The Role of Smart Money: What Drives Venture Capital Support and Interference Within Biotechnology Ventures?

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Abstract

- It is a well established fact that venture capitalists become actively involved with their portfolio firms in order to encourage a start-up's successful development. Thereby, the involvement consists of two very distinct activities: first, VCs support the entrepreneurs, for example by providing contacts to potential customers. But second, VCs also monitor the management's actions and if necessary actively interfere with the management's decisions. The aim of this paper is to disentangle the overall involvement of VCs into support and interference and separately investigate the individual drivers for both activities.
- An analysis of modern finance-theoretical predictions does not yield any significant results as long as only the overall involvement of the VCs is considered. Only a separation of the involvement into the dimensions of support and interference allows conclusions based on principal-agent and control rights theory.
- The derived results of the separate analysis are largely in line with the agency-theory and the signalling approach of Dessein (2005).
- Government co-financing schemes that provide funds in the form of debt-like instruments clearly decrease the VCs' incentives to monitor the activities of their portfolio companies while they have no effect on the extent of support provided.

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A. Introduction

One distinct feature of venture capital financing is the active involvement of the investors within the management of their portfolio companies – often referred to as "smart money". This value-adding role of venture capitalists (VCs) has been analyzed by a growing number of empirical literature, such as Lerner (1994), Sapienza (1992), Sapienza/Gupta (1994), Hellmann/Puri (2002) and Kaplan/Strömberg (2004). The overall evidence suggests that the post-investment engagement of VCs consists of two separate types: firstly, VCs support their companies for example by establishing corporate strategies or providing contacts to potential customers. Secondly, VCs closely monitor the activities of the management team and, if necessary, interfere with their decisions in order to secure the investor's interests. One frequently observed action of VC interference is the replacement of a founding CEO by an outside manager against the will of the initial founders. To understand the value-adding of active investors it is therefore important to separately investigate the incentives for both dimensions of VC involvement: the support and the interference.

Several recent theoretical articles address active VC engagement within their portfolio companies. Most papers focus solely on the effect of VC advice in a double moral hazard setting. These papers mainly regard support as the investor's effort to enhance the possibility for a successful development of the venture (Inderst/Müller, 2004; Repullo/Suarez, 2004; Schmidt, 2003). VC interference is of a different nature. According to the classical principal-agent theory, VCs frequently monitor the entrepreneur's actions and if necessary interfere in her decisions (Cumming/Johan, 2007). By doing so, VCs reduce the entrepreneur's opportunity costs of exerting effort and thus increase the expected pay-offs (Holmström/Tirole, 1997; Dessi, 2005). Control theory-related literature directly models VC control as active intervention in the daily business of the entrepreneur (Chan/Thakor, 1990; Hellmann, 1998). Having the option to take over control of the management in case of unforeseen circumstances reduces the entrepreneur's incentive to engage in opportunistic behavior (Dessein, 2005). In general, motivations to provide support or to interfere are quite different. Advice is offered when a VC receives high powered incentives to invest his costly time and effort in order to support the development of his portfolio company. Interference frequently occurs as a consequence of agency conflicts due to an uneven distribution of information between the two parties. This article's aim is therefore to identify the distinct drivers for active VC support and/or interference and to subsequently test the predictions of the cited theories with a new and comprehensive data set of German and British venture capital-financed companies.

As the concepts of support and interference cannot easily be separated from the overall VC activity, I distinguish – similar to Hellmann/Puri (2002) and Kaplan/Strömberg (2004) – between VC actions that are welcomed by the entrepreneurs ("support") and actions that are undertaken against their will ("interference").[1] So far very little empirical research has attempted to separate the two dimensions, support and interference, when analyzing the active involvement of VCs within their portfolio companies. Hellmann/Puri (2002) distinguish between VC support and a control activity in the case of CEO turnovers. The authors argue that if the former CEO retains a position within the company then the VC action should be regarded as supportive. In the case of a separating turnover, where

the founder leaves the company for good, Hellmann/Puri (2002) interpret this act as monitoring. Kaplan/Strömberg (2004) take a similar approach. They pick certain actions of VCs and relate them – regardless of the VCs' intention – to either advice (e.g. developing the business model) or to control (e.g. replacing the management). Cumming/Johan (2007) operationalize VC monitoring by the number of different types of disagreements between the management and the investor. My approach is different. I analyze six areas of potential VC involvement to which I do not ex ante assign an area to either of the two dimensions of support or interference (or neither of them). As VC involvement could in any area represent either a support activity or interference[2] I distinguish between these two types of VC activities based upon whether or not active involvement was desired by the entrepreneur. The information is then merged into two separate indices representing the extent of these two forms of VC-entrepreneur interaction. With this new, more direct and comparable measure for VC involvement I analyze in a multivariate setting the different drivers for support and interference by active investors.

The empirical analysis follows a two step approach. Firstly, I separately analyze whether the extent of VC support and interference can be explained through company, VC or contract specific characteristics. I test in total eight hypotheses, based on different strands of modern finance theory, namely the classical principal-agent and the control rights theories. Secondly, I estimate the relation between the same set of independent variables and the overall extent of VC involvement. Thereby, I analyze whether it is necessary to disentangle the overall VC involvement into support and interference in order to understand the motivation for active VC engagement.

The analysis in this article is based on a new and comprehensive sample of 79 venture capital financed biotechnology firms in Germany and the United Kingdom who have participated in personal interviews. The focus on one industry provides a variety of industry-specific information which offers the opportunity to more thoroughly investigate the interrelation between VC support/interference and company specific characteristics e.g. the development stage or the patent status of the core product(s).

The organization of the article is as follows. In section B individually testable hypotheses for VC support and interference are developed from the classical principal-agent theory and the control rights theory. Section C gives a brief summary of the sample selection and collection. Furthermore, I offer first descriptive results. Section D describes the development of the individual indices that are used as independent variable in the consecutive analysis. In a multivariate setting I then examine the influence of several contract and company specific details on both the overall VC involvement, and separately, their support and interference. Finally, Section E summarizes and discusses the results.

B. Implications of Financial Contracting Theories on Venture Capitalist Actions

In this section, I will discuss the implications of modern finance theory on the VCs involvement with the management of their portfolio company. I will separately deal with the two dimensions, support and interference, in order to derive individually testable hypotheses. I will focus on two classes of theories: the classical principal-agent approach and the control rights theories as part of incomplete contracting theory. Hypotheses are

generated from the general classes of these theories as well as from more recent VC-specific advancements.

I. Venture Capitalist Interference

Venture capital finance is characterized by a high degree of asymmetric information, e.g. uncertainties concerning the extent to which the entrepreneur is better informed than the VC.[3] Due to the inherent uncertainties, an investor faces two distinct agency problems that might, if they become too severe, lead to the VC's involvement in the entrepreneur's decisions in order to secure his interests.[4] Firstly, VCs might be concerned that an entrepreneur is lacking the quality and/or ability to effectively run a newly established company. Secondly, the entrepreneur may not work hard enough to maximize the firm's value or may invest great effort to enhance a project that yields high personal reputation but does not contribute to the overall success of the venture (moral hazard). These agency problems are more intense when the quality of the management team is not known due to the lack of previous industry or entrepreneurial experience. When these uncertainties increase and moral hazard problems as well as quality risks become more severe, the rate of potential conflicts of interests also increases. This in turn will lead to more frequent VC interference in the management's actions. I therefore conclude

Hypothesis 1: *The extent of venture capital interference will decrease with an increase in the industry and entrepreneurial experience of the management team.*

