are willing to provide financing to companies in the late stage exist. We expect competition to drive their returns towards zero. For simplicity we further assume all investors to be risk neutral and we set the discount rate to zero. Without the late-stage investment, the company will be liquidated at the end of the first period. The liquidation value is $l$. When the early-stage VC succeeds in finding another
capital provider for the late-stage period, the uncertainty and information asymmetry will be resolved at the end of that period. At this time, liquid markets (IPO or trade sale) exist that allow VC investors to sell the company for its true value.¹

The new investor may be either a late-stage VC investor or a VL investor. Beyond the type of financing (equity vs. debt), another important difference exists between VC and VL financing. The late-stage VC investor provides specific advice and monitoring services to the company that the early-stage investor cannot offer in this stage (as it specializes on the early-stage) and that may increase the value of a good company, while the VL investor does not provide such services. Thus, early-stage VC investors face a trade-off when deciding whether to turn to a VC or a VL investor to finance the late stage. If they turn to a VC investor they face dilution of their equity stake as the late-stage VC investor obtains an equity fraction α on the company, while the VL investor obtains a fixed interest payment i. However, early-stage VC investors, as equity investors, may profit when a late-stage VC investor joins because this investor’s value-adding services may increase company value.

We assume that only two types of companies (bad and good) and two states of nature (high and low) exist. The expected company value depends on the type of financing in the late stage (VC or VL), the company type and the state of nature. With the participation of the early-stage VC investor (and financing from a VL investor in the late stage), the company value equals h in the high state, while in the low state the company value remains at the early-stage liquidation value l (l<h) for both company types. We assume that the liquidation value does not cover the late-stage investment (l<1). The value of a good company can be levered up with the monitoring and advice services that the late-stage VC investor provides. Only good companies in the high state can benefit from these services and their value increases to kh (k>1) with a late-stage VC investor. The company type does not affect the company value in each state, but affects the likelihood that the high state of nature occurs, which is higher for good companies than for bad companies. Good companies likely (with a probability p>0.5) end in a high state and bad companies likely end in a low state. However, even good companies may end, with a probability 1−p, in a low state (and bad companies may end, with the same probability, in a high state). Thus, there is an idiosyncratic risk, which causes the

¹The results of the model still hold if uncertainty is resolved at the end of the second period and we allow VC investors to stay invested in the company instead of exiting. In this case they would hold shares of a known value instead of selling these shares for this value.
exact late-stage outcome to remain uncertain at the end of the first period. The parameter $p$ captures the level of certainty. At the end of the first period the market participants form their expectations about the value of a bad ($b$) company at the end of the next period:

$$E(V_b) = pl + (1 - p)h .$$

(1)

The expected value of a good ($g$) company, which a VL investor co-finances, is:

$$E(V_{gVL}) = ph + (1 - p)l .$$

(2)

If, instead, a late-stage VC investor co-finances the good company, its expected value reaches:

$$E(V_{gVC}) = pkh + (1 - p)l .$$

(3)

Under perfect information everybody can observe the true company quality at the end of the first period. In a more realistic setting, which we will analyze in Section 4, the early-stage VC investor receives a signal about the future profitability of the company, while the external investors cannot observe company quality until the end of the next period. In this model, we ignore the entrepreneur and let the early-stage VC investor to make the decision. Alternatively, we could imagine a group of “initial investors” (consisting of an early-stage VC investor and an entrepreneur) that provide monetary investment and joint effort in the early stage, but remain passive in the late stage. Several studies demonstrate that entrepreneurial effort is particularly beneficial in the early-stage, but less so in the late stage when entrepreneurs even are replaced by professional outside managers in many cases (e.g., Hellmann and Puri, 2002).

Let us assume that bad companies are not worth funding in the late stage because their net expected value $pl + (1 - p)h - 1$ is lower than the liquidation value $l$ at the end of the first period. On the contrary, we assume that good companies are worth funding in the second period, i.e., $ph + (1 - p)l - 1 > l$.

Due to the perfect competition among potential new investors, these investors will be willing to finance the company when they expect their initial investment of one unit to be repaid. For bad companies, the net expected value at the end of the second period turns negative. Thus, the early-stage VC investor will be better off when it terminates the
investment and obtains \( l \) rather than when it turns to a late-stage investor. We derive the exact early-stage VC investor’s payoffs in each situation in Appendix A. As \( pkh + (1-p)l - 1 > ph + (1-p)l - 1 > l \), early-stage VC investors with good companies will choose to continue and their preferred choice will be VC. The late-stage VC investor obtains a fraction

\[
\alpha_{sym} = \frac{1}{ph + (1-p)l}.
\]

The potential disadvantage of sharing the upside when the company obtains VC is thus irrelevant under perfect information because the additional value that a late-stage VC investor may generate will accrue to the early-stage VC investor, due to the competition in the late-stage market. Because we do not want to introduce a further parameter into the model, we assume that the late-stage VC investor’s effort is costless \((c = 0)\). However, if a late-stage VC investor exerts costly effort \((c > 0)\), it must be compensated (and obtain at least \(1 + c\) in order to break-even). As long as the effort cost \(c\) is low enough \((ph(k - 1) > c)\), the model outcome in the perfect information setting will not change.\(^2\) To sum up, bad companies will be liquidated after the early stage and good companies will be financed with VC in the late stage. VL will not occur.

4 The model: asymmetric information

Under asymmetric information, the incoming late-stage (VC or VL) investors are no longer able to observe the quality of a specific company. They only know the distribution of company types. The fraction of good companies in the population is \(\lambda\) \((0 < \lambda < 1)\), which is the prior belief of potential late-stage investors about the probability of facing a good company.

