Convertible Securities and Optimal Exit Decisions in Venture Capital Finance

by

Andreas Bascha[a] and Uwe Walz[b]

a University of Tübingen

b University of Tübingen, and CEPR, London*

16. November 1998

Abstract

We develop a theoretical framework enabling us to analyze the interaction of exit decisions and contract design in venture capital finance. One of the main characteristics of venture capital funds is that they are closed-end. This requires that the relationship between the venture capitalist and the entrepreneur has to end at a more or less given point in time. However, in many cases the venture capitalist and the entrepreneur have diverging interests with respect to different exit solutions (e.g. initial public offerings or trade sales). Ex-post there is a potential disagreement about how to terminate the financial relationship mainly because of distributional conflicts regarding monetary and private benefits. In order to avoid serious efficiency losses, it is crucial to provide for an instrument which solves this problem in the context of an ex-ante agree contract. We show that with a financial contract based on convertible securities an automatic and ex-ante agreed switch in control and decisions rights implementing ex-post the optimal exit decision is available. We therefore provide a theoretical explanation for the wide-spread usage of convertible securities in venture capital finance.

*Address of authors: Andreas Bascha, Department of Economics, University of Tübingen, D-72074 Tübingen, Germany, e-mail: andreas.bascha@uni-tuebingen.de; Uwe Walz, Department of Economics, University of Tübingen, 72074 Tübingen, Germany, e-mail: uwe.walz@uni-tuebingen.de

1 Introduction

Innovative firms almost always lack adequate financial resources and therefore have to rely on external funds. In many cases they enter into a financial relationship with a venture capital firm. The relationship between such a financial intermediary and the entrepreneur is, however, burdened with a substantial number of asymmetric information problems (see e.g. SAHLMAN (1990)). This is mainly due to the fact that young, innovative firms are mostly based on the ideas and efforts of the founder of the firm. These and their implications for the value of the firm are obviously difficult to observe, control and to verify.

Another main characteristic of venture capital finance besides extensive information problem is the observation that most venture capital fund are closed-end.[1] Given the limitation of its investment period, the VC wants to or has to terminate the financial relationship with the firm after a more or less given period of time. This together with the existence of asymmetric e.g. non-verifiable information at the moment where the exit decision has to be taken leads to a major control-problem, if there are more than one possible exit channels.

There are different ways to terminate the financial relationship. Empirically, the two main ones are trade sales (TS), i.e. selling the firm as a whole to a large outside firm and an initial public offering (IPO). With the initial public offering, the firm is sold to a disperse spectrum of shareholders with none of them having a majority stake in the firm. These two exit channels account approximately for 2/3 of all financial relationships between a firm and the VC in the EU (see (BVK) (1997), S. 4 and BVK (1998), S. 4).

We will focus in this paper on the exit problem and its consequence for the design of the financial contract between the founder of the entrepreneur (in the following we call her the owner manager (OM) and the VC. We discuss potential methods of resolving problems associated with the exit problem by using a well specified contract design. We argue that the interests between OM and VC diverge not only with respect to the distribution of the surplus but even more importantly with respect to the exit mode. This divergence of interest together with the problem to observe and/or verify major variables such as the value of the firm creates a fundamental problem in venture capital finance.

[1] This is often interpreted as an instrument with which the shareholders of the venture capital fund aim to control the manager of the venture capital (VC) fund. See SAHLMAN (1990) S. 490, S. 493 f.

We show that these problems can be resolved at least in some cases with the help of hybrid financial instruments (convertible debt and/or convertible equity) in a Pareto-efficient manner. Well defined decision rights and options on a switch in control agreed upon in an ex-ante financial contract specifying the payoff structures can be used to induce Pareto-optimal exit channels. Thereby, we rationalize one of the two major empirically observed instruments of corporate control in venture capital finance (see Sahlman (1990)).

In order to show this we develop a simple model which describes the relationship between the OM and the VC as well as the evolution of the firm over a certain period of time. Typically the VC steps in after the OM has sucessfully tested the viability of his product idea, but thereby has exhausted his personal financial resources. The VC finances in the first period the investment project of given size which enables the young, innovative firm to develop his product idea further, to develop a prototype and finally introduce it to the market. Thereby, we focus on start-up finance. [2] We completely abstract from adverse selection as well as from incentive problems in the sense that there should be no asymmetric information at that time where the exit decision has to be taken, i.e. hidden information. [3] The investment project yields a strictly positive stochastic return in the following period which is observable by both parties but not verifiable to outsiders. This is a rather typical scenario for the OM-VC relationship. Since the VC is in most cases also involved in managerial issues and decisions, her information gap with respect to the realized variable firm value is most likely to be small or does not exist at all. However, owing to the characteristics of the assets involved and the problems in valuing them it is impossible or at least very costly to verify the true firm value in court before the firm is ultimately sold via one of the two exit channels.

