Three essays on venture capital contracting

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Chapter 1

Introduction

1.1 Motivation

The term 'venture capital' may sound unfamiliar to people outside the finance profession. The concept is, however, not as remote from everyday life as it seems to be. Who has not heard of Apple Computer, Intel, Hewlett-Packard, Google, eBay, or Yahoo? All of these high-technology companies were launched by venture capital financing, in the Silicon Valley in California. Products and services sold by these companies have become an essential part of our lives.

Venture capital refers to long-term investment into innovative, often high-technology projects that are typically too risky to be financed by ordinary bank loans. The first venture capital firms were set up in the United States in the post-World War II years. The American Research and Development Corporation, founded in 1946, is considered as one of the earliest venture capital companies. Its biggest success was the sale of Digital Equipment Corporation (DEC) that became a pioneer of the US computer industry. World War II produced an abundance of technological innovations that spurred the development of the industry. The investment by J.H. Whitney & Co. in Minute Maid, for example,
aimed at the commercialization of an orange juice concentrate that had been developed
to provide nourishment for troops in the field.

Despite the several success stories that emerged from the post-World War II tech-
nological developments, the venture capital industry grew only at a moderate pace until
1990. In contrast, over the past decade it went through a dramatic expansion. In the
US, funds invested by venture capitalists grew from $3 billion in 1990 to over $100 billion
in 2000. In the same period, in Europe, venture capital investments increased from $4
billion to approximately $31 billion. This enormous expansion was, to a large extent,
nurtured by the ‘dotcom’ boom that created prospects of immense IPO returns in the
late 1990s. Indeed, since the collapse of the high-tech bubble in March 2000, venture
capital investments have dropped significantly. The total amounts invested, however, still
constitute a multiple of the early 1990 investment levels both in Europe ($27 billion in
2002) and the United States ($22 billion in 2002).\footnote{The dollar values for 2002 are not comparable for the definition of the term ‘venture capital’ differs on the two continents. According to the US National Venture Capital Association (NVCA), ‘venture capital’ refers to investments in seed-, early-, expansion-, or mezzanine-stage projects. Buyout transactions are considered as ‘private equity’, not venture capital investments in the US. The European Venture Capital Association (EVCA) defines all of these transactions as venture capital.}

Since venture capital ensures funding for new and expanding enterprises, the growth
of the industry is interesting in itself. Recent evidence suggests that venture capital is an
especially important form of intermediated financing for it stimulates the development of
capital funding on innovation. Hellmann and Puri (2000, 2002) show that venture capital
backed start-ups bring their products to market and develop their organization faster than
other young companies that received no venture capital financing. These findings support
the claim that venture capitalists are more than financiers and justify the term they use
to refer to themselves: ‘value-adding investors’.

This dissertation consists of three essays, two theoretical and one empirical, focusing
on asymmetric information problems that arise from the value-adding roles of venture financiers. From a more general perspective, the dissertation explores a recent and highly relevant question in corporate finance research, namely: *how do entrepreneurs choose to finance projects that require the involvement of ‘active financiers’?* In other words, *what form of financial intermediation and what type of financial contracts would entrepreneurs prefer if information asymmetries were two-sided?*

The active involvement of financiers in the firms funded is a distinctive feature of venture capital financing. Venture capitalists perform a number of typical tasks: they assess and revise business plans and formulate strategies, they hire key managers and other professional personnel, they provide business contacts and help arranging additional financing from outside sources. The need for the financier’s involvement usually arises from the nature of the firm funded. Small, entrepreneurial start-ups have no tangible assets that can serve as collateral. They face significant project and market related uncertainty and a high risk of failure. Various types of information asymmetries make it impossible for potential financiers to assess the risk involved in their creative, but highly uncertain projects. Consequently, these entrepreneurs are unable to obtain external funding from more traditional, risk-averse financial intermediaries such as banks. Using professional investors who both provide the necessary capital and become actively involved in the management is the most plausible way to realize their risky but potentially profitable projects.

