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**Working Paper**

## Venture Capital Contracts: A Survey of the Recent Literature

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**Kiel Working Paper No. 1017**

**Venture Capital Contracts:  
A Survey of the Recent Literature**

**by  
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December 2000

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**Venture Capital Contracts:**  
**A survey of the recent literature**

**Abstract:**

This paper surveys empirical and theoretical studies of various control mechanisms embedded in venture capital contracts. These mechanisms mitigate incentive problems and opportunistic behavior arising in the uncertain environment of financing young high-technology enterprises that predominantly invest in intangible assets. In particular, the paper discusses the entrepreneurs' compensation, the type of financing, the staging of capital infusions, and various control rights explicitly given to venture capitalists. While theoretical studies explain some of the mechanisms empirically observed, others and the combinations of control mechanisms often used are still unexplained.

**Keywords:** venture capital contracts, stage financing, convertible securities, entrepreneurs' compensation

**JEL classification:** D82, G24, G32, L14

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## **1 Motivation**

There is increasing interest in venture capital finance in general and in venture capital contracts in particular, because enterprises which received venture capital in their early stages of growth, such as Microsoft and Netscape, created tremendous growth and employment opportunities. This suggests that venture capital contracts with their various control mechanisms may be more efficient means of financing high-risk investments than more traditional financing strategies, such as passive equity participations of outside investors. Moreover, understanding the contractual arrangement between venture capitalists and entrepreneurs is important especially for an efficient design of public policies to encourage venture capital investments in enterprises' early stages of development.

Venture capital is predominantly used to finance young innovative enterprises with high growth potential. Obtaining financial means on public credit and equity markets is almost impossible for these enterprises, because they largely invest in intangible assets resulting in a lack of collateral, and because they often do not meet the requirements necessary for selling their shares on public equity markets. But venture capitalists do not only provide financial means for these enterprises, they also provide consultancy services and they take on several control functions in the enterprises financed by them.

The main difference between venture capitalists and other financial intermediaries is seen in the combination of infusing capital and exerting management support. Due to supporting and controlling the management team, recruiting key personal, building contacts to customers and suppliers (Barry 1994, Gorman and Sahlman 1989), they can affect the profits of their portfolio firms. Because of this, it is not astonishing that venture capital-backed enterprises outperform non-venture capital-backed ones even after the initial public offering (Brav and Gompers 1997). In addition, the total costs of going public are lower for venture capital-backed enterprises, since the degree of underpricing and the compensation of underwriters are lower (Megginson and Weiss 1991). Moreover, venture capital-backed enterprises significantly patent more (Kortum and Lerner 1998).

This paper discusses several empirical and theoretical studies which focus on the various control mechanisms used in venture capital contracts. These are embedded in the contracts to mitigate problems arising from asymmetric information between venture capitalists and entrepreneurs, and to reduce the overall risk of the investment, which has largely to be carried by venture capitalists. In this paper, the main findings of empirical studies, which analyze the various control mechanisms, and the main ideas of theoretical

studies, which explain particular control mechanisms, are described. Thereafter the main predictions of the theoretical studies are confronted with the empirical findings. In particular, entrepreneurs' compensation, the use of convertible securities, the staging of capital infusion, and venture capitalists' control rights as control mechanisms often used in venture capital contracts are mentioned.<sup>1</sup>

Entrepreneurs' compensation with a basic salary and a profit participation weakens incentive problems, such as moral hazard or adverse selection.<sup>2</sup> Venture capitalists choose convertible securities in order to participate in realized profits, while increasing risks have to be carried by entrepreneurs. With the staging of capital infusion, i.e. spending capital not at once but in several stages, venture capitalists have the option to abandon the project if specific performance criteria are not met. Therefore, staging the capital infusion can reduce moral hazard and adverse selection problems as well. Embedding explicit control rights, for example voting rights, gives venture capitalists the opportunity to affect the business policies of their portfolio firms.

The paper is organized as follows. Section 2 surveys empirical and theoretical studies on cash-flow oriented mechanisms, that are the compensation of the entrepreneurs and the type of financing used. Section 3 discusses the staging of capital infusion. Thereafter, venture capitalists' control rights, such as voting rights and board rights, are described. The last section stresses some further research questions necessary on the way to fully understanding venture capital investments in general, and contractual arrangements in venture capital finance in particular.