When company type is private information to the early-stage VC investor, the above analysis changes substantially. In general, early-stage VC investors that own good companies suffer from the existence of bad companies. As we will show further down, early-stage VC investors have to give up a larger fraction of equity or rely on VL when the potential late-stage investors cannot distinguish between the company types. Due to this, separation through signaling (either VC or VL) may be a potentially beneficial strategy.

\(^2\)In the asymmetric information setting, costly effort decreases the relative attractiveness of VC, especially that of VC pooling. For some parameter settings, the model outcome may change when we consider effort cost. As long as the effort cost is small enough, it will be a small range of parameter combinations.
In the following, we develop the model under asymmetric information and we determine the optimal strategy of the early-stage VC investor that finances a good company. We show how the strategy varies with changing company characteristics, late-stage VC investor’s ability to add value and market conditions.

Our setting is a sequential Bayesian game. The early-stage VC investor undertakes the first move, i.e., it either liquidates the company or it announces how the company should be financed in the late stage. This announcement consists of VC-VL choice and financing conditions (fraction \( \alpha \) or interest rate \( i \)) at which late-stage investors can participate. Potential late-stage investors act subsequently. Based on the announced action they update their beliefs of facing a good company by the use of Bayes’ rule. If it is possible to draw conclusions from the early-stage VC investor’s actions, their belief about the probability of facing a good company will change compared to the prior belief \( \lambda \).

4.1 Venture capital

We start by modelling the situation, in which VL does not exist so that the late-stage investment can only be financed by a new VC investor. We will relax this assumption in Sections 4.2 and 4.3, in which we consider the financing from a VL investor and how the early-stage VC investor chooses between VC and VL. We established the first-best behavior in a perfect information benchmark in Section 3. When everybody can perfectly observe the company type, all profitable projects will be executed (and all good companies obtain financing), while all non-profitable projects will be stopped (and all bad companies will be liquidated). This outcome does not necessarily hold when information is asymmetric. This is because early-stage VC investors with bad companies benefit from mimicking good companies.

If late-stage investors cannot distinguish whether the company type is bad or good, early-stage VC investors with good companies (“good types”) may decide to signal company quality by offering a higher fraction \( \alpha_{sep} > \alpha_{sym} \) on the company. In order to prevent the early-stage VC investor with a bad company (“bad type”) from mimicking, good types must ensure that the bad type does not benefit from following the good type. When the bad type mimics the good type, it expects a value of \((1 - \alpha_{sep})(pl + (1 - p)h)\). The bad type compares this value to its value under truth telling, which equals \( l \). Consequently, the incentive compatibility
constraint of the bad type becomes \((1 - \alpha_{sep})(pl + (1 - p)h) \leq l\), resulting in the minimum fraction that the good type must pay in order to separate itself from the bad type:

\[
\alpha_{sep} = 1 - \frac{l}{pl + (1 - p)h}.
\]  

(5)

Furthermore, the incentives of the good type have to be taken into account. For a separating equilibrium to exist, this VC investor must benefit from separating compared (i) to a liquidation and (ii) to being perceived as a bad type. We assume that the late-stage VC investor’s value added is large enough \((k > \frac{h(p-1)(l(p-1)+1)-(l(p-1)^2+p)}{h(p-1)p(h-l)})\) to make liquidation be the inferior choice to separating for good companies.

Let us consider what happens if late-stage investors are not able to distinguish between good and bad companies and if they believe that all (good and bad) companies are in the market. Then, they expect a company value of \(\lambda(pk(h+(1-p)l)) + (1 - \lambda)(pl + (1 - p)h)\) and require a fraction:

\[
\alpha_{pool} = \frac{1}{\lambda(pk(h+(1-p)l)) + (1 - \lambda)(pl + (1 - p)h)}.
\]  

(6)

Depending on the model parameters, the VC investor with a good company will choose to separate whenever \(\alpha_{pool} \geq \alpha_{sep}\), otherwise it will pool with the bad type. By the intuitive criterion (Cho and Kreps, 1987) the separating equilibrium is uniquely selected. Thus, if we only consider VC financing, the following proposition holds:

**Proposition 1** If \(\alpha_{pool} \geq \alpha_{sep}\) (see Equations (5) and (6)), then an equity separating equilibrium exists, in which good companies obtain late-stage VC financing (early-stage VC investor gives up a fraction \(\alpha_{sep}\)) and bad companies are liquidated (leaving the early-stage VC investor with the liquidation value of 1).

If \(\alpha_{pool} < \alpha_{sep}\) both types obtain VC financing in the late stage and the early-stage VC investor gives up a fraction \(\alpha_{pool}\).

Without imposing further restrictions on parameter values, no closed-form solution exists. We solve it numerically, for varying fraction of good companies in the population \(\lambda\), by using the base parametrization \((h = 2.1, l = 0.2, p = 0.6, k = 1.05)\) and by changing one of these parameters at a time. We show the results in Figure 1. For higher \(\lambda\), pooling becomes more
attractive for good companies as the harm caused by the existence of bad companies reduces. Pooling gets more attractive for high-potential than low-potential companies (high values of \( h \)), for companies with low liquidation values (low values of \( l \)) and when the late-stage VC investor is able to add large value (high values of \( k \)).