The OM is assumed to have strong preferences for control over the firm. This is an often used hypothesis (see e.g. Cressy (1995) and Hutchinson (1995)) and results among other things from the desire of the firm founder to complete "her" project. Henceforth, the OM prefers the exit solution which compensates her the most for her desire of monetary payoff and control, i.e. she prefers for low equity holdings an IPO to a TS. In the latter (TS) all control rights are exercised by the new owner, the outside conglomerate, whereas control remains with the OM in the case of an IPO. An IPO is, for the VC, associated with a

[2] In contrast to seed financing, where the viability of the product idea is not yet clarified.

[3] This terminology is borrowed form Rasmusen (1995), S. 133f.

reputation effect. The higher the firm value when it is sold in the equity market, the higher the reputation effect and vice versa. This together with a superior liquidation value in case of a TS implies that with a badly performing firm, the VC prefers for positive equity holdings a TS to an IPO.

A potential conflict of interest emerges which could be solved with the help of state verification or renegotiation. However these two means to resolve conflicts are costly. As outlined above, there exists a more efficient mechanism: Incentive compatible financing contracts in the form of convertible securities.

Thereby, our paper points to another reason for convertible securities, especially applicable in the area of venture capital finance. Previous rationalizations of convertible securities have concentrated on information asymmetries (adverse selection) between managers and investors in mature firms (see e.g. HARRIS und RAVIV (1985) and STEIN (1992)). In the context of venture capital finance GREEN (1984) and GOMPERS (1993) argue that convertible debt induces the correct incentives for entrepreneur to invest in projects with different risks. MARX (1998) points out that convertible preferred equity imposes incentives on the VC to intervene in poorly performing firms in an efficient manner. CORNELLI und OVED (1997) show that convertible debt reduces the incentive of the entrepreneur to invest in (inefficient) short-term signal manipulation ("window dressing"). Most closely related to our approach is BERGLÖF (1994), who discusses how the possibility of a future sale of control over the liquidation of the firm affects the initial choice of contract. In his model the control issue becomes important because of different management and liquidation capabilities of the OM and a private investor (PI), who could acquire the firm in a TS. As in our model the true value of the firm is observable for the involved parties but not verifiable in court at the time when the firm can be sold to a PI. Henceforth the management and liquidation capabilities of the party in control determine the reservation price in the negotiations with the PI, who is assumed to have all the bargaining power. In BERGLÖF'S model it turns out to be optimal, that on the one hand the VC should control the exit decision only in bad states of nature because of the inferior asset stripping capabilities of the OM and that on the other hand control should stay with the OM in good states of nature because of his private benefits form managing the firm. In contrast to our model this control switch is implemented by a debt component in the financing contract which is conditioned on verifiable interim profits.

Then the superiority of the convertible debt contract over a standard debt equity mix stems form the fact, that it maximises the reservation price of the OM (i.e. the value of his equity holdings) in the negotiations with the PI. Unlike BERGLÖF (1994), we focus not on the most efficient way to terminate the economic life of the firm but on the most efficient allocation of future control rights over the management of a young, innovative and possibly further expanding firm.

As BERGLÖF (1994) our paper aims also to extend the basic idea of AGHION und BOLTON (1992) to venture capital finance. Relying on a fairly general incentive problem in an externally financed firm they show that transfers of control from one party to another in certain states of the world may be optimal. That is, shifts in control depend on the realization of a verifiable state of the world. We follow this route of argument when we discuss the most likely implementation of the first-best solution in section 3.1. The new aspect we try to develop rests in the case where the firm value is not verifiable. Are there efficient means to design control and payoff rights in such a way that it is in the self-interest of the involved parties to behave ex post in an ex ante optimal manner? And what are the conditions under which such an solution to the exit problem can be expected to work?

What we try to show in this paper is that optimal exit decision can be achieved with a switch in control for a continuum of states of the world. This in turn, can be achieved with convertible securities.