## **2 Using cash-flow allocation as a mechanism**

Cash-flow oriented mechanisms subsume the compensation of the entrepreneurs and the type of financing. The entrepreneur's compensation includes a basic salary which she receives in each period as long as her project is not abandoned, and an equity stake so that she participates in realized profits. The type of financing determines the profit

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<sup>1</sup> A further control mechanism used in venture capital finance is the syndication of investments. The reason for financing one enterprise by several venture capitalists is seen in sharing information instead of solely spreading financial risks (Bygrave 1987, Bygrave and Timmons 1992). Evidence supports this view: venture capitalists syndicate their investments with venture capitalists who have similar experience (Lerner 1994).

<sup>2</sup> Moral hazard exists if one contract party changes his behavior after the contract has been signed and thereby damages the other party. Adverse selection problems arise if one contract party has to select a contracting partner out of a set of heterogeneous potential partners without knowing the specific characteristics of these partners.

allocation between the two contracting parties. It can be independent of the state of the project as in the case of a pure equity or debt contract or it can be dependent on the state of the project as in the case of convertible security contracts.

## **2.1 Evidence of entrepreneurs' compensation and type of financing**

Evidence of mechanisms used in venture capital contracts predominantly exists for the US, while for most other countries, such as the countries of the European Union, only descriptive evidence exists (see for example Reid 1998<sup>3</sup>).

Baker and Gompers (1999a) scrutinize the level and cross sectional determinants of Chief Executive Officers' (CEO) compensation. They find that CEOs' basic salaries are significantly lower than the salaries of CEOs in non-venture capital-backed enterprises. Moreover, entrepreneurs of venture capital-backed enterprises usually accept smaller basic salaries compared to their income as dependent employees (Sahlman 1990), i.e. entrepreneurs give up a share of their safe income for their entrepreneurial activity.

With respect to entrepreneurs' equity stakes, Baker and Gompers (1999a) find evidence that CEOs of venture capital-backed firms receive lower equity stakes than their counterparts at non-venture capital-backed firms. But the elasticity of CEOs' wealth to shareholder wealth, defined as the percentage change in CEOs' wealth for a percentage change in the enterprises' value, is significantly higher for CEOs of venture capital-backed firms. Kaplan and Strömberg (2000) also analyze entrepreneurs' equity stakes. They find that entrepreneurs' equity stakes depend on the state of the project: with increasing performance of the enterprises, entrepreneurs' equity stakes rise as well.

Convertible securities are the most frequently used financing type in venture capital finance. In the sample of Kaplan and Strömberg (2000), more than 94 per cent of the venture capital-backed enterprises are financed with convertible preferred stocks. Furthermore, venture capital contracts often contain a specification of events or milestones after which automatic conversion occurs so that entrepreneurs have all residual rights of disposal until this point in time. In the sample of Gompers (1997), containing only convertible preferred agreements, 92 per cent of all contracts specify an automatic conversion that occur at the time of the initial public offering, which can be

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<sup>3</sup> Reid (1998) analyzes information handling and risk sharing in British venture capital arrangements. He finds evidence that venture capitalists are generally better able to handle risks while entrepreneurs are better able to recognize risks.

seen as the biggest possible milestone, because venture capitalists, entrepreneurs, and outside investors can interpret an initial public offering as the best signal of enterprises' success. Moreover, the enterprises' early stages of growth, in which the risk to lose the investment is highest (Ruhnka and Young 1987, 1991), are more often financed with convertible securities than enterprises in later stages (Gompers 1997).

Cash-flow oriented mechanisms set strong incentives for entrepreneurs to exert high effort and to avoid high risks, because their equity stakes increase with the enterprises' performance, and because they participate in increasing profits while they have to bear increasing risks themselves. Furthermore, using convertible securities makes venture capital finance unattractive to entrepreneurs with low quality. Venture capitalists have incentives to exert high effort as well, because if the performance of their portfolio firms do not meet a certain level or a contractual specified milestone, conversation does not occur so that they only receive the fixed payment specified in the contract usually below the expected and targeted profit of a participation.