### 4.2 Venture lending

Instead of asking a VC investor, the early-stage VC investor can turn to a VL investor for providing the late-stage financing. In the low state, the early-stage VC investor’s revenue at the end of the second period is zero and the VL investor obtains \( l < 1 \). In the high state, the VL investor obtains \((1 + i)\) and the early-stage VC investor gets \( h - (1 + i) \).

If late-stage investors cannot distinguish whether the company is bad or good, the early-stage VC investors with good companies may decide to signal their quality by offering an interest rate \( i_{sep} \). In order to prevent the bad type from mimicking, the good type must ensure that the bad type does not benefit from following the good type. When the bad type mimics the good type, it expects a value of \( pl + (1 - p)h - (1 + i) \). The bad type compares this value to its value under truth telling, which is \( l \). Consequently, the incentive compatibility constraint of the bad type becomes \( (p.0 + (1 - p)(h - (1 + i)) \leq l \), resulting in the minimum interest rate that the good type must pay in order to separate itself from the bad type:

\[
i_{sep} = h - 1 - \frac{l}{1 - p}.
\] (7)

For a separating equilibrium to exist, the good type must benefit from separating compared to a liquidation. We assume that the company in the high state is valuable enough \((h > l + \frac{l}{1-p} + \frac{l}{p})\) so that liquidation is the inferior choice to separating for good type. In addition, the good type must prefer separating to being perceived as a bad type. Let us consider what happens if the latter occurs, VL investors are unable to distinguish between good and bad companies and believe that all companies are in the market. In this situation, VL investors will expect to receive \( \lambda(p(1 + i) + (1 - p)l) + (1 - \lambda)(pl + (1 - p)(1 + i)) \) and require a fraction:

\[
i_{pool} = \frac{p - lp + \lambda - l\lambda - 2p\lambda + 2lp\lambda}{1 - p - \lambda + 2p\lambda}.
\] (8)

The early-stage VC investor with a good company will choose to separate whenever
$i_{pool} \geq i_{sep}$, otherwise it will pool with the bad type. By the intuitive criterion (Cho and Kreps, 1987) the separating equilibrium is uniquely selected. Thus, the following proposition holds:

**Proposition 2** If $i_{pool} \geq i_{sep}$ (see Equations (7) and (8)), then a VL separating equilibrium exists, in which good companies obtain late-stage VL (early-stage VC investor promises to pay an interest rate $i_{sep}$) and bad companies are liquidated (leaving the early-stage VC investor with the liquidation value of $l$).

If $i_{pool} < i_{sep}$ both types obtain VL in the late stage and the early-stage VC investor promises to pay an interest rate $i_{pool}$.

The choice between VL pooling and separation depends on the parameter constellation. We again modify the base parametrization ($h = 2.1, l = 0.2, p = 0.6, k = 1.05$) by varying one parameter at a time. The fraction of good companies in the population is $\lambda$. We depict the results in Figure 2.

As with VC, for higher $\lambda$ pooling gets more attractive for good companies. Also, pooling is more attractive for high-potential than low-potential companies (high values of $h$) and for companies with low liquidation values (low values of $l$). Clearly, the late-stage VC investor ability is irrelevant when we consider only VL in the late stage.

### 4.3 The VC-VL choice

Under symmetric information, VL never was the optimal choice of financing as it induced a dead weight loss because the value adding potential of the late-stage VC investor remained unused. However, VL might serve as a signal if information gets asymmetric. As we will shown further down, under some situations, even VL pooling may be chosen. Early-stage VC investors with good companies will select between $VC_{pool}$, $VC_{sep}$, $VL_{pool}$ and $VL_{sep}$ the
type of financing that maximizes their expected revenue (see Appendix B):

\[
RVC_{g,\text{pool}} = \frac{hk\rho + l(-p) + l - 1}{h((\lambda k + \lambda - 1)p - \lambda + 1) + l(-2\lambda p + p + \lambda)}
\]

(9)

\[
RVC_{g,\text{sep}} = \frac{l(hk\rho + l(-p) + l)}{h(-p) + h + lp}
\]

(10)

\[
RVL_{g,\text{pool}} = \frac{p(h((2\lambda - 1)p - \lambda + 1) + l(-2\lambda p + p + \lambda) - 1)}{(2\lambda - 1)p - \lambda + 1}
\]

(11)

\[
RVL_{g,\text{sep}} = \frac{lp}{1 - p}
\]

(12)

Good companies will never be liquidated as \(RVL_{\text{sep}}\) generates a higher expected revenue for the early-stage VC investor than liquidation (\(\frac{lp}{1 - p} > l\) because \(p > 0.5\)). Without imposing further restrictions on parameter values, no closed-form solution exists. Under different parameter constellations early-stage VC investors with good companies take different decisions, which we specify in Table 1. We once more solve the model numerically by using the base parametrization (\(h = 2.1, l = 0.2, p = 0.6, k = 1.05\)) and by varying one parameter at a time. Fraction of good companies in the population is \(\lambda\). Figure 3 shows the results.

Early-stage VC investors with good companies with a low upside potential \(h\) or a high liquidation value \(l\) prefer VL in the late stage and they signal the company type. Only if the fraction of good companies in the population \(\lambda\) is sufficiently high, good companies pool with bad companies in the late stage and use VC. Moreover, when good companies can profit from the high value added by late-stage VC investors \(k\), early-stage VC investors tend to ask a VC investor to join them in the late stage. Also, in periods of a very high volatility (low level of certainty \(p\)), early-stage VC investors turn to another VC investor rather than a VL.