The three essays in this dissertation focus on active financial intermediation. They emphasize the active involvement of both the financier and the entrepreneur in the firm funded. Chapter 2 analyzes the impact of entrepreneurial wealth-constraints on the financier’s contribution along two effort dimensions: advising and monitoring. Proposing a clear distinction between the two tasks, the analysis points out that wealth-constrained entrepreneurs may be offered less favorable deals by venture capitalists than wealthier ones. Typically, poor entrepreneurs will be provided fewer advice and more intense monitoring, which might be to the detriment of their welfare. The second theory chapter,
Chapter 4 of the dissertation focuses on the possibility for idea-theft and the adverse consequences of the potential expropriation of entrepreneurs on the incentives of both parties to carry out research and development. The analysis shows that, even if no expropriation occurs, the ex-ante possibility for idea-theft is damaging for both parties' involvement, especially for the entrepreneur's incentives to do early-stage research. The essay in Chapter 3 is of an empirical nature. It raises the question whether the involvement of financiers in their firms could be enhanced by the means of appropriately designed financial contracts. Given its empirical focus, the analysis uses regular empirical techniques including univariate tests and regression analysis. The remaining chapters, Chapter 2 and 4, are of a theoretical nature. A brief overview of the relevant background and the methodology of these chapters is provided in the next section.

1.2 Methodology and Background

Chapter 2 and 4 of this dissertation are built on the economics of information that has been developed for the last thirty years to analyze situations where information is unequally distributed across economic agents. Applying the tools of non-cooperative game theory, stylized models of information economics focus on strategic interactions of a small number of economic agents, in most cases only two: a party with private information (agent) and a party with no private information (uninformed player or principal). They summarize the constraints imposed by the institutional and strategic environment in 'the contract' that may either arise endogenously from interaction between the parties or be exogenously introduced.

Since its early days, information economics has provided the primary tool for theoretical corporate finance research. Numerous facets of corporate financial policy and financial intermediation have been analyzed in various asymmetric information settings.

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2The first applications of the economics of information to the field of finance are Jensen and Meckling (1976), Leland and Pyle (1977), Ross (1977), Bhattacharya (1979), and Stiglitz and Weiss (1981).
Theoretical and empirical contributions have shown that information considerations play a crucial role in explaining observed features of financial contracting and intermediation.

Models of the principal-agent paradigm are classified in the literature along two specific dimensions: first, whether the private information concerns what the agent does (hidden action) or what the agent is like (hidden information); second, whether the information asymmetry arises pre-contracting (adverse selection and signalling) or post-contracting (moral hazard).

In the context of financing, two fundamental types of information asymmetry may arise. First, entrepreneurs in need of capital may possess more information concerning the quality and prospects of their investment projects than what they reveal to their financiers (hidden information). Second, entrepreneurs may behave opportunistically and shirk on projects funded by outside financiers or hide favorable profit realizations (hidden action). These possibilities may distort investment decisions and might hamper firms' access to financing. A number of papers have shown that specific contractual features might alleviate the adverse consequences of information asymmetries. With the exception of a few recent contributions, the literature assumed that financiers were passive capital providers: only the firms (managers) themselves could influence the realization of the projects funded or possess private information. Consequently, information problems in relation to financing decisions have been considered as one-sided.

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3Models of adverse selection and signalling differ in the game's strategic form. In a situation of adverse selection, it is the uninformed party, while in a signalling game, it is the informed party that has the first move.

4The earliest contributions to information economics include the market breakdown argument of Akerlof (1970), the job market signalling model by Spence (1973), and the insurance market model of Rothschild and Stiglitz (1976). These papers focus on ex-ante (pre-contracting) information asymmetries between a principal and an agent. Situations of moral hazard (ex-post information asymmetry) have subsequently been analyzed by Ross (1973), Holmström (1979), and Grossman and Hart (1983).