## **2.2 Explaining entrepreneurs' compensation and type of financing**

Entrepreneurs' compensation can be explained due to moral hazard and adverse selection problems arising if information is asymmetrically distributed between the contracting parties. There exists a huge literature analyzing incentive problems in principal agent frameworks even if this does not explicitly focus the entrepreneurs' compensation in the context of venture capital finance.<sup>4</sup> In the traditional principal agent framework, entrepreneurs' compensation solves any existing incentive problems. Hence, there is no need for preferred equity or convertible loan to solve incentive problems because these do not exist after the contract has been signed. In order to analyze the choice of financing type, theoretical studies often use an incomplete contract approach based on the theoretical work by Grossman and Hart (1986) or Aghion and Bolton (1992).

Theoretical studies analyzing the type of financing have only in common that they compare the pay-off of the enterprise under various contracts, such as equity, debt and convertible security contracts. They widely differ with respect to their assumptions about the number of capital infusions, cash-flow uncertainties, or observability and verifiability of

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<sup>4</sup> Weimerskirch (1998) examines how venture capitalists can use entrepreneurs' compensation to solve an adverse selection and a moral hazard problem. The venture capitalists offer contracts to the entrepreneurs, which differ with respect to entrepreneurs' basic salaries and the profit participations, so that entrepreneurs identify their real type to the venture capitalists.



contracting parties' actions, such as efforts by the venture capitalist and the entrepreneur. Assumptions made depend on the goal of the respective model. For example, if the model should be used to analyze negotiation after the contract has been signed, it is necessary to assume that specific information, such as the state of the project, is observable but not verifiable. Due to the fact that this information cannot be verified by a court, the contract cannot be based on this information so that negotiation of the initial contract is possible and often desirable. Since these models contain a multitude of predictions and assumptions, the following descriptions can only offer the general idea of each model.

The intensive usage of convertible security can be explained by the property of this financing type to endogenously allocate the cash-flow after the contract has been signed as Cornelli and Yosha (1997) and Schmidt (1999) show in their theoretical work. This property arises because convertible securities combine elements of credit and equity contracts. In the bad state of a project, in which the profit of the enterprise does not exceed the costs of the capital infusion, the venture capitalists prefer a debt contract because under this contract they have a claim on the assets of the enterprise. While in the good state of the project they prefer an equity contract, with which they can participate in the profits of the enterprises. Under convertible security contracts, venture capitalists have a claim on the enterprises' assets, as long as the shares are not converted. After conversion, they receive equity stakes in their portfolio firms. With this property of convertible securities, several incentive problems between the contracting parties can be reduced.

In the model by Schmidt (1999), the convertible security contract mitigates a double-sided moral hazard<sup>5</sup> problem between the contracting parties. After the contract has been signed and the capital has been infused, both contract parties observe the state of the project before the entrepreneur makes her effort affecting the enterprise profit. After the venture capitalist has observed the level of the entrepreneur's effort, he provides effort as well which likewise affects the enterprise profit. Neither the effort of the venture capitalist nor the entrepreneur's effort can be contracted upon. Any combination of equity and debt does not ensure efficient amounts of effort from both contracting parties in all states of the project, while the convertible security contract does if the conversion rate is appropriately chosen.

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<sup>5</sup> In the existence of a double-sided moral hazard problem, both contract parties have to give the opposite party incentives for doing something. In the model by Schmidt (1999), both contract parties can increase the profit of the enterprise by exerting their efforts, but they need sufficient incentives for exerting effort.

In the model by Cornelli and Yosha (1997), a convertible debt contract prevents the entrepreneur from manipulating the short-term performance (STP) of the enterprise, measured by the enterprise's profit after the first capital infusion. She always likes to continue her enterprise financed by several capital infusions, while the venture capitalist likes to liquidate the enterprise in some states of the project. The venture capitalist uses the STP of the business to decide on a further capital infusion. If the STP is bad, he liquidates the enterprise, while if it is in the middle range or even good, he infuses further capital. By undertaking specific actions, the entrepreneur increases the probability of a STP in the middle range if the long-term performance is bad and she increases the probability of a good STP if the long-term performance is middle. Under a convertible debt contract does the entrepreneur have less incentives to manipulate the STP, although the entrepreneur's incentives to manipulate the signal in order to reduce the probability that the venture capitalist liquidates the enterprise do not change. But under this contract the entrepreneur has overall less incentive to manipulate the signal, because signal manipulation increases the probability of a good STP so that the venture capitalist converts his shares. And this reduces the entrepreneur's expected pay-off since without signal manipulation the venture capitalist would never convert his shares if the signal is in the middle range.