### 4.4 Threshold level for early-stage VC financing

As we have seen above, VL generates, under some parameter constellations, higher expected revenues for the early-stage VC investor with a good company than VC financing. In this section we want to answer the question whether more or less projects obtain early-stage financing when we extend the set of potential financing choices and allow for VL as an alternative to VC in the late stage.

Let us consider a decision of an early-stage VC investor whether or not to invest an
amount $I$ in a new company. At this time, the potential early-stage VC investor knows the parameter constellation $(h, l, p, k$ and $\lambda)$, but it does not know the exact company type. Thus, the early-stage VC investor knows what the revenue maximizing solution (and the level of its revenue) will be if it turns out to be a good company and it also knows the solution and its revenue if the company turns out to be a bad one.

The VC investor forms its return expectations by weighting these values by $\lambda$ and $(1 - \lambda)$ and only invests in a company if the required investment $I$ does not exceed the expected return. Let us denote $I_T$ the threshold early-stage investment, for which the VC investor just breaks even. Those companies that require investments larger than $I_T$ will not obtain early-stage VC financing. If we restrict the late-stage financing to VC only, this threshold investment may decrease (a lower number of companies get early-stage VC financing), but it may also increase (more companies obtain early-stage VC financing) compared to the situation, in which both, VC and VL are possible. The latter will be the case in situations, in which VL separation is the preferred choice in the late stage (when VL and VC are possible), but VC pooling would have been selected if VL was not possible. The reason is that VC pooling generates a higher expected revenue for the early-stage VC investors that own bad companies than VL separation. If the size of this “benefit” for bad companies weighted by the fraction of bad companies in the population outweighs the “loss” for good companies weighted by their fraction, the threshold for project financing rises if both VC and VL are possible. In most situations, the existence of a VL industry increases the number of positive value projects and, thus, the amount of early-stage VC financing. As we see from Figures 1 and 2, only a few parameter constellations exist, in which the opposite is the case (i.e., we observe a VL separation in Figure 2 and VC pooling in Figure 1).³

Table 2 illustrates this point with a numerical example using our baseline parameters. It shows the threshold levels $I_T$ for varying shares of good companies in the population if VC and VL are possible (Panel A) and if only VC is possible (Panel B). In most situations, the option to employ VL in the late stage increases the threshold for the early-stage investment.⁴

³The threshold with VL separation is $\frac{\lambda l}{1-p} + (1 - \lambda)l$. With VC pooling it reaches $h((\lambda k + \lambda - 1)p - \lambda + 1) + l(-2\lambda p + p + \lambda) - 1$.

⁴As in previous sections, we have ignored that the VC investors’ effort may be costly to keep the number of parameters tractable. If the effort of the late-stage VC investor was costly, VL would get more attractive in the late stage. Effort cost in the early stage would reduce the threshold level in both situations (with and without the possibility of VL) as the early-stage VC investor would require not only the compensation for its monetary contribution but also for its effort in the early stage.
To sum up, VL can be seen as a valuable option to early-stage VC investors. The option increases the value of their investment so that they are ex-ante willing to finance also companies which would not be financed if only VC financing was available in the late stage. When only VC financing in the late stage was available, in some cases the early-stage VC investor would have to dilute its stakes too much in the late stage, leading ex-ante to a negative net expected revenue, in which case the VC investor prefers not to participate in the early stage. VL may help reduce these inefficiencies that arise due to information asymmetries when late-stage financing is needed.

5 Data and descriptive statistics

Our model develops several predictions, which we test empirically. To this aim, we employ a sample of US VC-backed start-ups and track their financing and exits in the period 1995-2013. We combine company, deal, VC, industry and market data from several sources: VentureSource, Capital IQ, Orbis, NVCA, website sources and reports.

5.1 Data on venture lending and exits

The investment data comes from the Dow Jones VentureSource database that provides information on all financing rounds and exits of venture backed-companies. To identify new investment rounds, VentureSource scans public disclosures, web pages, news, etc. In addition, they contact VC funds, which are supposed to update their data quarterly. Compared to other VC databases, such as Thomson Venture Economics, VentureSource provides a much better coverage of rounds financed with debt.

From VentureSource, we extract information on all financing rounds of all US companies that were founded between 1995 and 2008. The reason for why we do not consider companies founded later than 2008 is that some of these companies still might be in venture capitalists’ portfolios but we want to include all financing rounds and the exit event for each company. Further, we remove those companies for which we do not know the exact date for each financing round. Also companies with a management buy-in and public investments in a private company are excluded from the sample. The final sample consists of 50,623 financing rounds in 12,629 companies.
Table 3 depict the sample composition. 3,625 companies obtained VL, which corresponds to 28.7% of all sample companies. 15.9% of all rounds contained VL. VL is most prominent in Energy and Utilities as well as in Healthcare. We observe two upward jumps in VL, which emerged after the burst of the dot.com bubble and after the start of the recent financial crisis. In parallel, we notice a drop in VC fundraising in these times (see Figure 4).

Albeit VentureSource provides data on exits, bankruptcies are underrepresented. This is a common problem, which researchers face when dealing with this and comparable databases that rely on information provided by the industry participants. To address this problem, we use the approach established by the previous literature and assume that companies that have not recorded any financing round for a “substantially long” period are out of business.\(^5\) After applying this approach, 77% of all companies are exited at the end of our sample period. The bankruptcy rate among these companies is 49%, which is comparable to 50% in the sample of Hall and Woodward (2010).