5Allen and Winton (1995) and Schmeits (1999) provide excellent reviews of the contemporary literature on financial intermediation and contracting.
In contrast to the more traditional approach to corporate financing, models of venture capital assume the existence of two-sided information asymmetries. A large body of the literature focuses on the two-sided moral hazard problem that stems from the need for both the entrepreneur's involvement and the financier's advice.\(^6\) Contrasting the widely accepted view on the optimality of debt financing,\(^7\) various contributions have shown that in the venture capital context incentive problems can not be solved by rendering the entrepreneur residual claimant for the firm's profits and giving the investor a debt claim. The financier's value adding roles give ground to a more innovative allocation of cash-flow rights. Equity type securities - in particular convertible debt and convertible preferred equity - have been shown to be optimal in implementing incentive mechanisms that stimulate both parties to contribute. Furthermore, innovative theories of venture capital have emphasized the role of decision making power (control) in guiding the relationship of entrepreneurs and financiers. Contrary to traditional financial intermediaries, which typically refrain from interference as long as repayment obligations are duly met, venture capitalists interfere in entrepreneurial decision-making rather frequently. Many venture capital backed start-ups fear the substitution of the original founder with an outside manager once future prospects turn out to be less rosy. To be able to intervene, venture financiers require a wide variety of control rights: disproportionate voting rights, board seats, veto rights concerning important decisions, and even unusual rights to interfere, such as the potential to replace the CEO. Existing models have pointed out that, by providing means for interference, control rights may also enhance the value-adding involvement of venture capitalists in entrepreneurial firms.\(^8\)

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\(^6\)Venture capital financing is modeled in a two-sided moral hazard setting in Casamatta (2003), Schmidt (2003), Inderst and Müller (2004), and Repullo and Suarez (2004). Section 3.2 in Chapter 3 reviews these theories.

\(^7\)Debt contracts have been shown to be optimal in solving problems of managerial moral hazard by Townsend (1979), Jensen (1986), Gale and Hellwig (1985), Innes (1990), among others.

\(^8\)The most important control theories of venture capital are Chan, Siegel, and Thakor (1990), Hellmann (1998), Kirilenko (2000).
1.3. OUTLINE OF DISSERTATION

The emphasis on control allocation relates research in the field to the recent literature on incomplete contracts. Incomplete contracting theories argue that, since all future contingencies can not be contracted upon, the allocation of property rights (decision making power) must constitute an inherent part of contracts. Contractual incompleteness is a typical feature of the financing of start-up firms. The essay in Chapter 2 thus builds on the incomplete contracting approach.

1.3 Outline of Dissertation

The two theoretical essays in this dissertation, Chapter 2 and 4, contribute to the literature by exploring certain subtleties of the various two-sided information problems inherent in the venture capital context. Chapter 2 entitled 'Advice and Monitoring: Venture Financing with Multiple Tasks' points out the unusual, multitask nature of the involvement of venture capitalists in entrepreneurial firms. In contrast to the rest of the literature that focuses on either the support (advising) or the control (monitoring) function, the analysis in Chapter 2 takes both into account. It argues that these two tasks are different in nature and may therefore have different impacts on the outcome of the project funded and the entrepreneur's welfare. The analysis is based on the premise that entrepreneurs like advising but dislike monitoring by their financiers, a generally accepted view in venture capital research. In the model, advising increases value by raising the chance for successful project realization and is thus advantageous for both contracting parties. Monitoring increases verifiable project returns, too. At the same time, however, it imposes a cost on the entrepreneur by decreasing his non-verifiable rewards derived from project

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10 The essay in Chapter 2 provides a, in which the effective allocation of control between an entrepreneur and a venture capitalist is stochastic and depends on the venture capitalist's effort to monitor the entrepreneur.
realization. Consequently, advising is congruent, while monitoring is dissonant with the entrepreneur's interests. Although he dislikes interference in general, if wealth-constraints are severe, the entrepreneur is willing to give up control and allow the financier to monitor in order to ensure external funding for his project.

Emphasizing the fact that venture capitalists are both advisors and monitors to entrepreneurial firms, Chapter 2 explores the question whether multitask financing expands funding possibilities for projects of wealth-constrained entrepreneurs in comparison to other forms of financial intermediation, such as bank financing or joint project realization by a bank and a consulting company. From a wider perspective, the analysis considers whether the participation of a multitask financier (venture capitalist) mitigates the adverse consequences of credit rationing, a phenomenon that results in the withdrawal of many entrepreneurs with profitable investment opportunities from the capital market. Furthermore, the chapter explores the financial contracting implications of the multitask nature of the financier's involvement and provides a simple rationale for the widespread use of convertible securities together with extensive control rights in the financing of highly wealth-constrained start-up entrepreneurs. The key insight of the model is that, in order to obtain funding, entrepreneurs with low collateral need to offer convertible securities and relinquish control over project realization. In contrast, entrepreneurs with more self-financing may offer equity contracts and retain control, while still be eligible for external funding. At the more general level, the analysis shows that multitask financing expands funding possibilities compared to other forms of financial intermediation, which may explain why highly wealth-constrained entrepreneurs are usually funded by venture capitalists.