Berglöf (1994) analyzes how the revenue and control should be allocated between the entrepreneur and the venture capitalist when the enterprise is to be liquidated after some time has passed. After the venture capitalist and the entrepreneur have signed a financing contract, determining the allocation of the revenue and the control, the entrepreneur starts her business. The financing contract should ensure that by liquidating the enterprise the entrepreneur is compensated for her private benefit only existent in the good state of the project while the venture capitalist should be protected against a dilution of his shares in the bad state. The contract dominating all other considered contracts by reaching the mentioned goals is a debt contract, which gives the venture capitalist an option to convert debt into non-voting equity.

All above-mentioned theoretical studies explain the preference for using convertible securities in venture capital finance, while Trester (1998) primarily explains why the venture capitalist should prefer equity over debt financing. The author argues in a stochastic model that asymmetric information, which may arise after the contract has been signed, leads to the infeasibility of a debt contract. It is the foreclosure right of the venture capitalist which makes this financing type undesirable and infeasible. Trester's main idea is that the entrepreneur receives earlier information about the enterprise probability of success or failure than the venture capitalist. Under a debt contract, she has an incentive

to take all available money out of the enterprise even if the probability of success is still positive. Therefore, the venture capitalist can choose between a possible total loss under a debt contract and a possibly inefficient continuation of the enterprise under a preferred or common equity contract. The higher the asymmetric information between the two contacting parties is, the more preferred or common equity should be used.

Another model discussing the type of financing is provided by Marx (1998). Although the differences between standard contracts, such as debt and equity, and convertible security contracts are not considered, a combination of equity and debt can be interpreted as convertible security in this model. Marx (1998) determines the contract ensuring efficient interventions of the venture capitalist. Only if debt is combined with equity does the venture capitalist intervene in all states of the project in which it is efficient, i.e. in which the difference between the firm's value after intervention in all states and the cost of interventions carried by the venture capitalist exceeds the sum of the entrepreneur's private benefit and the firm's value without intervention. Thereby, the intervention of the venture capitalist affects only the enterprise cash-flow in the bad state, while in the good state his intervention has no effect on the enterprise profit. Neither a pure debt contract nor a pure equity contract implements efficient intervention decisions by the venture capitalist.

In the model by Schmidt (1999), the entrepreneur's equity stake after conversion is consistent with empirical observations: this stake increases with the performance of the enterprise. But this result is mainly driven by the assumption of a competitive venture capital market. In the model by Cornelli and Yosha (1997), the venture capitalist converts his securities after observing the short-term performance of the enterprise which can be manipulated by the entrepreneur's actions. Since venture capital contracts often comprise automatic conversion at the time of an initial public offering, the modeled uncertainty about the true performance at the time of conversion seems not plausible. Berglöf (1994) wants to explain how the revenue and control rights are allocated between the entrepreneur and the venture capitalist. Empirical findings indicate that venture capitalists take over full control if the performance of the enterprise is bad. But in the model by Berglöf (1994), the optimal contract is a debt contract with an option on non-voting equity so that the venture capitalist never takes over the control of the enterprise. In the model by Trester (1998), the result of infeasibility of the debt contract critically depends on the assumption that the only difference between the preferred equity and debt contract is the venture capitalist's foreclosure right. This assumption combined with the impossibility of costly auditing by the venture capitalist directly leads to the infeasibility of a debt contract (Thakor 1998).

### **3 Using capital infusion as mechanism**

Venture capitalists can decide to infuse the necessary capital for developing the prototype, to build up production capacity, and to open up the market all at once or at several times. Capital infusion occurring at different times is called stage financing or simply staging. Infusing capital in several stages is probably common for all enterprises, but it is more intensively and explicitly used in venture capital finance.