### 5.2 Regressors of interest

From our model, we have concluded that VL is preferred if the fraction of good companies in the population is low. We employ two alternative variables to capture the distribution of company quality in the population: POD and INDPOD. These variables, which we obtain from S&P (2013), reflect the annual default rates of non-investment grade bonds of all US companies (POD) and of each industry (INDPOD). A higher value of these variables is associated with a higher default probability in the market and in the respective industry (i.e., a lower fraction of good companies in the market and the respective industry). We therefore expect a positive relationship between these variables and the likelihood that a company obtains VL.

Another prediction states that VL should be used if the company cannot profit much from the new VC value added. We expect the new VC value added to be more beneficial when the company is young and when the company has not involved a reputable VC already in the past. Our first variable to proxy for the potential benefits from VC support is thus company

\(^5\)For each type of round, we calculate the 95 percentile of duration between this and the next round. If the last financing round recorded in VentureSource for a particular company is not an exit round and the duration between this round and the end of the sample period exceeds the 95 percentile, this company is imputed to be bankrupt. Related studies, e.g., Hall and Woodward (2010), also impute bankruptcy when no financing round occurs within a pre-defined period of time.
age (AGE), which we obtain from VentureSource. As companies grow older, the potential for the VC value added decreases and companies more likely obtain VL. We therefore expect a positive sign. Second, we use the Lee-Pollock-Jin VC Reputation Index, which is available on an annual basis from the Timothy G. Pollock’s website\(^6\), and employ the rank of the best-ranked VC that participated in previous rounds, RANK(BEST). As the rank gets worse (1 is the top rank), the potential for the new VC value added increases. Consequently, we expect a negative sign.

Moreover, the model suggests that uncertainty should be negatively related to the use of VL. We employ the standard deviation of the S&P index returns over the period of 125 trading days prior to the financing round (SD) to capture overall market uncertainty. At the industry level, we calculate industry beta from returns over the same period (INDSD). We obtain return data from S&P Capital IQ. These variables should have a negative sign.

In addition, high liquidation value should support VL. Company liquidation value is positively related to the ratio of property, plant and equipment to total assets (e.g., Lemon and Zender, 2010), fixed assets to total assets (e.g., Rajan and Zingales, 1995) or tangible assets to total assets (e.g., Brav, 2009). We obtain these variables (PPE_TA, FE_TA, TANG_TA) from Bureau van Dijk Orbis database. Including these company specific variables substantially reduces the size of our sample as most of our sample companies are not covered in Orbis (we used the Orbis online database, which covers ten years back, as well as historical Orbis databases). We expect a positive sign on these variables.

6 Empirical results

6.1 Determinants of venture lending

Table 4 depicts results from logit regressions at the round level. The binary dependent variable equals one if a company obtains VL in a particular round, zero otherwise. As regressors, we employ the variables described in Section 5.2. In addition, to control for conditions in the VC industry, we include the variable VCfundraising, which captures the annual VC fundraising activity (NVCA, 2014). We also add dummies for US states with large VC or VL activity (California, Massachusetts, New York, Texas and Pennsylvania); all

\(^6\)http://www.timothypollock.com/vc_reputation.htm
other states represent the omitted category. Finally, we use dummies to control for industry, company and time effects that may be correlated with our regressors as well as with the type of financing companies obtain.

The first four regressions do not include any company specific effects. The variables POD and INDPOD have a positive sign and are highly significant, suggesting that if the fraction of good companies in the population is low (i.e., the value of POD and INDPOD is high), the likelihood to obtain VL increases. AGE is positively related to the likelihood to obtain VL, indicating that older companies more likely obtain VL. RANK(BEST) has a negative sign and is highly significant, supporting the view that the likelihood to obtain VL increases when a highly-ranked VC (i.e., the value of RANK(BEST) is low) provided financing to the company in the past. These two results are in line with the model prediction that VL is used if the company cannot profit much from the potential VC value added. Firms are less likely to use VL when uncertainty is high, which is reflected in the negative coefficients on SD and INDS. The coefficient on INDS, however, loses its significance when we include industry fixed effects. Models (5)-(8) add company fixed effects and models (7) and (8) employ also time fixed effects. The results remain similar, albeit a few variables lose their statistical significance.

The final six regressions include company characteristics that proxy for liquidation value. All three proxies (described in Section 5.2) are highly statistically significant and positive, suggesting that the likelihood to obtain VL increases with a higher liquidation value. In these regressions, the sample size drops dramatically. Despite this drop, company age and VC rank remain statistically significant, while the market and industry effects lose their significance. All in all, the results in Table 4 support the model predictions.

6.2 Venture lending and success

The model further implies that VL is preferred by companies with a low upside. We expect that the upside will be reflected in the way how the VC exits and that companies with a low upside tend to have successful exits less frequently than companies that have a higher upside. Following much of the literature on venture capital performance (e.g., Hochberg et al., 2007), we classify companies with an IPO or a trade sale as successful. We therefore expect a negative relationship between VL and a successful exit.
Table 5 depicts the results from cross-sectional models that regress successful exit on VL dummy, which indicates whether the company obtained VL in its history, and a set of control variables. The binary dependent variable is one for IPOs and trade sales and zero otherwise. As control variables, we include number of financing rounds prior to exit (No. rounds), a dummy variable for syndication (SYNDICATION), the rank of the best-ranked VC investor (RANK(BEST)), the market default rate (POD), the standard deviation of the S&P index returns (SD) and the VC fundraising level (VCfundraising).

The first three columns show results from different specifications of logit regressions (with or without time and industry fixed effects). These results indicate that VL is negatively related to success. The potential endogeneity of the financing choice represents a serious caveat to these analyses. For example, the financing choice as well as company success may be related to some unobservable company specific characteristics, which we cannot control for.