The paper is organized as follows. In the next section we outline the basic model by describing the main assumptions and decisions as well as the timing of the game. In section 3 we look at the first-best solution to the exit problem and argue that costly-state verification leads to a second-best solution. In section 4 we analyze the design of the financial contract. Thereby, we analyze the consequences of using convertible debt and equity to warrant an efficient outcome in the exit stage. Section 5 concludes.

2 Basic Model

We consider a simple one-stage investment project. In order to realize a promising idea or to introduce an innovation in the market, an entrepreneur has to investment a given amount I. Investment results in a stochastic project return, being completely independent on the effort and type of the entrepreneur under consideration. That is, we abstract entirely from incentive problems as well as from issues of adverse selection and focus only on our main theme: how to organize the separation of control and ownership between the entrepreneur and the external investor. Since the entrepreneur lacks any own resources she has to rely completely on external funds. The potential source for external funds is the venture capital industry which is competitively organized. Venture capitalists are, however, committed to restricting their investment into young firms to one period only. Hence, after this period has come to an end, the financial relationship between the entrepreneur and the VC has to be terminated.

At the end of the first period, the the VC as well as the OM can observe the discounted value of the stochastic project return (w). This value can, however, not be verified against outsiders. This reflects the idea that owing to the typical engagement of the VC in management issues, the VC is very familiar with the profitability of the firm. Due to the special features of the investment project which involves to a large degree investment in non-tangible assets this information can, however, not be passed on to courts in a credible manner.

There are two potential exit channels.[4] On the one hand, there exists the possibility to sell the firm to an outside firm or conglomerate (a trade sale (TS)). This outside firm takes over all assets of the firm as well as control over the firm. On the other hands the VC and the entrepreneur can choose to sell the firm to disperse shareholders via an initial public offering (IPO).

We assume that in both cases buyers pay the true price of the firm. In effect the VC signals credibly the true value of the firm to capital markets because he has reputation capital at stake (see e.g. Booth und Smith (1996) and Gompers (1996b)). In the case of an IPO

[4]For matters of simplicity we limit our analysis to the analysis of these two exit modes which are empirically the most important ones. To allow for a larger number of exit channels would complicate the analysis considerably without changing our basic line of argument.

market participants realize that overstating the firm's value implies an underperformance of the respective share in future years leading to pronounced reputation losses for the VC. Understating the firm's value is not in the self-interest of the VC either because it then receives a lower payoff without gaining anything. Actually in the case of a TS reputation effects seem to be less pronounced because of the lower public but therefore the buyer is familiar with the business and is able to acquire the necessary information with rather low verification costs in the sales negotiations.

Whereas the value of the firm is independent of the chosen exit channels, this is not true with respect to the aggregate monetary payoffs to the VC and the entrepreneur. When selling the firm in the capital market, emission costs (E) have to be incurred. Hence, the net aggregate monetary payoffs for the VC and the entrepreneur amount to $\underline{w} - E$, whereby $\underline{w}$ denotes the actual value of the firm. The outside conglomerate, in contrast, experience synergy effects between the newly acquired firm and its established businesses. After substracting potential auditing costs (see above), the conglomerate is willing to pay the premium A.

After having described the basic assumptions of our model we now describe the preference of entrepreneur and VC before turning to the timing of the game between the two.

2.1 Entrepreneur

For simplicity, both agents are assumed to be risk-neutral. Both possess preferences which are additively separable and linear in income. The main feature of the entrepreneur's preferences is her preference for control over the firm. This assumption which is very well-founded in the emprical small business literature (see e.g. Busenitz und Barney (1997) and??) just reflects the notion that one of the main reason for entrepreneurs to become entrepreneurs is their preference for independence. This independence is kept in the case of an IPO where the entrepreneur is still in control over decisions and management of the firm. In contrast, with a TS the entrepreneur looses all control and even faces the risk of losing her job if the new firm wants to bring in a new management. Hence, we say that the entrepreneur receives strictly positive additional utility benefits of control in the case of an IPO, whereas none with a TS. These control benefits (K) are assumed to be smaller than sum of the premium paid by the outside conglomerate (A) and emissions costs (E) which have to be incurred with an

IPO ($K < A + E$).[5]

In order to illustrate the potential conflict of interest with regard to the exit channel let us denote the entrepreneur's share in net proceeds of sales by his equity holdings (α).[6] This allows us to write her utility function depending on the exit channel as:

$$U^{OM} = \begin{cases} U^{OM}_{IPO} = \alpha(\underline{w} - E) + K \\ U^{OM}_{TS} = \alpha(\underline{w} + A). \end{cases} \tag{1}$$

Hence, we find the following exit preferences for the entrepreneur:

$$\begin{aligned} IPO &\succ TS \quad \text{for} \quad K > \alpha(A + E) \\ IPO &\prec TS \quad \text{for} \quad K < \alpha(A + E) \end{aligned} \tag{2}$$

The OM prefers the exit solution which compensates her the most for her desire of monetary payoff and control.