#### **3.1 Evidence on capital infusions**

Staging the capital infusion is deemed the most important mechanism to improve the entrepreneurs' incentives to do everything to achieve a good performance of the enterprise, because after each financing stage the venture capitalist has the option to abandon the project if the enterprise has not met specific performance criteria (Sahlman 1990). Staging is possible and desirable because young enterprises in the high-technology industries demanding venture capital develop in their earliest stage a prototype of their innovative product described in their business plan. Therefore, venture capitalists<sup>6</sup> can check after this development stage if the prototype is applicable (this might be a heavy undertaking if venture capitalists do not have sufficient knowledge to do this). After the second development stage, for example, the venture capitalist can carefully look at a first market reaction to the new product. By doing so, he receives new information about the progress of the enterprise.

Indeed, financing enterprises in stages enables venture capitalists to obtain significant information about the development progress of their portfolio firms (Gompers 1995). Because receiving information and monitoring the portfolio firms' progress is costly, venture capitalists only periodically control the progress of their portfolio firms. In particular, Gompers (1995) finds that the number of capital infusions significantly depends on the success of the portfolio firms: enterprises going public receive more capital infusions than non-successful enterprises. Also, the total amount of capital spent in successful portfolio firms is higher than in unsuccessful ones. Furthermore, an increasing share of tangible assets, which lowers the agency costs for venture capitalists, leads to a higher duration of funding, a higher amount of capital per round, and a fewer number of capital infusions.

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<sup>6</sup> The capital infusion in the earliest stage of development is often financed by wealthy individuals called business angels, some of whom are more interested in realizing new business ideas than in realizing profits.

### **3.2 Explaining the usage of capital infusions**

Theoretical models explaining the staging of capital infusion use a deterministic framework, such as Neher (1999), or a stochastic framework, such as Bergemann and Hege (1998). Due to the different frameworks used, the economic interpretation of staging the capital infusion differs significantly. Neher (1999) attributes the stage financing to a lack of collateral; over time the enterprise builds up tangible assets used as collateral. Bergemann and Hege (1998) ascribe the staging of capital infusion to the unknown level of investment; staging of capital infusion has an option value in this model because capital invested is ultimately sunk. Note, Cornelli and Yosha (1997) also consider a staged capital infusion in their model discussed in Section 2.2. But while the models discussed below endogenously explain the staging of capital infusion, Cornelli and Yosha (1997) assume that an up-front capital infusion is not profitable.

In the dynamic agency model by Bergemann and Hege (1998), the value of the project is initially uncertain, and the true investment level is unknown. Both parties start with identical expectations but since the entrepreneur controls the allocation of capital she receives earlier information about the progress of the enterprise. In particular, the entrepreneur's expectation about a successful development of the project is lower compared with the venture capitalist's expectation if she has chosen a capital allocation which does not increase the value of the enterprise. A long-term contract leads to a more efficient continuation decision of the venture capitalist compared to periodically negotiated contracts. In this model, the venture capitalist controls the enterprise progress in the late stage more intensively than in the early development stage, the least successful enterprises receives the highest amount of capital infusions, and the venture capitalist decides on further capital infusion without receiving significant information about the progress of the enterprise.

Neher (1999) ascribes the staging of capital infusion to a hold-up behavior of the entrepreneur. In this model, the entrepreneur's human capital plays a crucial role in determining the success of the enterprise. By working with physical capital spent by the venture capitalist, she adds her human capital and creates by doing so an asset of the enterprise. But the venture capitalist cannot observe how the entrepreneur works with the capital. Therefore, the venture capitalist spends only a small capital amount in the first stage, observes after this period if the entrepreneur has created with this capital an asset before he infuses further capital. This physical capital invested at the beginning of each period by the venture capitalist is used as collateral at the end of the respective period. With his model, Neher (1999) determines the optimal number of capital infusions and the

optimal amount of each capital infusion. The optimal amount of capital is reached when all specific human capital of the entrepreneur is embodied in the enterprise's assets.