Incentives for managers to engage in opportunistic behavior are also largely affected by the allocation of cash flow rights. For example, if an entrepreneur chooses to invest her effort in activities that mainly offer non-pecuniary benefits to herself but not to the company, she will entirely profit from this action, whilst only bearing a fraction of the arising costs according to her share in the venture. The incentives to exploit such opportunities increase with a decline in the entrepreneur's equity stake as the gap between personal costs and benefits widens (Jensen/Meckling, 1976). I consequently propose the following second hypothesis:

Hypothesis 2: *The extent of venture capital interference will decrease with an increase in the management's equity share.*

To avoid potential agency conflicts due to adverse selection and/or moral hazard, principal-agent theory traditionally emphasizes monitoring as an effective way to reduce the information asymmetry (Akerlof, 1970; Jensen/Meckling, 1976; Fama/Jensen, 1983). In venture finance the most common feature of formal monitoring are the regular reports that almost every financed company must send to their investors. These reports usually have to state key company facts such as the progress of important research projects or when significant investments were made. By providing regular statements, the risk of getting caught for moral-hazard behavior increases which should, when anticipated by the entrepreneurs, lead to the following hypothesis:

Hypothesis 3: *The extent of venture capital interference will decrease with an increase in the frequency of compulsory reporting*

One unique feature of venture capital finance is the frequently observed separation of cash flow and control rights (Kaplan/Strömberg (2003). Typically, VCs possess dispro-portionally large control rights compared to their capital commitment but the exact split is regularly subject to bilateral negotiations. In a world of incomplete contracts, Dessein (2005) offers a formal signalling model investigating the impact of the control rights distribution. He analyzes the relationship between the extent of formal control (control rights held by the VC) and real investor control. Formal control reflects the right to decide on specific actions whereas real control stands for effective control over the entrepre-neur's decisions, hence investor interference.[5] Dessein (2005) shows that by relinquishing formal control to the VC, an entrepreneur could send a credible signal of the congruence of interests with her investor that she is of the 'good' type. As the entrepreneur solely cares about real control, she offers the VC formal control rights and thereby trades these rights for real control. Consequently, a VC will interfere less often within the manage-ment's business. This theory gives rise to the following hypothesis:

Hypothesis 4:   *The extent of venture capital interference will decrease with an increase in the VC's voting rights and board seats.*

When deciding on how much effort to invest in monitoring, and if necessary in interfering within a portfolio company, a VC will also consider the associated costs and trade them off against his outside options of e.g. doing nothing.[6] Thereby, the costs a VC has to bear for his engagement are directly related to his industry and work experience. For example, investing funds only in companies of one specific sector facilitates the understanding of the whole industry and its needs. A knowledgeable VC with such know-how will more easily detect a flawed corporate strategy or opportunistic management behavior and will quickly provide an alternative (better?) solution. In contrast, a less experienced VC has to invest a lot of time and effort in order to understand potential problems. I therefore con-clude the following hypothesis:

Hypothesis 5:   *The extent of venture capital interference will decrease with fewer years of investment experience of the VC and the VC's investment focus on more than one industry.*

II. Venture Capitalist Support

Gorman/Sahlman (1989) point out that support activities by a VC require a substantial amount of costly time and effort. An investor will perform this advisory role only if suf-ficient incentives are in place, hence when he is adequately compensated. Similarly to the entrepreneur, the VC only participates in the results of his engagement according to his equity shares in the portfolio company but has to bear all expenses. Therefore, the VC's incentive to support a company increases with his ownership share.[7] Overall, this leads to the following hypothesis:

Hypothesis 6:   *The extent of venture capital support activities will increase with an in-crease in the investor's equity stake.*

Control rights theories mainly contribute to the understanding of why VCs actively inter-fere with the entrepreneur's decision. However, Hellmann (1998) argues that control rights are also suitable to provide incentives for VCs to exert support. In his model, a VC only has an incentive to invest costly time and effort in supporting a portfolio company (the search for a superior management team) when he holds a majority of the control rights. In this case, he knows that such effort will not be wasted because he can, if neces-sary, enforce his ideas even against the management's choice. Hence, a VC will more frequently provide support when he holds a majority of control rights. I therefore con-clude Hypothesis 7:

Hypothesis 7: *The extent of venture capital support activities will increase with an increase in the VC's voting rights and board seats.*

Similarly to the extent of interference, VCs will also consider the associated costs when deciding on the level of advice they provide. An investor with industry expertise will come up with helpful hints more easily in comparison with a VC who first has to accumu-late knowledge of a specific industry and its products. The same argumentation holds for VC funds that focus their investments only on one sector. Here, managers could profit from the know-how they have gained from working with other start-ups within the indus-try. Therefore I offer the following last hypothesis.

Hypothesis 8: *The extent of venture capital support activities will increase with the years of VC investment experience and the VC focus on one industry.*

III. Control Variables

To test the above derived hypotheses, I include a number of control variables in my analysis. As VCs only have a specific time contingent available to deal with their financed companies, they have to decide on how much to monitor or to support each of their financed firms. To capture whether the choice to get actively involved depends on the relative importance of the financial commitment, a variable measuring the proportion of the single investment to total assets under management is considered. Along the same line, Gompers (1995) finds empirical evidence that VCs are more actively involved in companies whose growth options are high. I therefore include a dummy variable to ac-count for whether a company currently develops therapeutic medication. In the case of biotechnology firms, companies that succeed to develop effective medication generally offer much higher potential gains compared to other biotechnological products (e.g. diag-nostics, platform technologies) (Casper, 2000).

I also insert a dummy variable for VC investments that are at least partly co-financed by a government promotional bank. These investments are distinct from other forms of deal syndication, as for a long time the publicly owned banks (e.g. DtA in Germany) did not invest their funds in the form of equity[8] but predominantly in form of more debt-like instruments with low interest rates, deferring back-payments for several years. Many VCs successfully applied for this scheme as it was a welcome instrument to leverage their expected returns and simultaneously lower their overall capital commitment. Since a large proportion of the potential losses in case of an investment failure is covered by

public money, such a portfolio company becomes comparably less important within the investment portfolio of a VC and he may therefore have less incentive to monitor a company. This in turn should result in less frequent interventions.

The patent status of the core product(s) of a company may also have a significant impact on the VC-entrepreneur relationship. Once a product reaches proprietary protection, a large proportion of the inherent value of a newly established company in the form of the unique entrepreneur's human capital becomes embodied in a more physical value, a tradable patent right. This collateral value is then no longer in the sole possession of the entrepreneur, but owned by the company and thus also partly by the investors. Once the entrepreneur has passed over her knowledge to the company she loses a large stake of her negotiation power which decreases her chance to get away with opportunistic behavior (Neher, 1999). This self-disciplining effect should then result in a reduced likelihood of conflicts of interests and thus in less VC interference.

As many venture capital investments are syndicated I include a dummy variable to consider potential free riding behavior among the investors. Each VC might count on the other co-investor(s) to do the costly monitoring and therefore reduce their own governance. If this holds, a decreased intensity of VC interference in syndicated investments should be observable.

The sample data constitutes only German and British venture capital financed companies. To account for any country-specific effects of VC involvement I introduce a dummy variable for German firms into my analysis. Since the British market for venture capital is considered to be more mature, British VCs might be better skilled in ex ante screening for good or bad investments due to their past experience and therefore are more frequently able to avoid investing in poor ventures. If this holds, British companies should receive less VC interference compared to their German counterparts.