2.2 Venture Capitalist

The VC does not only engage in one project but plays the game quite often. In the course of this repeated engagement in project finance the VC accumulates a "reputation capital stock". The increase in reputation resulting from a single project depends on the exit mode and the realized value of the firm. The notion that reputation is a crucial factor for VC funds is supported by an empirical study of Gompers (1996b). The VC selects the projects under consideration and is also engaged in management issues of the financed firms. Hence, the larger the realized value of the firm, the better signal this is for the quality of the VC management received by capital markets. [7] Since the realized value of the firm becomes better known to the interested public in the case of an IPO and since the true value of the firm is much more observable to the public in the case of an IPO (shares are permanently traded in secondary markets), it is plausible to assume that the reputation gain is more

[5] It turns out that this assumption is necessary for our problem.

[6] Exit preferences depend on the compensation scheme. For example with pure debt financing the OM would prefer always a TS over an IPO as long as $A + E > K$.

[7] See also the empirical discussion about the "value added" by venture capital firms. Sapienza, Manigart und Vermeit (1996)

pronounced with an IP than with a TS. Technically, we assume that the reputation gain is linear in the realized value of the firm. The marginal reputation gain is larger with an IPO (r_{IPO}) than with a TS (r_{TS}). *Ceteris paribus* the same is true for the respective overall reputation gains ($R_{IPO} = r_{IPO}\underline{w} - R > R_{TS} = r_{TS}\underline{w} - R$). This formulation reflects our perception, that the VC is able to improve on his reputation capital stock only if the realized firm value exceeds a critical value ($\underline{w} > R/r_{IPO(TS)}$). Hence, we can write the utility function of the VC as:

$$U^{VC} = \begin{cases} U^{VC}_{IPO} = (1-\alpha)(\underline{w} - E) + r_{IPO}\underline{w} - R \\ U^{VC}_{TS} = (1-\alpha)(\underline{w} + A) + r_{TS}\underline{w} - R. \end{cases} \tag{3}$$

The level of utility as a function of the realized firm value is depicted in figure 1.

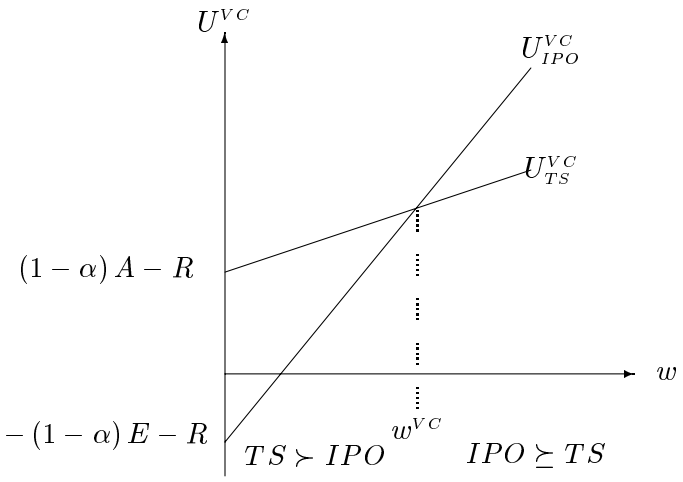

figure 1

With $U^{VC}_{IPO}(w^{VC}) = U^{VC}_{TS}(w^{VC})$ we find: $w^{VC} = \frac{(1-\alpha)(A+E)}{r_{IPO} - r_{TS}}$

For small realized firm values ($\underline{w} < w^{VC}$) the VC prefers the TS to the IPO ($TS \succ IPO$) whereas the reverse is true for large realized firm values ($\underline{w} > w^{VC}$). This just reflects the fact that with larger firm values the differences in reputation effects get more and more pronounced. For $\underline{w}$'s larger than w^{VC} this gain in reputation overcompensates the lower net

revenues arising with an IPO (from the VC's perspective: $(1-\alpha)(A+E)$).

