

Studienreihe der Stiftung Kreditwirtschaft
an der Universität Hohenheim

Julius Tennert

Venture Capital

The Impact of Asymmetric Information
on Optimal Investments, Learning
and Exit Outcomes



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Venture Capital: The Impact of Asymmetric Information on
Optimal Investments, Learning and Exit Outcomes

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Preface

The European venture capital market experienced significant growth in the recent years. This has a variety of reasons. On the one hand, investors increased their demand for risky assets as expected returns in traditional asset classes were strongly impacted by the expansive monetary policy of the ECB. On the other hand, European founders were inspired by the success stories drawn from US start-ups in the Silicon Valley, reaching for more risk capital in Europe.

Despite its strong growth, the European venture capital market is rather neglected in scientific research. However, for European politicians and decision makers in the industry it is more important than ever to better understand how an efficient funding process for business innovations looks like and what incremental value venture capitalists can add to this process. Only with an in-depth understanding of venture capitalists' business model, we can take the right steps to keep innovative European entrepreneurs in Europe or even attract the most talented entrepreneurs from all over the world to set-up their business idea in Europe. This way, we can ensure that Europe remains one of the most successful regions in the world.

This book addresses the fundamental question of how international venture capitalists do their business with European start-ups and whether success factors significantly differ between Europe and the world's largest venture capital market in the US. The results have impact for both, politicians and decision makers in the industry as they give advanced insight how to increase effectiveness of the funding and exit process. In the long-term,

this can make risk capital less expensive, and innovations and economic growth faster.

Hohenheim, December 2018

Prof. Dr. Hans-Peter Burghof

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List of Abbreviations

<i>AIC</i>	Akaike Information Criterion
<i>CART</i>	Classification and Regression Trees
<i>CO</i>	Contal and O'Quigley (1999) Break-Point Value
<i>CVC</i>	Corporate Venture Capitalist
<i>DCF</i>	Discounted Cash Flow
<i>E.G.</i>	Example Given
<i>EXP</i>	Exponential Distribution Function
<i>GAMMA</i>	General-Gamma Distribution Function
<i>GICS</i>	Global Industry Classification Standard
<i>GLS</i>	Generalized Least Squares
<i>IPO</i>	Initial Public Offering
<i>IMR</i>	Inverse Mills Ratio
<i>IRR</i>	Internal Rate of Return
<i>LLOG</i>	Log-Logistic Distribution Function
<i>LNORM</i>	Log-Normal Distribution Function
<i>LOG</i>	Natural Logarithm
<i>LOG₂</i>	Logarithm to Base 2
<i>M&A</i>	Mergers and Acquisitions
<i>MIO</i>	Million
<i>MSCI</i>	MSCI Inc.
<i>R&D</i>	Research and Development
<i>R²</i>	R-Squared Measure
<i>RESP.</i>	Respectively
<i>U.K</i>	United Kingdom
<i>U.S.</i>	United States of America

<i>VC</i>	Venture Capitalist
<i>VSTOXX</i>	Volatility Index of the EURO STOXX 50 Index
<i>WEIB</i>	Weibull Distribution Function

Chapter 1

Introduction

Venture capitalists (VCs) are specialized intermediaries between innovative entrepreneurial firms and opportunity oriented investors. The rationale for the co-existence of VCs and other intermediaries, such as banks, is given by the VC's higher ability to evaluate entrepreneurial projects (Ueda, 2004) and to monitor entrepreneur's effort (Hölmstrom and Tirole, 1997). This predicts entrepreneurial projects with less collateral, higher return, higher growth, and higher risk to attract venture capital instead of bank lending (Metrick and Yasuda, 2011). The role of the VC goes beyond the role of a passive screening agent. While a bank only monitors the financial health of its borrowers, the VC provides his portfolio firms managerial advice and access to his network to actively increase the survival and growth of the firms (Bottazzi et al., 2008; Bruton et al., 1997; Hellmann and Puri, 2002; Metrick and Yasuda, 2011; Sapienza et al., 1996).