Finally, I also control for effects caused by the maturity of a portfolio company. Lerner (1995) finds evidence that VCs become more frequently involved within their portfolio companies when the need for oversight is greatest, hence in times of increased uncertainties. To capture such potential impact I include several proxy variables in my analysis. Since uncertainties are especially pronounced in early development stages, a dummy variable measures the stage of the core product. To further proxy the VC's uncertainty, the age of the company and the number of previous financing rounds is included in the econometric models. However, Sapienza/Gupta (1994) offer an alternative link between the uncertainty and VC activities based on the so-called "home-run" strategy. The authors speculate that VCs could prefer to invest greater effort and resources into companies that look the most promising and hence in more mature firms. This is because a large proportion of the returns of a VC fund usually comes from one or two so-called high flyers, portfolio companies that increase their value by factor of ten or even more. Since VCs only have limited time available, investing effort into portfolio firms in later development stages, where the chances for success are already calculable, might then become the favorable strategy for many investors.

Table 1 summarizes the discussed variables and the expected directions of their influence on VC support and interference.

Table 1. Definition of Independent Variables and Expected Impact on Venture Capitalist Support and Interference
This table presents the definition of the independent variables used in the ordered logit models as well as the predicted coefficient given the cited theories. In the table, a + implies a positive and – a negative impact on the independent variable.

Hypothesis	Variable	Variable Definition	Support	Interference
Principal-agent theory				
1	Entrepreneurial experience	Dummy for previous CEO entrepreneurial experience		–
	Industry experience	Years of previous industry experience of CEO		–
2 / 6	Entrepreneurial ownership	Dummy for majority of equity shares held by entrepreneurs/ management team	–	
3	Compulsory reporting	Average number of compulsory formal reports per year		–
5 / 8	VC biotechnology focused	Dummy for VC investments in fund focused on biotech/health care sector	+	+
	Age VC	Years since foundation of VC firm	+	+
Control rights theory				
4 / 7	VC control of voting rights	Dummy for the majority of voting rights held by VC	+	–
	VC board control	Dummy for the majority of board seats controlled by VC	+	–
Control variables				
	Investment/Funds under management	Quotient of VC commitment/overall fund size		
	Therapeutic	Dummy for therapeutic developers		
	Co-financing	Dummy if public co-financing program was involved in financing		
	Patent protection	Dummy for patent protection of most important product		
	Syndicated investment	VC funding is provided by more than one investor		
	Later stage	Dummy for most important product being in a later stage development phase		
	German firm	Dummy for German firms		
	Age company	Years since foundation of portfolio firm		
	Financing rounds	Numbers of closed financing rounds		

C. The Data Set

I. Sample Selection and Collection

The analyzed dataset of 30 British and 49 German biotechnology companies is the venture capital financed subsample of 280 biotechnology companies interviewed in 2005. German and British firms were carefully selected from the red biotechnology sector[9] to be those which apply biotechnology methods according to the OECD (2005) definition. Firms that solely offer services or supply products without self-research were excluded from the sample. In addition, firms that are subsidiaries or not originally from either of the two countries were also excluded. Several existing biotechnology databases (e.g. Bio Commerce, Dechema, Biocom, all regional databases like erbi, Bio-M) were matched and further Internet research was conducted to identify the suitable companies. With the help of biologists and biotechnologists the homepage of each company was then examined and selected according to the above criteria. In the end the basic population consisted of 346 German and 343 British firms that fulfilled the criteria in 2005, and were also founded before the year 2005.

Each selected company was asked to participate in a personal interview. Professional interviewers from a commercial market research institute were then sent to each accepting company. The interviews lasted around 45-60 minutes and were successfully carried out with 162 German and 118 British top-level firm managers between May and October 2005.[10] This resulted in a response rate of 47% for Germany and 34% for the UK, providing a representative sample of British and German biotechnology firms.

In this article I separately analyze a subsample of companies that successfully completed at least one venture capital financing round. As I am primarily interested in the current collaboration between the management and the investors I have excluded those companies where VCs have already successfully exited. Due to some missing data I had to further eliminate 15 companies from the sample, therefore ending up with a total of 79 venture capital financed companies. Of 15 drop-outs, nearly all were reluctant to report detailed ownership data, e.g. equity share or voting rights distribution. To check whether the drop-outs are systematic and whether the sample is subject to a selection bias, I statistically tested the available data of the excluded companies against those within my sample.[11] I find no statistically significant difference concerning the distribution of the independent variables used in the logit estimations. Furthermore, the sample might be affected by a response bias. Not all firms were willing to participate in the interviews, raising the question of whether there is any systematic bias in the responses received. I compared the characteristics (e.g. age, company size, raised capital) of my sample companies to those reported by previous studies and publicly available data from commercial databases.[12] None of the values indicated a significant divergence.[13] I am therefore reasonably confident that my sample does not suffer from any severe form of selection bias.

After receiving the company-specific information I additionally collected data on the characteristics of the company's lead venture capital investors. Mainly through researching a commercial database (VentureExpert) and the Internet, information concerning e.g. fund sizes, the age of the VC firm and industry focus was gathered and matched with the original dataset.

II. Sample Description

Table 2 provides an overview of the characteristics of the 79 sample companies and their lead VCs. The first column shows the combined sample, while the second and third column present the separate British and German summary statistics, respectively. Panel B indicates that with the average age being 6.93 years most firms should have surpassed their start-up phase. However, as the development of marketable products in the biotechnology sector can take up to 12 to 15 years, roughly a third of the sample companies are still in an early product development stage. Furthermore, only about half the companies have proprietary protection even though 62% are developing thera-peutics where patent protection is essential to secure long term revenues after the ini-tially high developing costs, although they offer no guarantee for success (Baeyens et al. 2006).

Panel C shows the distribution of cash flow and control rights between the entrepre-neurs/management team and the VCs. In total, 32% of the entrepreneurs still hold the majority of equity shares, whereas VCs only possess the majority of voting rights in just over 50% of the cases. Even less company boards are controlled by the investors (32%).[14] Largely due to generously available public funding, German VCs more frequently made use of government co-financing schemes (Panel D). As I only consider the last financing round, it is not surprising that the average funding per round of 6.2 million euros differs significantly from the median amount of only 2.5 million euros.

Panel E presents the characteristics of the lead management. The average years of previous industry experience is 8.5 years, whereas British managers possess more than three times the amount of experience compared to their German counterparts. Interest-ingly, more than 45% of the CEOs already had entrepreneurial experience before joining the company.

Finally, Panel F indicates that the financing VCs vary significantly with respect to their financial resources and investment strategies. A median of 100 million euros of funds under management compared to a mean of 1 billion euros shows the large variation in VC firm sizes. Interestingly, a relatively large proportion (39%) of VCs primarily invest in companies in the biotechnology/health care sector.

D. Driving Forces Behind Venture Capitalist Interference, Support Activities, and Overall Involvement

In this section, I firstly present the construction of the three indices for the extent of the overall VC involvement, the support activities and interference. The subsequent sections provide a multivariate analysis using the indices as the dependent variable. Due to the ordinal nature of the endogenous variables I run several ordered logit esti-mates.[15]

Table 2. Summary Information

This table presents the summary information for 49 German and 30 British venture capital financed biotechnology companies. Product development stages from clinical stage II until market approval where the core product is a therapeutic or vaccine and product development stages from validation/market tests until market approval of other products are classified as later development stage. VC funds are classified as biotechnology focused when more than 80\% of the capital is invested in the biotechnology/health care sector.