The model by Bergemann and Hege (1998) is not in accordance with empirical findings, while the model by Neher (1999) is. Some predictions of the model by Bergemann and Hege (1998) strongly contradict empirical findings. Venture capitalists do not infuse further capital if they have not obtained new positive information about enterprises progress (Lerner 1998). Moreover, because information asymmetries are more fundamental in the enterprises' early stages of growth, as the evidence found by Gorman and Sahlman (1989) indicates, venture capitalists tend to control the progress of their portfolio firms in this stage more intensively. And unsuccessful enterprises receive significantly less capital than successful ones. Although Neher (1999) uses a deterministic framework, the venture capitalist can incur losses because he cannot ensure that the entrepreneur will add her human capital to the physical capital. Neher (1999) assumes that adding the entrepreneur's human capital creates an asset that the venture capitalist uses as collateral. Certainly, collateral in this context should not be defined as tangible assets which can be sold on a financial market. Furthermore, the model makes another important prediction in accordance with empirical findings: the number of capital infusions increases with the degree of intangibility of investments.

#### **4 Using direct control rights as a mechanism**

So far, the theoretical and empirical studies discussed focus on the entrepreneurs' compensation, the type of financing, and staging the capital infusion as mechanisms in venture capital contracts. All of these mitigate several economic problems, such as moral hazard, adverse selection, or hold-up problems. But why do venture capitalists still need direct control rights, such as board and voting rights or antidilution rights?<sup>7</sup>

##### **4.1 Evidence on control rights**

The empirical study by Cornelius (1997) examines which covenants (for example the limitation of the entrepreneurs' salary, restricting the distribution of profits, venture capitalists' control over the number of directors on the board) are embedded in venture

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<sup>7</sup> Further contract elements are: conversion specification, often the conversion conditions of venture capitalists' securities is specified in the contractual arrangement, liquidation rights of venture capitalists, and non-compete clauses for entrepreneurs, i.e. the entrepreneur is not allowed to work for another enterprise. For a discussion of these contract elements see for example Kaplan and Strömberg (2000).

capital contracts at various stages of capital infusion. Out of seventy-seven venture capital investments, almost 62 per cent use voting restrictions in the seed stage, in which a first prototype is developed without realizing revenues (pre-revenue stage). In the enterprises' early stages of growth, over 80 per cent use this covenant, while in the later stage of growth only 25 per cent, respectively. The usage of voting rights over the development of enterprises is roughly consistent with the findings by Kaplan and Strömberg (2000). Venture capitalists have in 66 per cent of the analyzed arrangements the majority of votes in the pre-revenue stage compared to 49 per cent in the post-revenue stage, both figures are under the condition that contractual specified milestones are met. If the enterprises do not meet contractually specified milestones, venture capitalists have in 87 per cent the voting majority in the pre-revenue stage compared to 59 per cent in the post-revenue stage, respectively. Therefore, venture capitalists more frequently take over control of enterprises with low performance.

Several empirical studies analyze the role of the venture capitalists as members of the board of directors and the effects that venture capital finance has on this board. Using a sample of biotechnology firms, Lerner (1995) finds that the number of venture capitalists on the board of directors significantly increases in situations where monitoring is most important, for example when the CEO of an enterprise is replaced. By replacing the CEO between two stages of capital infusion, on average 1.75 venture capitalists are added to the board of directors, while without replacing the CEO only 0.24 venture capitalists are added on average. The board size increases significantly with enterprise development stage, in the seed stage the board has only 3.7 members, while in the late stage, the board has 6.0 members (Rosenstein et al. 1993).

The allocation of the board of directors over the various interest groups, such as insiders, quasi-outsiders (financiers) and outsiders (venture capitalists), is analyzed in the study by Baker and Gompers (1999b). According to this, venture capitalists' participation results in a reduced number of insiders on the boards of directors. Furthermore, the higher venture capitalists' reputation, the lower the fraction of insiders on the boards is. Also, the risk of financing an enterprise influences venture capitalists' participation on the boards of directors: the higher the research and development intensity, i.e. spending a large amount in intangible investments (for example paying wages for researchers), and the higher the risk of an enterprise, i.e. for instance the probability of not successfully developing the prototype, the higher venture capitalists' representation on the board is.