To deal with this potential endogeneity, we perform a two-step estimation. In our setting, we have binary dependent variables (success and VL) in both stages. Angrist and Krueger (2001, p. 80) note serious potential concerns with a probit two-stage model. Therefore, we rely on linear models in the first and the second stage. We use the standard IV approach with a variance-covariance estimator that is robust to heteroscedasticity. As instrumental variables, we employ five dummies for US states, in which VC or VL activity is strong. The likelihood that a particular company obtains VL (VC) should be positively related to the VL (VC) supply in the state, in which the company is located. We do not expect state dummies to be related to the company success or to the residuals from the second stage regression. To be able to compare the results from the IV estimation (column 5) and a one-step estimation, we show the results from a simple OLS model in column 4.

The results from the IV regression confirm the negative relation between VL and success. In this regression, we include all control variables and we also control for time and industry fixed effects. The economic significance of VL in the IV regression drops slightly compared to a simple OLS regression. The statistical significance drops substantially, but the effect remains significant at the 10% level. We perform several tests to check that our IV spec-

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7 In the first step regression, all these dummies have their expected signs and are significant. When we included these variables in the success regression, none of them was significant.

8 Alternatively to using state dummies, we employed the fraction of VL deals in the particular state and year (excluding the deal under consideration) as a single instrument. The results are very similar.
ification is reasonable. We test for overidentifying restrictions with the Hansen test. The joint null hypotheses that the instruments are valid and that the excluded instruments are correctly excluded cannot be rejected (J test statistic has a value of 0.63). Kleibergen-Paap underidentification LM and Wald test statistics, which are at 74.35 and 75.17, reject the null hypothesis, which is underidentification. The results of these three tests give us confidence that our instruments may be adequate to identify the equation. In addition, we test for weak instruments. The value of the Kleinbergen-Paap F test statistic in the first stage regression has a value of 15.01, suggesting that the bias of the IV estimator is between five and ten percent of the OLS bias according to the critical values from Stock-Yogo test, which are 18.37 (5%) and 10.83 (10%).

To sum up, our results confirm the model prediction that VL is preferred by companies with a low upside, which is reflected in a lower success probability of companies that obtain VL. Albeit the VL decision seems to be endogeneous, the negative relationship between VL and success persists when we control for this endogeneity.

7 Summary and conclusion

This paper investigates venture lending – an important, but yet under-studied source of entrepreneurial finance. In the first part of the paper, we model the early-stage VC investor’s decision to turn to different types of syndicate partners (VC or VL investors) to join in the late stage when these potential partners do not know the company quality, while the early-stage VC investor does. Besides continuation through the late stage, the early-stage VC investor also has the option to liquidate the company. Our results suggest that VL does not occur under perfect information, but – when information is asymmetric – it becomes attractive as a signal of company quality and is observed for a large range of parameters related to company and market characteristics as well as late-stage VC investor’s value-adding abilities. In contrast, the applicability of VC financing as a signal remains quite low. If VC financing is used, it more often results in a pooling equilibrium.

More precisely, with a higher liquidation value and a lower upside potential, early-stage VC investors tend to rely on VL in the late stage and they signal the company type. VC financing (without signaling) occurs particularly in situations when not many bad companies exist in the population so that they do not harm the good companies too much. Also, VC
financing is preferred when the uncertainty regarding the final outcome increases. Finally, for companies that can largely profit from value added by a late-stage VC investor, the early-stage VC investor tends to turn to another VC investor instead of a VL investor. Our findings shed light on the rationales behind the emerging VL industry and deliver several testable implications for the choice between VC and VL and the relationship between the financing choice and success.

In the second part of the paper, we conduct empirical analyses to test the model predictions. Our results from a large sample of US venture-backed companies lend support to the model predictions. They are robust towards different specifications as well as endogeneity.

We believe that our paper opens a promising field for future research. Our model could be extended and include a dynamic component, which would help in understanding how venture capital investors and venture lenders interplay and build their networks and which effects repeated relationships may have on the financing choice as well as success of high-growth entrepreneurial companies. Further research also should investigate the economic effects that VL has on the provision of capital to early-stage high-growth entrepreneurial companies, a question we touched only briefly. Last but not least, as most governments around the world are aware of the inefficiencies that exist in start-up financing and aim at improving the financing conditions for high-growth entrepreneurial companies, the findings of this paper and further research in this area may have important consequences for the design of public policies towards the emerging VL industry.

Appendix

A Early-stage VC investor’s expected payoffs with a bad company under perfect information

Below we derive early-stage VC investor’s expected payoffs with a bad company.

If a VC investor co-finances the company in the late stage, this VC investor obtains a fraction $\alpha$ in turn for its investment and its payoff thus amounts to

- $\alpha h$ in the high state
• \(al\) in the low state

Given the model setting, the expected value of this payoff must equal the invested sum of one unit, i.e., \((1 - p)ah + pal = 1\), resulting in \(\alpha = \frac{1}{(1-p)h+pl}\). This leaves the early-stage VC investor with \(pl + (1 - p)h - 1 < l\).

If a VL investor co-finances the company in the late stage, this VL investor obtains a promised interest \(i\) in turn for its investment. Its payoff thus is

• \(1 + i\) in the high state

• \(l\) in the low state

Again, the expected value of this payoff must equal the invested sum of one unit, i.e., \((1 - p)(1 + i) + pl = 1\), resulting in \(i = \frac{p(1-l)}{1-p}\). This leaves the early-stage VC investor with \(p \cdot 0 + (1 - p)(h - (1 + \frac{p(1-l)}{1-p}))\), i.e., \(pl + (1 - p)h - 1 < l\).