	Total		Germany		UK	
	Mean	N / Median	Mean	N / Median	Mean	N / Median
A.						
Number of VC financed companies		79		49		30
First time VC financed		24		13		11
B. By company/product						
Time since foundation (yrs)	6.938	5.999	6.723	5.999	7.289	6.167
Product is in late development stage	0.633	50	0.653	32	0.6	18
Product has propriety protection	0.494	39	0.510	25	0.466	14
Therapeutic product	0.379	30	0.367	18	0.4	12
C. By cash flow and control right						
Entrepreneurs control majority of company shares	0.317	25	0.306	15	0.333	10
VCs hold majority of voting rights	0.532	42	0.531	26	0.533	16
VCs control majority of board seats	0.329	26	0.449	22	0.133	4
D. By received financing						
VC funding received in last financing round (mil. €)	6.222	2.5	7.223	3.3	4.587	900
No. of closed venture capital rounds	2.228	2	2.327	2	2.067	2
Public co-financing received	0.279	22	0.408	20	0.067	2
E. By management						
CEO has entrepreneurial experience	0.468	37	0.388	19	0.6	18
CEO industry experience (yrs)	8.532	5	4.367	3	15.333	15
F. By VC						
Focused on biotechnology industry	0.392	31	0.408	20	0.367	11
Time since foundation (yrs)	18.519	11	18.224	8	19	17
Total funds under management (bn. €)	1.048	0.1	1.044	0.1	1.055	0.082

I. Indices for Venture Capitalist Actions

VCs frequently become actively involved in various fields with the management of their portfolio companies. In this context, interviews with VCs, financed portfolio firms and industry experts resulted in six potentially important areas: the introduction of new corporate strategies; the introduction of new organizational structures; changes in the commercialization strategy; the recruitment of new management team members or key personnel; the establishment of new co-operations; and further fundraising/financing. To capture the extent of VC involvement, the interviewed managers had to indicate on a 5-point scale ranging from very weak (1) to very strong (5) how much their lead-investor was involved in each of the six areas since the conclusion of the last financing round. In case no involvement took place, I assigned an indicator value of 0. Summing up the results yields a first index of the overall extent of VC involvement.

I subsequently disentangle the involvement into the two dimensions of support and interference. As in any area, active involvement of the VC could be either support or interference; I consequently asked the managers to indicate for each of the six fields whether the collaboration with their VC was wanted or objected to.[16] Similar to the work of Hellmann/Puri (2002) and Kaplan/Strömberg (2004) I then regard desired VC actions as a support activity and actions against the manager's will as interference. The sum of the extent of VC involvement over all six areas where collaboration was (not) wanted then builds the index for support (interference). Finally, by dividing the three indices by 6 and rounding the results to the nearest integer value I end up with six potential levels reflecting the intensity of VC activities, a value of 0 representing nil, and 5 representing very strong involvement, in either support or interference.

Table 3 shows the extent of the overall VC involvement as well as the extent of VC support and interference within each of the six identified areas. As the intervention of VCs in the management's course of actions is usually only carried out when alternative options are not available or have failed, it is not surprising that VCs support their portfolio companies more frequently than they interfere with their daily business. Nevertheless,

Table 3. Extent of Overall Venture Capitalist Involvement, Support and Interference
This table presents the mean and the standard deviation of the extent of the overall venture capital involvement, support activities and interference on a scale ranging from 0 to 5. 0 represents nil and 5 represents very strong venture capital involvement. Additionally, the binary likelihood for a VC interference is shown.

	N	Collaboration		Support		Interference	
		mean	std	mean	std	mean	std
Total	79	2.215	1.140	1.886	1.187	0.354	0.641
Introduction of new corporate strategies	79	2.266	1.810	1.835	1.970	0.430	0.996
Introduction of new organizational structures	79	1.734	1.817	1.241	1.834	0.494	1.085
Changes in the commercialization strategy	79	1.873	1.690	1.329	1.752	0.544	1.119
Recruitment of management team members	79	2.114	1.854	1.658	1.954	0.456	1.072
Establishment of new cooperations	79	1.810	1.641	1.595	1.714	0.215	0.673
Further fund raising	79	2.987	1.765	2.937	1.828	0.051	0.273

VCs do frequently take actions that intervene in the management's tasks. In the subsequent sections, I will further investigate the important drivers of such VC interference and support activities.

II. Venture Capitalist Interference

Table 4 presents the results of the ordered logit estimates of the extent of VC interference. The findings are largely in line with the theoretical predictions. Even though not all coefficients are statistically significant, the significant variables all point in the expected direction. Furthermore, the Wald-χ^2-statistic ranges between 18.8 and 41.6. Hence the hypothesis that all coefficients jointly equal zero can be rejected at a statistically significant level.

In line with classical principal-agent theory, my data provides strong support for Hypothesis 1: a higher quality management team reduces the extent of VC interference. Statistically highly significant throughout all model specifications, CEOs with previous entrepreneurial know-how receive considerably less interference. The probability for VC interference increases by 23% if the CEO has previously not been actively involved in a start-up company. Interestingly, the years of the management's past industry experience have no significant effect on the extent of VC actions. Even though VCs put one major focus on the evaluation of the qualities of a management team when deciding where to invest funds (Wright et al., 1997), this result implies that after financing, it is not the industry know-how but the lack of entrepreneurial qualities of the CEO that may force VCs to get actively involved. Accordingly, previous start-up experience should receive more attention in the VC's ex ante evaluation process.

I also obtain supportive findings for Hypothesis 2. Statistically significant in all but the full model specification, VC interference significantly increases when entrepreneurs hold only a minority equity stake. This result is not surprising since the incentive to behave opportunistically on the investors' expenses increases with a decrease in the direct ownership (Jensen/Meckling, 1976). This issue becomes even more pronounced in later development stages where VCs typically hold a larger proportion of the equity simply because they provide more funding.

The frequency of formal reporting shows no significant impact on the extent of VC interference (Hypothesis 3). Therefore, according to my data I cannot recommend an increase in the frequency of this formal mechanism in order to discipline the entrepreneur's actions.

Control rights theory also offers some useful insights into the understanding of active VC involvement. Even though the influence of voting rights is only statistically significant in some model specifications, the impact of controlling the voting rights deserves some consideration. The chance of VCs not getting involved within the management's decision increases by 40% if VCs control the majority of votes. This result strongly supports the signalling approach of Dessein (2005) who argues that by transferring voting rights to the VC, entrepreneurs signal their quality which in turn leads to a decrease in VC interference (Hypothesis 4). In my analysis, controlling the majority of the seats on the governance board has no effect upon the VCs' extent of interference.

Interestingly, reduced VC effort costs either due to past investment experience or due to an industry focus on the biotechnology sector show no significant impact on VC inter-

Table 4. Relation between Company, Contract and Venture Capitalist's Characteristics and Venture Capitalist's Interference: Ordered Logit Estimates

This table presents the ordered logit estimates of the extent of venture capitalist interference within a portfolio company for 79 biotechnology companies. The dependent variable is an aggregated index of venture capitalist involvement within six areas: the introduction of new corporate strategies; the introduction of new organizational structures; changes in the commercialization strategy; recruiting new management team members or key personnel; the establishment of new co-operations; and further fundraising/financing. Independent variables include dummy variables equal to one for previous entrepreneurial experience; majority of entrepreneurial ownership; majority of VC voting and board rights; late product development stage of core product(s); patent protection; syndicated investment; government co-financing; therapeutic product development; biotechnology investment focus of VC fund; German firms. Further variables include the years of previous industry experience of the CEO; the average number of compulsory formal reports per year; number of closed financing rounds; ratio of investment size to funds under management; the age of the company and VC firm. Cutpoints are the thresholds on the underlying latent variable that result in a different observed value on the dependent variable. White (1990) standard errors are in parentheses. Asterisks indicate variables as being significant at 1%***, 5%**, and 10%* levels.