The venture capital set-up offers a proficient natural laboratory to test implications of the theory of the firm. This is because one can observe interactions between the VC (as the principle) and the entrepreneur (as the agent) in an isolated environment.¹ First, interactions between the

¹ Also, contracts between the VC (as the agent) and its sponsors (as the principal) are analyzed in the literature (Chung et al., 2012; Gompers and Lerner, 1996, 1999a; Lerner and Schoar, 2004; Metrick and Yasuda, 2010; Phalippou and Gottschalg, 2008; Sahlman, 1990). This aspect is seized in chapter 3, for the case of information

VC and the entrepreneur are not impacted by confounding factors, for example dispersed stock ownership and short term pressure associated with publicly traded firms (Metrick and Yasuda, 2011). Second, the nature of innovative entrepreneurial firms entails that little public information about the firm exist and hence that information asymmetry between the VC and the entrepreneur is great. Finally, the VC directly invests equity in the entrepreneurial firm and thus has a claim in the firm's profit. This entails an incentive problem for the entrepreneur.²

The funding relationship between the VC and the entrepreneur can be classified into three phases, whereas each phase is appropriately related to one specific kind of agency risk: First, the selection phase. In this phase, the VC screens several potential investment opportunities and acts as a screening agent to overcome adverse selection (Akerlof, 1970; Campello and Matta, 2010; Chan, 1983). Second, the investment phase. In this phase, the VC commits capital to the project and acts as a monitoring agent to reduce moral hazard (Bergemann and Hege, 1998; Neher, 1999; Cornelli and Yosha, 2003). Third, the exit phase. In this phase, the VC exits from the funding relation and acts as a certifying agent to reduce information asymmetry between the portfolio firm and the new investors (Barry et al., 1990; Cumming and Johan, 2008a; Gompers and Lerner, 1999b; Megginson and Weiss, 1991).

In this thesis, I focus on the VC's role as a monitoring agent in the investment phase and as a certifying agent in the exit phase.³ The scope of my thesis is to improve understanding of agency cost related to ven-

asymmetries between corporate VCs and their corporate mothers, and its impact on exit outcomes. However, the focus of my thesis is the principal-agent framework between the VC and the entrepreneur.

² Since VCs add value to their portfolio firms, the relationship between the VC and the entrepreneur is not a one-directional principal-agent problem. Moreover, there exists a double-sided principal-agent problem (Casamatta, 2003; Houben, 2002; Inderst and Müller, 2004; Repullo and Suarez, 2004; Schmidt, 2003). This is not in the focus of my thesis.

³ There are only few papers related to the VC's role as a screening agent (Amit et al., 1990; Berglund and Johansson, 1999; Chan et al., 1990; Hellmann, 1998; Kaplan and Stromberg, 2001; Ueda, 2004; Van Osnabrugge, 2000). This strand of the literature is mostly theoretical or qualitative in nature. A major reason for that is data availability. There is only private information owned by the VCs themselves about the firms they rejected to fund.

ture investments. I add new implications to this field, showing that (1) agency cost are time-variant in the investment phase, (2) the information rent earned by the VC in a funding relationship is biased under asymmetric information and (3) certification by the VC in the exit phase is most important if new investors face high search and screening costs. The results are in line with general theories regarding the compensation of risky employment (Amernic, 1984; Eisenhardt, 1989), credit assessment in loan portfolios (Duffie and Lando, 2001) and certification in markets with imperfect information (Baron, 1982; Chan, 1983). My thesis provides researchers and practitioners an improved toolkit to better understand the VC-entrepreneur relationship. The following three chapters coincide with the content of three my papers. For papers I wrote with co-authors, the personal pronoun 'we' is used in the thesis. For my single-author paper, the personal pronoun 'I' is used. Further, the papers are formally revised for the thesis.

In **Chapter 2** *Moral Hazard in VC Finance*⁴, we examine time-dependence of agency risk and its interaction with market risk. So far, papers have considered agency risk in venture projects to be independent time and environmental conditions (Bergemann and Hege, 1998; Neher, 1999; Cornelli and Yosha, 2003). However, we demonstrate that the environmental conditions (market risk in our set-up) significantly impact the incentives of the entrepreneur over time. The economic rationale for this relation is as follows: the entrepreneur has motivation to expend high effort to grow the firm if future market conditions are seemingly favorable and the prospects of the firm are high. But, his motivation decreases if expectations about future market conditions change. In periods of high market risk, the entrepreneur's expected payoff from the project is downgraded. As a consequence, private benefits from managing the firm become more attractive to the entrepreneur than the realization of the project. We introduce a formal model, in which the VC has to cope with two tasks: he

⁴ This chapter includes my paper *Moral Hazard in VC Finance: More Expensive than You Thought*. I'm the corresponding author of this paper. Co-authors are Marie Lambert and Hans-Peter Burghof. I contributed to this paper by the initial idea, the formal model, the empirical research design and co-writing every chapter. Moreover, I was responsible for data collection and preparation, the empirical analysis and interpretation of the results.