The second theoretical essay in Chapter 4 focuses on innovation by entrepreneurs and the multilateral financing of R&D activities by venture capitalists. For they invest in a portfolio of (usually related) projects, venture capitalists may have incentives to use their entrepreneurs' ideas and interim research results in alternative applications. The potential expropriation of entrepreneurs may damage effort incentives for R&D and might
decrease the intensity of innovation in general. This problem has been especially severe in recent years when, in order to defend their intellectual property, several entrepreneurial firms filed litigation against venture capitalists. Emphasizing the adverse consequences of multilateral financing, Chapter 4 raises the question how the potential expropriation of interim research results affects the involvement of an entrepreneur and a venture capitalist in an innovative project, taking into account the possibility for litigation and the resulting loss of the venture capitalist’s reputation. The paper suggests one possible solution to the incentive problem: syndication, that is the involvement of more than one venture capitalist in the realization of an investment project. The analysis shows that since syndication implies an increase in the venture capitalists’ collective ‘reputation at stake’ in a start-up firm, it may serve as a mechanism to alleviate the entrepreneur’s fear of expropriation and increase both parties’ contribution to R&D. The results refer to a link between investment syndication and innovation, and imply that projects aiming at more fundamental research will be syndicated more frequently, suggesting avenues for future empirical research. In contrast to the rest of the literature, the approach taken in the chapter accounts for the fact that venture capitalists engage in portfolios of investment projects rather than single firms and derives a need for syndication from the entrepreneur’s perspective. Moreover, in contrast to other papers, it provides an explanation for the participation of more than two venture capitalists in a syndicate.

The empirical essay in Chapter 3 focuses on the determinants of the involvement of venture capitalists in their entrepreneurial firms. It raises the question whether financial contracting that is the allocation of cash-flow and control rights plays a role in enhancing the contribution of venture capitalists to the development of the firms they finance. Although the empirical literature - especially the literature on entrepreneurship - has already considered the determinants of venture capitalists’ value adding in terms of project and environment related risk factors, financial contracts have so far been ignored.

\footnotetext[1]{Other theories of investment syndication, (Admati and Pfeiderer (1994) or Casamatta and Haritchabalet (2003), for example) ignore the active participation of entrepreneurs and consider syndication exclusively from the venture capitalist’s perspective.}
despite the fact that most theories have relevant implications in this context. Various authors have argued that, given the situation of double-sided moral hazard, convertible securities provide an efficient allocation of cash-flow incentives and thereby induce both entrepreneurs and venture capitalists to contribute.\textsuperscript{12} Other theories have claimed that it is the allocation of control rather than cash-flow rights that represents the key mechanism in enhancing the contribution of venture capitalists. Using a hand-collected sample of 74 investments by 14 European venture capital funds, the analysis in Chapter 3 examines the empirical validity of these claims. The results indicate that control rights are especially important: venture capitalists that have extensive board representation and veto rights in certain decisions spend more time with their entrepreneurs and regard their own contribution to the management of the firms as more important than investors without such rights. Although the results concerning the role of cash-flow rights are less robust, the data support the view that security choice matters: venture capitalists that use convertible debt or convertible preferred equity turn out to contribute more than financiers holding simple financial instruments like common or preferred equity, or debt. Overall, the findings indicate that both cash-flow and control rights are relevant in the venture capital context. This calls for theories that could explain the allocation of convertible instruments attached control rights to venture capitalists. As discussed earlier, Chapter 2 of this dissertation provides one such theory.

\textsuperscript{12}Chapter 3.2 in Chapter 3 provides a thorough review of the relevant literature.