	Model I		Model II		Model III		Model IV		Model V	
	Coef.	se	Coef.	se	Coef.	se	Coef.	se	Coef.	se
Industry experience									0.016	(0.052)
Entrepreneurial experience	-1.708	(0.682) **	-1.332	(0.662) **	-2.106	(0.745) ***	-1.525	(0.692) **	-1.622	(0.850) *
Entrepreneurial ownership	-2.192	(1.202) *	-1.928	(1.166) *	-2.373	(1.272) *	-1.972	(1.170) *	-2.336	(1.487)
VC control of voting rights	-1.901	(1.198)	-1.890	(1.381)	-2.544	(1.270) **	-2.081	(1.521)	-2.601	(1.218) **
VC board control					0.830	(0.857)	0.073	(0.771)	0.741	(0.949)
Later stage									1.443	(1.150)
Patent protection	-2.030	(0.746) ***	-2.046	(0.762) ***	-2.163	(0.761) ***	-2.082	(0.774) ***	-2.317	(0.847) ***
Syndicated investment	0.114	(0.065) *	0.083	(0.063)	0.124	(0.076)	0.072	(0.062)	-0.062	(0.640)
Compulsory reporting					0.361	(0.360)	0.255	(0.331)	0.122	(0.099)
Financing rounds									0.371	(0.402)
Co-financing	-1.695	(0.867) *	-2.175	(0.879) **	-1.780	(0.929) *	-2.329	(0.861) ***	-1.686	(0.916) *
Therapeutic	-1.310	(0.616) **	-1.157	(0.634) *	-1.233	(0.924)	-1.024	(0.692)	-1.554	(1.389)
Age company	-0.093	(0.085)	-0.062	(0.082)	-0.132	(0.098)	-0.088	(0.093)	-0.165	(0.094) *
Investment/Funds under managem.					-0.001	(0.000) *	-0.000	(0.000)	-0.001	(0.000) *
VC biotechnology focused	-0.996	(0.686)	-0.764	(0.588)	-1.248	(0.849)	-0.882	(0.604)	-1.310	(1.063)
Age VC					-0.009	(0.025)	-0.003	(0.017)	-0.018	(0.035)
German firm	-1.579	(0.756) **			-2.182	(0.971) **			-2.095	(1.460)
Cut1	-4.366	(1.497) ***	-3.221	(1.587) **	-4.327	(1.821) **	-2.872	(1.625) *	-3.405	(2.202)
Cut2	-2.102	(1.519)	-1.156	(1.589)	-1.893	(1.926)	-0.756	(1.697)	-0.834	(2.320)
Cut3	-0.090	(1.773)	0.683	(1.923)	0.410	(2.183)	1.148	(2.055)	1.566	(2.660)
N	79		79		79		79		79	
(Pseudo) R^2	.221		.175		.256		.185		.282	
LR-χ^2	21.71	**	17.37	**	31.19	***	24.63	**	41.63	***
Mean *VIF*	1.47		1.47		1.61		1.57		1.73	

ference (Hypothesis 5). This result may be due to the relatively noisy indicator for learning curve effects. Including the experience of the actual fund manager instead of the investment experience of the VC firm might yield improved results.

Generally, the results are in line with the predictions of principal-agent theory and the signalling approach of Dessein (2005). However, the analysis yields several additional interesting results. The dataset shows statistically significant evidence that companies holding patent rights for their core product(s) receive far less interfering actions than firms without any proprietary protection. The collateral value of the patent seems to have a strong disciplining effect on the management. Overall, the likelihood of receiving no interference at all increases by 34% once a company holds patent rights. Hence, creating collateral value by transferring the founder's tacit knowledge into physical assets is a key mechanism to reduce opportunistic behavior since the entrepreneur becomes more and more replaceable (Neher, 1999).

One result of political interest is the consequence of government co-financing schemes on VC-management interaction. As long as promotional banks provided capital in form of debt-like instruments, the likelihood of VCs not interfering at all within their financed company increases significantly by 19%. This result strongly supports the view that by taking over a large proportion of the overall capital at risk without participating in the value creation, such types of public subsidies significantly alter the investors' incentives to monitor their investments.[17] When assuming that companies partly financed through co-financing schemes receive too little governance, an increased failure rate should be observable over the next few years. Recently the largest German promotional bank (KfW) changed their support scheme and now only provides capital in the form of pure equity.[18] However, my dataset does not yet include co-financing based on the new equity system. Investigating the potential changes of VC behavior over the next years offers an interesting research opportunity.

I also find statistically significant evidence in the full model that the VC's interference decreases with a company's age. This result supports the findings of Lerner (1995) who argues that VCs become more actively involved when the need for oversight is greatest, hence in early company stages. Additionally, the past reputation of the entrepreneur to be capable of successfully running the company may serve as a credible signal for her quality. This could then partly explain why more and more VCs are reluctant to provide seed finance (EVCA, 2006) and instead become actively engaged in more mature companies with less need for their involvement.

Interestingly, the origin of a portfolio company does not seem to have a significant impact on the extent of VC involvement. This result challenges the common perception that the German market for venture capital financing is distinct from those of other countries e.g. in the sense of the experience and activity level of its investors (Jeng/Wells, 2000). In fact, the data rather indicates that the venture capital practices in Germany and Britain are much more alike than is commonly thought. Nevertheless, in the case of the biotechnology industry, statistically significant country specific differences do exist, but these are largely explained by the years of management experience and the public co-financing efforts.

Finally, the data shows no evidence of potential free riding behavior of VCs. In fact, companies financed by several VCs more frequently report interference than those with only a single investor. However, this result is statistically insignificant.

III. Venture Capitalist Support

As predicted by agency theory, my data shows evidence for the incentive provided by the allocation of cash flow rights. In most model specifications, the majority of equity shares held by an entrepreneur indicates a negative impact on the extent of VC support (Hypothesis 6).[19] This result is not surprising, since the VCs only benefit from the outcome of their support according to their equity share.

I also find some weak evidence for the theoretical approach of Hellmann (1998). Hellmann shows that VCs are more likely to engage in support activities when they hold a majority of control rights (Hypothesis 7). In my dataset it is evident that when board seats and voting rights are controlled by the VCs, the provided support increases. However, these results are not statistically significant.

Contrary to expectation, I find no evidence to confirm Hypothesis 8. Similar to the extent of interference, VC support is not affected by the effort costs of the investors. Neither biotechnology-focused VCs nor past investment experience show a statistically significant impact. This result has some important implications for the entrepreneurs. While previous research frequently emphasized that specialized VCs are much more likely to provide support to their portfolio firms (Jungwirth/Moog 2004), my data indicates that a specialization of the VC will not have a direct impact on the extent of support offered. Therefore, entrepreneurs do not need to directly aim for specialized investors in order to receive their support.

Interestingly, VC support is to a large extent driven by the companies' inherent growth options, as previously found by Gompers (1995). In several model specifications, companies with patent protection and those developing therapeutics show a significantly increased rate of VC activity.

I also find evidence that VCs interact more frequently with portfolio companies that are run by a CEO with previous entrepreneurial experience. Two possible explanations could be responsible for this result: firstly, repeat entrepreneurs may appreciate VC support more and therefore approach their investors more often for assistance. Secondly, experienced CEOs understand the VC's necessity to get involved within specific decisions and therefore regard such actions as welcomed support rather than as interference.

Of the other control variables, no statistically significant results can be reported. This is especially surprising in the case of the proxies for a company's maturity. None of these shows a significant sign. I therefore conclude that the extent of VC support is not affected by the development stage of a portfolio company as initially suggested by Gompers (1995) and Sapienza/Gupta (1994).