Comparing the interest of the VC with the ones of the entrepreneur with respect to the exit modes it becomes now obvious that a potential ex-post (i.e. when it comes to deciding upon the exit channels) conflict of interest exists. For large realized values of the firm and for small α's both parties prefer an IPO. For relatively low realized firm values and a large α, the VC would choose a TS, whereas the entrepreneur is still in favour of the IPO. That is, we have ex-ante two areas of conflicting interest: i) the division of the resulting net surplus and ii) the choice of the exit mode. Against this background we outline in the next subsection the timing of the game between the VC and the OM before we turn then to potential ways to resolves these conflicts in an (Pareto-) efficient manner.

2.3 Timing of the Game

We model the idea that a start-up entrepreneur who has nothing but a good product idea and an idea how to bring this product into the market approaches the venture capital industry for financial resources. We look at the interaction of a single VC with the entrepreneur. Given this framework the entire surplus accrues to the entrepreneur. Competition in the VC-industry pushes the VC down to the reservation utility or to the cost of capital. Technically speaking this implies that the participation constraint of the VC holds with equality.

There are basically three stages of the game. In the first stage the entrepreneur offers a contract (specifying the VC's share of realized firm value as well as a rule for exit) to the VC. In the second stage the VC accepts of rejects the offer. Then, in the third stage the mode of exit is chosen given the rule of exit specified ex-ante. In-between stages two and three nature decides upon the realized value of the firm.

Literatur

Aghion, P. und Bolton, P. [1992]: An "Incomplete Contracts" Approach to Financial Contracting. *Review of Economic Studies*, vol. 59 473–494.

Berglöf, Erik [1994]: A Control Theory of Venture Capital Finance. *Journal of Law, Economics and Organisation*, vol. 10, no. 2 247–267.

Booth, James R. und Smith, Richard L. [1996]: Capital raising, underwriting and the certification hypothesis. *Journal of Financial Economics*, vol. 15, no. 1,2 261–281.

Busenitz, Lowell W. und Barney, Jay B. [1997]: Differences between entrepreneurs and managers in large organisations: Biases and heuristics in strategic decision-making. *Journal of Business Venturing*, vol. 12 9–30.

(BVK), Bundesverband Deutscher Kapitalbeteiligungsgesellschaften [1997]: Venture Capital in Europa 1996. *Bvk-nachrichten special*, Bundesverband Deutscher Kapitalbeteiligungsgesellschaften (BVK). 24.6.1997.

BVK [1998]: Venture Capital in Europa 1997. *Special*, Bundesverband Deutscher Kapitalbeteiligungsgesellschaften e.V. Vom 25.06.1998.

Cornelli, Francesca und Oved, Yosha [1997]: Stage Financing and the Role of Convertible Debt. *Discussion Paper 1735*, Centre for Economic Policy Research (CEPR).

Cressy, Robert [1995]: Business Borrowing and Control: A Theory of Entrepreneurial Types. *Small Business Economics*, vol. 7 291–300.

Gompers, Paul A. [1993]: The Theory, Structure, and Performance of Venture Capital. Ph.D. thesis, Harvard University, Camebridge, Massachussets.

Gompers, Paul A. [1996b]: Grandstanding in the venture capital industry. *Journal of Financial Eonomics*, vol. 42 133–156.

Green, R. [1984]: Investment incentives, debt, and warrants. *Journal of Financial Economics*, vol. 13 115–136.

Harris, Milton und Raviv, Artur [1985]: A Sequential Signalling Model of Convertible Debt Call Policy. *The Journal of Finance*, vol. 40, no. 5 1263–1281.

Hutchinson, Robert W. [1995]: The Capital Structure and Investment Decision of the Small Owner-Managed Firm: Some Exploratory Issues. *Small Business Economics*, vol. 7 231–239.

Marx, Leslie M. [1998]: Contract Renegotiation for Venture Capital Projects. *Working paper*, University of Rochester.

Rasmusen, Eric [1995]: Games and Information. Blackwell, Oxford.

Sahlman, William A. [1990]: The structure and governance of venture-capital organisations. *Journal of Financial Economics*, vol. 27 473–521.

Sapienza, Harry J.; Manigart, Sophie und Vermeit, Wim [1996]: Venture capitalist governance and value added in four countries. *Journal of Business Venturing*, vol. 11, no. 6 439–469.

Stein, J. [1992]: Convertible bonds as "back door" equity financing. *Journal of Financial Economics*, vol. 32 3–22.