Thus, the early-stage VC investor with a bad company prefers liquidation.

B Early-stage VC investor’s expected payoffs under asymmetric information

If \(\frac{hp-h-lp+l}{hp-h-lp} > \frac{1}{h((\lambda k + \lambda - 1)p - \lambda + 1) + l(-2\lambda p + p + \lambda)}\) then early-stage VC investors with good companies prefer VC pooling to VC separation and their expected revenue (with VC pooling) is:

\[
RV C_{g,\text{pool}} = (1 - a_{\text{pool}})(hk p + l(1 - p))
\]

with \(a_{\text{pool}} = \frac{1}{h((\lambda k + \lambda - 1)p - \lambda + 1) + l(-2\lambda p + p + \lambda)}\)

\[
RV C_{g,\text{pool}} = (hk p + l(-p) + l) \cdot (1 - \frac{1}{h((\lambda k + \lambda - 1)p - \lambda + 1) + l(-2\lambda p + p + \lambda)}).
\]
The early-stage VC investor with a bad company expects to obtain in this case:

\[
RVC_{b,pool} = (1 - a_{pool})(lp + h(1 - p))
\]
\[
RVC_{b,pool} = (h(-p) + h + lp)
\]
\[
\frac{1}{h((\lambda k + \lambda - 1)p - \lambda + 1) + l(-2\lambda p + p + \lambda)).
\]

If \( \frac{hp - h - lp + l}{hp - h - lp} \leq \frac{1}{h((\lambda k + \lambda - 1)p - \lambda + 1) + l(-2\lambda p + p + \lambda)} \) then early-stage VC investors with good companies prefer VC separation to VC pooling and their expected revenue in this case is:

\[
RVC_{g,sep} = (1 - a_{sep})(hk p + l(1 - p))
\]
with \( a_{sep} = \frac{hp - h - lp + l}{hp - h - lp} \)

\[
RVC_{g,sep} = \frac{l(hk p + l(-p) + l)}{h(-p) + h + lp}.
\]

The early-stage VC investor with a bad company does not prefer mimicking the good company to liquidation because it would not obtain a higher expected revenue:

\[
RVC_{b,sep} = (1 - a_{sep})(lp + h(1 - p))
\]
\[
RVC_{b,sep} = (1 - \frac{hp - h - lp + l}{hp - h - lp})(lp + h(1 - p))
\]
\[
RVC_{b,sep} = l.
\]

If \( \frac{p - lp + \lambda - l\lambda - 2p\lambda + 2p\lambda}{1 - p - \lambda + 2p\lambda} < h - 1 - \frac{l}{1 - p} \) then early-stage VC investors with good companies prefer VL pooling to VL separation and their expected revenue with VL pooling amounts
to:

\[ RVL_{g,pool} = p(h - (1 + i_{pool})) \]

with \( i_{pool} = \frac{l(-p) + 2\lambda p - \lambda l + p - 2\lambda p + \lambda}{2\lambda p - p - \lambda + 1} \)

\[ RVL_{g,pool} = \frac{p(h((2\lambda - 1)p - \lambda + 1) + l(-2\lambda p + p + \lambda) - 1)}{(2\lambda - 1)p - \lambda + 1} . \]

The early-stage VC investor with a bad company expects to obtain in this case:

\[ RVL_{b,pool} = (1 - p)(h - (1 + i_{pool})) \]

\[ RVL_{b,pool} = \frac{(1 - p)(h((2\lambda - 1)p - \lambda + 1) + l(-2\lambda p + p + \lambda) - 1)}{(2\lambda - 1)p - \lambda + 1} . \]

If \( \frac{p - l - \lambda - l - 2\lambda l + 2l\lambda}{1 - p - \lambda + 2p\lambda} \geq h - 1 - \frac{l}{1 - p} \) then early-stage VC investors with good companies prefer VL separation to VL pooling and their expected revenue with VL separation is:

\[ RVL_{g,sep} = p(h - (1 + i_{sep})) \]

with \( i_{sep} = h - \frac{l}{1 - p} - 1 \)

\[ RVL_{g,sep} = \frac{lp}{1 - p} . \]

The early-stage VC investor with a bad company does not prefer mimicking the good
company to liquidation because it would not obtain a higher expected revenue:

\[
RV L_{b, sep} = (1 - p)(h - (1 + i_{sep}))
\]

\[
RV L_{b, sep} = (1 - p)(h - (1 + h - \frac{l}{1 - p} - 1))
\]

\[
RV L_{b, sep} = l .
\]

References


Figures and Tables

Figure 1: Venture capital only

- High state value \( h \)
- Low state value \( l \)
- Level of certainty \( p \)
- VC value added \( k \)
Figure 2: Venture lending only
Figure 3: The VC-VL choice

- High state value $h$
- Low state value $l$
- Level of certainty $p$
- VC value added $k$
Figure 4: Venture debt over time