Another feature in analyzing the effects of venture capitalists' participation in their portfolio firms is the replacement of the founders. Hannan et al. (1996) examine data on

young high-technology firms. They find that up to the 20th month only ten per cent of the founders are replaced by a non-founder, while up to the 70th month, 70 per cent of all founders are replaced. Baker and Gompers (1999b) find evidence that venture capitalists do not often replace the founders of their portfolio firms. The probability of replacing the founder is not affected by venture capital finance when the venture capitalists' reputation is not included in the regression analysis. Including venture capital-backing and the reputation of venture capitalists show that venture capital per se has a positive and significant impact on the probability of replacing the founder, while venture capitalists' reputation affects this probability significantly negative.

Cornelius (1997) also investigates how the two contracting parties prefer the inclusion of various covenants in their contractual arrangement. According to this, venture capitalists prefer the inclusion of voting restrictions in the contract which they would like to relax with the progress of the enterprises' development, while for entrepreneurs the inclusion of this covenant in the early stage of growth is not important and at the later stage of growth they assess the inclusion negative. With respect to venture capitalists' right of controlling the number of directors on the board, both contract parties attach importance to implementing this covenant in the contract. Comparing the two questionnaire surveys, Cornelius (1997) concludes that there is some but weak evidence for the view that venture capitalists' preferences match the observed usage of covenants in venture capital contracts more than the entrepreneurs' preferences do.

#### **4.2 Explaining the control rights used by venture capitalists**

Venture capitalists use control rights to enforce business strategies and entrepreneurs' behavior after the contract has been signed. These control rights are important since venture capitalists invest in people and not in tangible assets. But there is another reason for using control rights such as voting rights and board rights. In addition to their physical capital venture capitalists can add important resources into their portfolio firms that may increase the expected profit of these firms. In order to give venture capitalists incentives to offer their specific resources, they may need a multitude of control rights including intervention rights.

In a two period model, Chan et al. (1990) explain venture capitalists' control rights due to the unknown ability and unobservable actions of the entrepreneur. The abilities of the venture capitalist are common knowledge, while both contract parties have only an identical probability distribution over the abilities of the risk-averse entrepreneur. The entrepreneur's ability and her chosen actions, which the venture capitalist can observe



neither *ex ante* nor *ex post*, affect the cash-flow of the enterprise. The venture capitalist uses the cash-flow as a signal of the true and unknown abilities of the entrepreneur. If the cash-flow falls below a critical value, he takes over control in the second period and pays the entrepreneur a fixed salary independent of her abilities, as it is efficient to fully ensure the entrepreneur against cash-flow fluctuations, since moral hazard problems no longer arise. If the cash-flow surpasses a critical level, the entrepreneur further controls the enterprise and receives variable compensation ensuring that she has incentives to offer sufficient effort in the second period.

Hellmann (1998) explains why entrepreneurs accept the extensive control rights of venture capitalists even if these control rights may result in their replacements. In this model, the entrepreneur's ability to manage the enterprise is initially unknown. The entrepreneur does not only receive a monetary pay-off but also private benefits resulting from control. The venture capitalist can undertake a costly search for a new management team that replaces the original entrepreneur, and by doing so, the management team increases the overall monetary pay-off of the enterprise. If the entrepreneur has high private benefits, she prefers a contract with low monetary pay-off to induce a low replacement rate since replacing in terms of her overall utility is very costly. While the venture capitalist in the model by Chan et al. (1990) can take over production decisions by himself, in this model he is only an intermediary who can allocate control to another management team.

Repullo and Suarez (1999) consider several features of venture capital finance including among other the antidilution protection of venture capitalists' shares. In particular, they analyze the interaction between staging the capital infusion and a double-sided moral hazard problem, occurring after a second capital infusion has been made. Before infusing capital a second time, the state of the project is observable but not verifiable. Because the first capital infusion has ultimately sunk at the time of the second capital infusion, the initial investor has to be protected against dilution of his shares. But protecting these shares in a hard fashion compromises the development of the enterprise, because especially when profitability prospects are low there are weaker incentives for the contracting parties to exert considerable effort in the second stage. Buying back the initial investor's shares, or financing the first as well as the second capital infusion by a single venture capitalist increases effort incentives. The optimal contract of the first capital infusion can be interpreted as warrants, while the optimal contract of the second capital infusion is a simple common stock contract.