IV. Venture Capitalist Overall Involvement

In the previous section, I separately analyzed VC support and interference. Table 6 presents the ordered logit estimates with the same set of independent variables to investigate whether an effect on the extent of overall VC involvement is also observable. In several model specifications I only observe three variables that show a statistically significant impact on the VC involvement: the allocation of equity shares and board rights as well as the core product's development stage. As predicted by Hellmann (1998), VC

Table 5. Relation between Company, Contract and Venture Capitalist's Characteristics and Venture Capitalist's Support Activities: Ordered Logit Estimates

This table presents the ordered logit estimates of the extent of venture capitalists support activities within a portfolio company for 79 biotechnology companies. The dependent variable is an aggregated index of venture capitalist involvement within six areas: the introduction of new corporate strategies; the introduction of new organizational structures; changes in the commercialization strategy; recruiting new management team members or key personnel; the establishment of new co-operations; and further fundraising/financing. Independent variables include dummy variables equal to one for previous entrepreneurial experience; majority of entrepreneurial ownership; majority of VC voting and board rights; late product development stage of core product(s); patent protection; syndicated investment; government co-financing; therapeutic product development; biotechnology investment focus of VC fund; German firms. Further variables include the percentage of funding in form of convertibles; years of previous industry experience of the CEO; the average number of compulsory formal reports per year; number of closed financing rounds; ratio of investment size to funds under management; the age of the company and VC firm. Cutpoints are the thresholds on the underlying latent variable that result in a different observed value on the dependent variable. White (1990) standard errors are in parentheses. Asterisks indicate variables as being significant at 1%***, 5%**, and 10%* levels.

	Model I		Model II		Model III		Model IV		Model V	
	Coef.	se	Coef.	se	Coef.	se	Coef.	se	Coef.	se
Industry experience	-0.047	(0.033)			-0.045	(0.038)	-0.047	(0.042)	-0.074	(0.063)
Entrepreneurial experience	0.851	(0.455) *	0.848	(0.461) *	0.850	(0.457) *	0.965	(0.513) *	0.937	(0.513) *
Entrepreneurial ownership	-1.217	(0.465) ***	-0.986	(0.544) *	-1.039	(0.605) *	-1.089	(0.613) *	-0.617	(0.747)
VC control of voting rights					0.347	(0.595)			1.230	(0.807)
VC board control			0.534	(0.626)			0.341	(0.609)	0.323	(0.681)
Later stage			0.318	(0.488)			0.226	(0.517)	0.175	(0.506)
Patent protection	0.756	(0.458) *	0.497	(0.445)	0.741	(0.457)	0.748	(0.521)	0.870	(0.524) *
Syndicated investment	0.720	(0.441)			0.670	(0.469)	0.622	(0.466)	0.527	(0.505)
Compulsory reporting	-0.018	(0.041)			-0.016	(0.042)	-0.019	(0.042)	-0.041	(0.043)
Financing rounds									-0.183	(0.213)
Co-financing	1.026	(0.504) **	0.921	(0.501)	-0.025	(0.447)	0.020	(0.473)	0.414	(0.516)
Therapeutic					1.012	(0.510) **	1.040	(0.581) *	0.877	(0.619)
Age company	0.026	(0.060)	0.031	(0.076) *	0.032	(0.060)	0.017	(0.073)	0.057	(0.077)
Investment/Funds under managem.									-0.000	(0.000)
VC biotechnology focused									0.080	(0.527)
Age VC							0.005	(0.023)	0.004	(0.023)
German firm			0.204	(0.542)					-0.533	(0.819)
Cut1	-0.988	(0.595) *	-1.032	(0.842)	-0.867	(0.731)	-0.705	(0.858)	-0.683	(1.224)
Cut2	0.596	(0.585)	0.518	(0.774)	0.716	(0.708)	0.878	(0.836)	0.972	(1.241)
Cut3	2.312	(0.654) ***	2.178	(0.802) ***	2.439	(0.749) ***	2.604	(0.886) ***	2.759	(1.258) **
Cut4	3.774	(0.786) ***	3.616	(0.911) ***	3.912	(0.860) ***	4.095	(1.018) ***	4.277	(1.413) ***
Cut5	6.219	(1.091) ***	5.961	(1.244) ***	6.353	(1.199) ***	6.545	(1.358) ***	6.738	(1.712) ***
N	79		79		79		79		79	
(Pseudo) R^2	.0759		.0635		.0778		.079		.0943	
LR-χ^2	14.18	*	13.61	*	17.57	*	19.01	*	32.37	**
Mean VIF	1.16		1.27		1.25		1.33		1.73	

Table 6. Relation between Company, Contract and Venture Capitalist's Characteristics and Venture Capitalist's Overall Involvement: Ordered Logit Estimates

This table presents the ordered logit estimates of the extent of the overall venture capitalist involvement within a portfolio company for 79 biotechnology companies. The dependent variable is an aggregated index of venture capitalist involvement within six areas: the introduction of new corporate strategies; the introduction of new organizational structures; changes in the commercialization strategy; recruiting new management team members or key personnel; the establishment of new co-operations; and further fundraising/financing. Independent variables include dummy variables equal to one for previous entrepreneurial experience; majority of entrepreneurial ownership; majority of VC voting and board rights; late product development stage of core product(s); patent protection; syndicated investment; government co-financing; therapeutic product development; biotechnology investment focus of VC fund; German firms. Further variables include the percentage of funding in form of convertibles; years of previous industry experience of the CEO; the average number of compulsory formal reports per year; number of closed financing rounds; ratio of investment size to funds under management; the age of the company and VC firm. Cutpoints are the thresholds on the underlying latent variable that result in a different observed value on the dependent variable. White (1990) standard errors are in parentheses. Asterisks indicate variables as being significant at 1%***, 5%**, and 10%* levels.

	Model I		Model II		Model III		Model IV		Model V	
	Coef.	se	Coef.	se	Coef.	se	Coef.	se	Coef.	se
Industry experience	-0.063	(0.061)			-0.010	(0.038)	-0.009	(0.040)	-0.062	(0.076)
Entrepreneurial experience	0.682	(0.448)	0.638	(0.474)	0.738	(0.481)	0.676	(0.557)	0.607	(0.574)
Entrepreneurial ownership	-1.464	(0.861) *	-1.197	(0.797)	-1.261	(0.918)	-1.141	(0.881)	-1.461	(0.952)
VC control of voting rights	0.300	(0.759)	0.214	(0.800)	0.204	(0.898)	0.228	(0.976)	0.154	(1.049)
VC board control	1.213	(0.577) **	1.107	(0.582) *	0.739	(0.550)	0.680	(0.639)	1.066	(0.797)
Later stage	0.957	(0.489) *	0.775	(0.483)	0.789	(0.462) *	0.665	(0.511)	0.691	(0.551)
Patent protection					-0.006	(0.486)	-0.152	(0.486)	0.161	(0.533)
Syndicated investment							0.618	(0.646)	0.680	(0.650)
Compulsory reporting									0.001	(0.043)
Financing rounds	-0.209	(0.180)	-0.109	(0.216)			-0.203	(0.233)	-0.125	(0.253)
Co-financing			0.611	(0.538)	-0.297	(0.576)	-0.422	(0.717)	-0.213	(0.651)
Therapeutic			0.025	(0.073)	0.708	(0.511)			0.527	(0.714)
Age company					0.022	(0.069)	0.036	(0.083)	0.009	(0.080)
Investment/Funds under managem.							-0.000	(0.000)	-0.000	(0.000)
VC biotechnology focused							0.059	(0.614)	-0.107	(0.731)
Age VC							-0.006	(0.019)	-0.003	(0.023)
German firm	-1.361	(0.924)	-0.580	(0.527)					-1.346	(1.000)
Cut1	-3.230	(1.049) ***	-2.467	(1.014) **	-1.975	(1.251)	-2.376	(1.229) *	-2.812	(1.584) *
Cut2	-1.721	(0.910) *	-0.961	(0.887)	-0.489	(1.109)	-0.915	(1.059)	-1.287	(1.489)
Cut3	0.342	(0.826)	1.116	(0.885)	1.549	(1.063)	1.104	(0.979)	0.856	(1.410)
Cut4	1.982	(0.903) **	2.730	(0.990) ***	3.160	(1.147) ***	2.730	(1.024) ***	2.549	(1.451) *
Cut5	4.652	(1.310) ***	5.392	(1.322) ***	5.850	(1.540) ***	5.403	(1.471) ***	5.254	(1.660) ***
N	79		79		79		79		79	
(Pseudo) R²	.1		.0978		.0917		.0927		.115	
LR-χ^2	18.99	**	22.11	***	22.90	**	33.20	***	38.26	***
Mean VIF	1.72		1.61		1.54		1.58		1.73	

involvement increases when they control the majority of board seats.[20] Also, in line with classical principal-agent theory, VCs decrease their involvement when the entrepreneur holds the majority of equity shares. In such cases, the entrepreneur's incentives to behave opportunistically are less pronounced. Simultaneously, the VC's incentive to invest his costly time and effort to support a company also declines.