Source: Venture Source, NVCA (2014)
Table 1: The VC-VL choice

<table>
<thead>
<tr>
<th>Situation</th>
<th>Condition 1</th>
<th>Condition 2</th>
<th>Condition 3</th>
<th>Decision</th>
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<tbody>
<tr>
<td>1</td>
<td>$\alpha_{pool} &lt; \alpha_{sep}$</td>
<td>$t_{pool} &lt; t_{sep}$</td>
<td>$RV_{C_{pool}} &lt; RV_{L_{pool}}$</td>
<td>RVL_{g,pool}</td>
</tr>
<tr>
<td>2</td>
<td>$\alpha_{pool} &lt; \alpha_{sep}$</td>
<td>$t_{pool} &lt; t_{sep}$</td>
<td>$RV_{C_{pool}} \geq RV_{L_{pool}}$</td>
<td>RVC_{g,pool}</td>
</tr>
<tr>
<td>3</td>
<td>$\alpha_{pool} \geq \alpha_{sep}$</td>
<td>$t_{pool} &lt; t_{sep}$</td>
<td>$RV_{C_{sep}} &lt; RV_{L_{sep}}$</td>
<td>RVL_{g,sep}</td>
</tr>
<tr>
<td>4</td>
<td>$\alpha_{pool} \geq \alpha_{sep}$</td>
<td>$t_{pool} &lt; t_{sep}$</td>
<td>$RV_{C_{sep}} \geq RV_{L_{sep}}$</td>
<td>RVC_{g,sep}</td>
</tr>
<tr>
<td>5</td>
<td>$\alpha_{pool} &lt; \alpha_{sep}$</td>
<td>$t_{pool} \geq t_{sep}$</td>
<td>$RV_{C_{pool}} &lt; RV_{L_{sep}}$</td>
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<td>6</td>
<td>$\alpha_{pool} &lt; \alpha_{sep}$</td>
<td>$t_{pool} \geq t_{sep}$</td>
<td>$RV_{C_{pool}} \geq RV_{L_{sep}}$</td>
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<td>7</td>
<td>$\alpha_{pool} \geq \alpha_{sep}$</td>
<td>$t_{pool} \geq t_{sep}$</td>
<td>$RV_{C_{pool}} &lt; RV_{L_{pool}}$</td>
<td>RVL_{g,sep}</td>
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<td>8</td>
<td>$\alpha_{pool} \geq \alpha_{sep}$</td>
<td>$t_{pool} \geq t_{sep}$</td>
<td>$RV_{C_{sep}} \geq RV_{L_{sep}}$</td>
<td>RVC_{g,sep}</td>
</tr>
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Table 2: Threshold investment levels for early-stage VC financing

<table>
<thead>
<tr>
<th>$\lambda$</th>
<th>0.1</th>
<th>0.3</th>
<th>0.5</th>
<th>0.7</th>
<th>0.9</th>
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<tr>
<td>Panel A: VC and VL possible</td>
<td>$VL_{sep}$</td>
<td>$VL_{sep}$</td>
<td>$VL_{sep}$</td>
<td>$VL_{sep}$</td>
<td>$VC_{pool}$</td>
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<tr>
<td>$I_T$</td>
<td><strong>0.2100</strong></td>
<td><strong>0.2300</strong></td>
<td><strong>0.2500</strong></td>
<td>0.2700</td>
<td>0.3587</td>
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<td>Panel B: Only VC, but not VL possible</td>
<td>$VC_{sep}$</td>
<td>$VC_{sep}$</td>
<td>$VC_{sep}$</td>
<td>$VC_{pool}$</td>
<td>$VC_{pool}$</td>
</tr>
<tr>
<td>$I_T$</td>
<td>0.2092</td>
<td>0.2277</td>
<td>0.2461</td>
<td><strong>0.2701</strong></td>
<td>0.3587</td>
</tr>
</tbody>
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Table 3: Sample composition by industries

<table>
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<tr>
<th>Industry (Rounds)</th>
<th>Debt</th>
<th>in %</th>
<th>No debt</th>
<th>in %</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business and Financial Services</td>
<td>1,159</td>
<td>12.2</td>
<td>8,336</td>
<td>87.8</td>
<td>9,495</td>
</tr>
<tr>
<td>Consumer Goods</td>
<td>114</td>
<td>15.7</td>
<td>613</td>
<td>84.3</td>
<td>727</td>
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<tr>
<td>Consumer Services</td>
<td>627</td>
<td>11.6</td>
<td>4,769</td>
<td>88.4</td>
<td>5,396</td>
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<td>Energy and Utilities</td>
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<td>22.0</td>
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<td>11,746</td>
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<td>79.5</td>
<td>1,068</td>
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<td>14.7</td>
<td>18,000</td>
<td>85.3</td>
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<td><strong>Total number of rounds</strong></td>
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<td>15.9</td>
<td>42,580</td>
<td>84.1</td>
<td>50,623</td>
</tr>
<tr>
<td>Industry (Companies)</td>
<td>Debt</td>
<td>in %</td>
<td>No debt</td>
<td>in %</td>
<td>Total</td>
</tr>
<tr>
<td>------------------------------------</td>
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* p < .1, ** p < .05, *** p < .01
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Kleinbergen-Paap rk chi2 LM 74.35
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*p-values in parentheses, robust std. errors
* p < .1, ** p < .05, *** p < .01
Nontechnical summary

The traditional venture capital literature argues that young entrepreneurial companies with little assets-in-place cannot raise debt financing and rationalizes equity-like contracts. In practice, however, these companies have started receiving debt financing from venture lenders. This paper models the early-stage venture capital investor’s decision to turn to different types of syndicate partners (venture capital or venture lending investors) to join in the late stage when these potential partners do not know the firm quality, while the early-stage venture capital investor does. Beyond shedding light on the rationales behind the emerging venture lending industry, the paper also demonstrates that a viable venture lending industry may lead to an increase in the number of companies that obtain early-stage venture capital financing. The model delivers several testable implications. Empirical evidence from a large sample of US venture-backed companies is consistent with model predictions.