The model by Chan et al. (1990) predicts that the venture capitalist's control rights depend on the cash-flow; the venture capitalist only takes over control of the enterprise if the cash-flow does not exceed a critical value, otherwise the entrepreneur is in control. This is consistent with empirical findings: venture capitalists only take over control if specific performance goals are not met. While in the model by Hellmann (1998), control rights are specified in the contract and do not change with the performance of the enterprise. Repullo and Suarez (1999) assume that the second capital infusion is financed with common stocks. This is not convincing because the contracting parties have to induce their effort after this second capital infusion has been made. But this model mentions another important problem: there might exist an incentive problem among investors (including the entrepreneur) who finance various stages of capital infusions or who offer efforts at various stages of the enterprise's development. This incentive problem may explain why venture capitalists syndicate their investments. Furthermore, the model predicts that protecting the venture capitalist's shares is most important in the early stages of an enterprise, which is consistent with empirical observations (Kaplan and Strömberg 2000).

## **5 Directions of further research**

This paper has sketched the findings of several theoretical and empirical papers on and around contracts between entrepreneurs and venture capitalists. The studies discussed point out that venture capital contracts are written in such a way as to solve several kinds of incentive problems between the two contracting parties, using the cash-flow allocation as a positive stimulus for the entrepreneur, using the allocation of risk as a negative stimulus for the entrepreneur, and using explicit control rights to undermine specific unwanted behavior of entrepreneurs. However, at present there are still many unresolved questions, both empirical and theoretical ones, on the way to fully understanding venture capital finance.

The preference for convertible securities, and the entrepreneurs' compensation are sufficiently explained due to the property of convertible securities to endogenously allocate cash-flows and to set incentives for entrepreneurs to offer high effort. Also, the staging of capital infusion is sufficiently explained by various incentive problems, such as entrepreneur's hold-up behavior or double-sided moral hazard problems. With respect to the allocation of control rights, it seems unclear how this allocation process works. None of the empirical and theoretical studies discussed investigates which contract party has more power in determining a special contract element.

Empirical studies give some information regarding the mechanisms used in venture capital finance. But, these empirical studies often use data from the US, while European venture capital contracts have not yet been examined mainly because data for these analyses are often not available. Therefore, it is open whether European venture capitalists use convertible securities in the same way as their American counterparts. There might be some institutional and regulatory reasons resulting in significant differences between venture capital arrangements used in the US and in other countries. Furthermore, the overall financial architecture of the economies might result in different venture capital industries in general (as argued by Black and Gilson 1998), and in different venture capital contracts in particular. Information about the design of venture capital contracts in Europe is essential if public policies are to be designed so as to be welfare improving.

Further research on venture capital contracts in the US should pursue the following direction: how does the experience and expertise of venture capitalists affect the contractual arrangement between them and the entrepreneurs? This experience and expertise may differ due to exogenous characteristics but also due to their specific technological knowledge accumulated over time. Venture capitalists' qualities approximated by different variables, such as the length of time which the lead venture capitalist has served on the board of directors, negatively affect the degree of underpricing (Barry et al. 1990 for the US and Bergström et al. 1995 for Sweden). Therefore, it might matter whether an experienced or a relatively inexperienced venture capitalist signs a venture capital contract with an entrepreneur.

Since venture capitalists invest the money of third parties, it might also be important to examine how the relationship between the venture capitalists and the outside investors affects the contractual arrangement between venture capitalists and entrepreneurs. Venture capitalists' concerns about signaling their true quality to original investors are a reason for young venture capitalists to make their portfolio firms go public earlier than older venture capitalists do. The benefits of this behavior, signaling their true quality, exceeds the costs of this behavior, the greater underpricing of the shares (Gompers 1996). Moreover, evidence suggests that a learning process is the driving force in the relationship between venture capitalists and original investors (Gompers and Lerner 1999). But how does the relationship between venture capitalists and original investors affect the contractual arrangement between venture capitalists and entrepreneurs?

## 6 References

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