However, a more striking result of this analysis is that very few (in two models none) of the included variables shows a statistically significant influence on the overall collaboration. To fully understand the drivers behind active VC involvement it is therefore necessary to separately analyze support and interfering activities.

V. Robustness of the Results, Multicollinearity and Endogeneity

Some independent variables in my analysis may be subject to multicollinearity and/or endogeneity. I observe some high correlations among the exogenous variables that could indicate multicollinearity.[21] To assess the extent of this issue, I use the variance inflation factor (*VIF*) test.[22] While the standard error of a coefficient is doubled when the *VIF* reaches 4, an arbitrary but common cut-off criteria when deciding whether a specific variable shows too much multicollinearity is *VIF* > 4.[23] In my analysis all variables are well below this threshold level, hence I do not exclude any variable from the regressions. To further check the robustness of the results and for collinearity among the independent variables, I present for each dependent variable five ordered logit estimates with a different set of explanatory variables.

A more severe problem concerns potential endogeneity of the independent variables, especially contract details. In fact, many theoretical papers suggest a direct link between the desire to avoid agency conflicts and the contract design (Repullo/Suarez, 2004; Schmidt, 2003). For example, in case a VC anticipates the need for interference and therefore insists on a majority of board voting rights, contract variables would no longer be solely exogenous and would vary with the company characteristics. If such endogeneity exists, the interpretations of my results need to be treated cautiously as endogeneity severely affects the estimation of the independent coefficients.

However, similar to Cumming/Johan (2007), I argue that the actual contract details are determined in bilateral negotiations between the entrepreneur and the VC. Hence, the exact outcome also depends to a large extent on the parties' bargaining position e.g. the current supply of venture capital on the market or the entrepreneur's wealth constraints. The impact of market characteristics on VC contracts is supported both by theoretical (Inderst/Müller, 2004) and empirical work (Gompers/Lerner, 2000). Unfortunately, this does not necessarily imply that efficiency considerations do not play any role when determining the contract design. Thus endogeneity may still be prevalent. Sadly, so far no satisfactory computable statistically model, like the two stage least squares (2SLS) for OLS regressions, exists to run tests on potential endogeneity in ordered logit models.[24] However, based on the previous discussion, I believe that my results do not, if at all, severely suffer from endogeneity and thus still offer interesting insights into the motivation for support and interference within portfolio firms.

E. Summary and Discussion

I have analyzed the involvement of active VC investors within their portfolio companies. I first measured the overall VC engagement and then disentangled these activities into the two effort dimensions, support and interference. My analysis builds on the assumption that VC support is welcomed by the management whereas interference is not.

This article offers a new approach, in which the overall VC commitment is further broken down and separately analyzed with regards to its distinct drivers of the two dimensions of active VC involvement. I showed that VCs act upon separate incentives induced by the allocation of cash flow and control rights to provide support and to interfere. On the other hand, when investigating the extent of overall involvement, I could only identify a small set of variables which showed a significant impact. Generally, the results are in line with the predictions of principal-agent theory and the signalling approach by Dessein (2005). Overall, the analysis implies that VC support and interference should be regarded as separated tasks, and therefore the results encourage the recent theoretical attempts of Schindele (2006) and Cestone (2006), who simultaneously model VC advice and monitoring.

My analysis is based on a new and comprehensive data set taken from British and German biotechnology companies. However, there are some limitations to the derived results that are important to mention. By focussing the analysis on one industry it was possible to include variables in the econometric models that are comparable throughout the whole sample, such as the current product development stage or the patent status. On the downside, it is not clear whether the results are valid in other industries. Additionally, similar to Cumming/Johan (2007) my analysis assumes a constant level of VC support and interference over time as well as independence between these two dimensions.

Besides the richness of the available data, some important aspects could not be considered in the analysis. For example, information concerning the incentive structure between the VC fund and their investors, such as performance dependent fees, restrictions to the investments horizon and/or sources of the funds might offer additional insights. It would be interesting to further explore how the VC activities affect the future development of both the portfolio company and the VC firm. The incentive structure of financial instruments (e.g. the use of convertibles or the level of debt) is also not included. These areas leave fruitful opportunities for future research.

Finally, I acknowledge that it is sometimes difficult to distinguish between a support activity and interference. My analysis is based on information provided by the companies, which means my separation criteria partly reflect the managements' perception of the VCs' actions. In some cases VC support might be mistaken as interference and vice versa. I double-checked the indication of some companies with their investors' intentions and the results showed that the assumption of interference being an unwanted VC action and support activities being welcome collaboration is an adequate separation criterion.

Appendix

Table 7. Pairwise Correlation of Independent Variables
The following table shows the pairwise correlation coefficients of the independent variables for 79 venture capital financed biotechnology companies. Coefficients significant at the 5% level are indicated with asterisks.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(1) Industry experience	1																
(2) Entrepreneurial experience	0.2264*	1															
(3) Entrepreneurial ownership	-0.2138	-0.1477	1														
(4) VC votes	0.1884	0.2201	-0.6704*	1													
(5) VC board	-0.0473	0.0444	-0.4766*	0.5494*	1												
(6) Later stage	-0.0547	-0.3904*	0.1229	-0.1359	-0.0255	1											
(7) Patent	0.1898	-0.0642	0.0358	-0.088	0.0089	0.1742	1										
(8) Syndicated investment	0.0693	0.1304	-0.3666*	0.3224*	0.2548*	0.1127	-0.0079	1									
(9) Frequency of comp. reporting	-0.0878	-0.065	-0.0454	0.3197*	0.0966	0.0607	0.0243	0.1591	1								
(10) Numbers of closed financing rounds	-0.0453	0.2486*	-0.3708*	0.3629*	0.3516*	-0.1556	-0.0443	0.2098	0.0245	1							
(11) Co-Financing	-0.3135*	-0.1304	0.1237	-0.2658*	-0.0746	-0.0541	-0.0486	0.071	0.1103	-0.0265	1						
(12) Therapeutic	-0.0493	-0.0549	0.1406	-0.1019	-0.104	0.1089	-0.0944	-0.0376	0.0681	-0.2620*	0.0376	1					
(13) Age company	0.016	-0.1409	-0.0371	-0.2331*	-0.1121	0.3742*	0.1263	0.1251	-0.2471*	0.0889	-0.1469	0.1383	1				
(14) Investment/Funds under management	0.1146	0.1102	-0.0798	0.11	-0.0624	-0.1413	-0.09	0.0882	-0.104	0.0724	-0.0588	-0.0613	-0.137	1			
(15) VC biotechnology focused	-0.0752	-0.0789	-0.1009	0.1309	0.044	-0.0871	-0.0676	-0.0212	0.1803	0.0466	0.0212	0.0122	-0.2549*	-0.1007	1		
(16) Age VC	0.1153	-0.2271*	-0.0742	0.1137	0.0821	0.212	-0.0092	0.1482	-0.0109	0.0366	-0.14	-0.0084	0.2839*	0.0265	-0.3432*	1	
(17) German Firm	-0.6307*	-0.2064	-0.0284	-0.0026	0.3260*	0.0534	0.0423	0.0957	0.1952	0.1169	0.3697*	-0.0327	-0.0688	-0.1651	0.0412	-0.0218	1

Endnotes

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 1 Besides effectively interfering in the daily business of the management, VCs also monitor their portfolio companies through more formal control mechanisms, e.g. through obligatory monthly reports, necessary approvals if investments exceed certain amounts, etc. (Sahlman, 1990).
 2 Hellmann/Puri (2002) argue that even the replacement of a founding CEO could either be a support or a control activity.
 3 The pronounced information asymmetries in entrepreneurial finance are one major explanation for the existence of venture capitalists (Amit et al.,1998).
 4 Another agency problem initially analyzed by Hart/Moore (1994) is the threat of the entrepreneur to leave the company (hold-up). This problem cannot be effectively solved by control activities, but rather by implementing sanctions that make leaving the company too costly for the entrepreneur.
 5 The distinction between formal authority – the right to decide – and real authority – effective control over decisions – was introduced by Aghion/Tirole (1997).
 6 Barney et al. (1989) emphasize the necessity to take the arising costs of a VC into account when assessing the incentives to provide monitoring or advice.
 7 As shown in the previous section, this also leads to more extensive monitoring as the entrepreneur's incentives to invest effort decline.
 8 Only recently did the largest German promotional bank (KfW) restructure their co-investment scheme, now only offering funds in the form of pure equity. However, since my data only includes financing rounds before 2004, the new equity scheme is not yet reflected in my data. Before 2004 only a comparably small number of companies received equity funding from the KfW.
 9 Red biotechnology is the use of genetically altered microorganisms for the production of substances like insulin, antibiotics, vitamins, vaccines and proteins for medical use, and is thus related to medical processes. Genomic manipulation is also an example of red biotechnology.
10 For a detailed description of the characteristics of the responding firms, please refer to Haagen et al. (2007).
11 Tests applied include the x^2 and Fisher's exact test as well as two-tailed t-test.
12 Studies considered include Reiss/Hinze (2004) and Ernst & Young (2006); Databases used include Bio Commerce, Dechema, and Biocom.
13 For a more detailed discussion of the sample characteristics, please refer to Haagen et al. (2007).
14 Note: Due to the different governance role of the board of directors in the UK and Germany, British companies are far less likely to be confronted with a VC-controlled board of directors.
15 The sample size of 79 portfolio companies is rather small for an econometric analysis based on the maximum likelihood (ML) estimator since the small-sample behavior of ML estimators is largely unknown. However, even for small samples the estimator usually still produces acceptable results. For further discussion please refer to Long/Freese (2006).
16 This proceeding is in contrast to the work of Kaplan/Strömberg (2004) who assumed that involvement in a specific area always resembles either support or interference, respectively.
17 An alternative explanation could be that co-financing only took place in less risky ventures. While possible, this seems very unlikely as for example in Germany the KfW and DtA/tbg were involved in up to 40% of all venture capital investments without any clear selection criteria (Sunley et al., 2005).
18 Even before 2004 the KfW did get engaged in start-up companies with equity-like investments. However, this program only represented a fraction of the overall industry support. The vast majority of capital was provided in the form of a debt-like silent partnership (Hoffmann, 2005).
19 Note: I implicitly assume that a decrease in entrepreneurial shares results in an increase in the VC's equity stake. While not always the case, this assumption will hold for the vast majority of cases.
20 One should keep in mind that the role of the British board of directors is quite distinct from that of the German governance board.
21 The pairwise correlations are presented in Table 7 in the appendix.
22 Note: The variance inflation factor is the reciprocal of tolerance.
23 For a detailed discussion about variance inflation factor cut-off values please refer to Craney/Surles (2002).
24 Lewbel (2004) suggests a simple estimator that should be available in the near future.

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„Smart Money": Welches sind die Treiber für eine aktive Unterstützung und Einflussnahme von Venture Capitalisten in Biotechnologieunternehmen?

Zusammenfasung

Dieser Beitrag analysiert die Unterstützung und Einflussnahme von Venture Capitalisten in 79 deutschen und britischen Biotechnologieunternehmen. Dabei trenne ich das gesamte Ausmaß der Zusammenarbeit in aktive Unterstützung und Einflussnahme. Unterstützung wird von Seiten der Gründer generell gewollt wohingegen eine Einflussnahme unerwünscht ist. Meine Untersuchung zeigt, dass die moderne Finanzierungstheorie nur dann die Zusammenarbeit zwischen VC und Entrepreneur ausreichend erklären kann, wenn das Ausmaß an Unterstützung und Einflussnahme getrennt voneinander analysiert werden. Dann zeigt sich, dass VCs Gründer einerseits häufiger unterstützen wenn sie Anreize durch Kontrollrechte besitzen. Andererseits steigt die Einflussnahme mit steigender Gefahr von Interessenskonflikten. Meine Ergebnisse bestätigen die Erkenntnisse der Principal-Agent-Theorie und des Signallingansatzes von Dessein (2005). Zusätzlich zeigen meine Daten, dass VCs ihre Kontrollaktivitäten reduzieren sobald öffentliche Kofinanzierungsprogramme fremdkapitalnahe Finanzierungsmittel zur Verfügung stellen.

The Role of Smart Money: What Drives Venture Capital Support and Interference within Biotechnology Ventures?

Summary

This article analyzes the extent of venture capitalists' support and interference within 79 German and British biotechnology companies. I disentangle the overall VC involvement on the basis that support activities are congruent with the entrepreneurs' interests while interference is generally objected to. My analysis shows that modern finance theory only offers useful insights in VC-entrepreneur collaboration when both support and interference are separately investigated. The data indicates that VCs provide more support when they are given incentives through a majority of control rights. Simultaneously, VC interference increases with potential conflicts of interests due to agency problems. The results are largely in line with principal-agent theory and the signalling approach of Dessein (2005). Furthermore, I find evidence that government co-financing schemes that provide funds in the form of debt-like instruments decrease VC monitoring activities.

Das Marketinglehrbuch mit konsequentem Praxis-Transfer
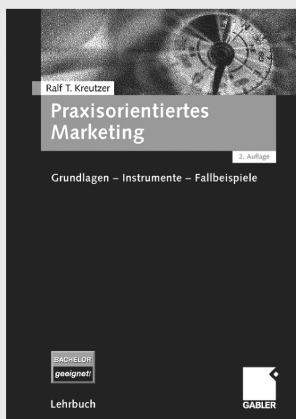
Ralf T. Kreutzer

Praxisorientiertes Marketing
Grundlagen – Instrumente - Fallbeispiele

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Grundlagen des Marketing. Die anschauliche Aufbereitung von Zielen, Strategien und Methoden sowie psychologischen Erklärungsansätzen des Marketings wird begleitet von vielfältigen Unternehmensbeispielen. So gelingt ein motivierender Transfer der theoretischen Ansätze in die Praxis. Ein Marketingbuch, das konsequent mit und für seine Zielgruppe erarbeitet wurde. In der 2. Auflage wurden alle Kapitel auf den neuesten Stand gebracht. Neben der Aktualisierung vieler Beispiele wurde im Kommunikationsteil das Themenfeld „Web 2.0" neu aufgenommen, das Kapitel zur Personalpolitik als 5. P im Marketingmix wurde konsequent weiterentwickelt.

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