What drives Venture Capital Syndication?

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Abstract

This paper analyses the syndication behavior of VC organisations and the factors influencing their overall propensity to co-invest. We develop hypothesis concerning the investment behavior of Venture Capitalists in the German market and compare these hypothesis to the actual empirical evidence from a data set including 2,500 VC investments. We find that the underlying theories of financial and resource driven motives can indeed be used to explain the observed behavior for syndicated venture capital investments. We show that mainly Resource driven motives foster the propensity to syndicate an investment. Additionally, we find that Venture Capital Firms tend to diversify their portfolio, such that both motives of venture capital syndication (Finance and Resource driven) seem to be present at the same time and play a significant role simultaneously for the decision to jointly co-invest. We find evidence that a lower level of experience and expertise fosters the need to syndicate an investment.

JEL Classification: G 24, G 31

Introduction

Venture Firms play a crucial role in providing growth capital to young and innovative entrepreneurial firms. Besides the pure support via capital they offer additional help by yielding managerial expertise and help to their portfolio firms. Because of the important role that Venture Capital plays in ensuring success of their portfolio companies in the aftermath of the investment decision a vast amount of literature studies the functioning of the Venture Capital Industry. Researchers have analysed the market on multiple dimensions. In particular the role of Venture Capital in spurring employment and earnings growth is a decisive feature. Lately, there is a number of studies dealing with the role of Venture Capital Syndication, trying to investigate the reasons behind the formation of such syndicates and estimating the effect that cooperation of financial institutions might have on the value and prospects of the funded portfolio company.

This paper extends the empirical literature on Venture Capital Syndication along two dimensions. Firstly, we analyze the reasons behind the syndication practice using outcome data in order to draw conclusions from the observable behaviour of market participants by employing a unique dataset of some 2,500 Venture Capital Deals in Germany. Secondly, we also investigate the role of differing motives for syndication and disentangle the competing views. The goal of the paper is to better understand the role of syndicate formation in the process of providing growth capital to entrepreneurial firms.

One of the difficulties in testing the explanatory power is to be able to make inferences about the motives separately to see whether they offer insights into the behavior of market participants. Thus, we treat the differing and competing views of Venture Capital Syndication as being not mutually exclusive. As such we test the explanatory power of the diversification motive along with the resource driven motive in order to see whether VC firms make use of several dimensions of portfolio choice when undertaking an investment.

This paper uses a unique dataset on Venture Capital investments in Germany that allows us to identify the parties involved in a number of transactions. We can observe for each investee company the VC firms that have invested over time and can therefore make inferences about their propensity to syndicate. As such we are also able to see which player syndicates with whom and how often. For each transaction we have identified characteristics about both sides of the involved partners, i.e. Firm characteristics for the VC firms along details of the investment target, to be able to draw conclusions on two dimensions.

We find that the resource motive explains the bevavior of market contestants in Germany, but additionally we come to the conclusion that VC firms also opt to diversify their portfolio, so that taken together both motives likewise can yield

insights into the investment decision and syndication formation process of Venture firms. Moreover, we show that we need to make inferences taking both motives into consideration at the same time.

We start by documenting how the characteristics of the investee company affect the decision made by the VC providers to jointly provide capital. We come to the conclusion that industry characteristics drive the propensity to syndicate an investment. Consequently, we find that the more mature industries exhibit a much lower level of syndication. However, for the Biotech industry we find that possibly due to the distinct particularities and the greater challenges faced in terms of industry expertise, VC firms are much more inclined to co-invest with a much larger number of partners.

Additionally, we also investigate the flipside of the investment decision by analysing the syndication behavior of different VC companies taking into consideration their level of experience and their affiliation background. Here we come to the conclusion that experience matters to the extent that more mature and experienced players syndicate much less that their inexperienced counterparts. This result is strong with respect to the behavior of foreign Venture Capitalists along with One Time Investors.

In the second part of the paper we show that there is a need to distinguish between two different perspectives on VC syndication behavior. Syndication per se can not be associated with a pure diversification strategy. Diversification only comes into play when the VC firm also chooses to build up a new partnership. Moreover, in order to be able to actually achieve such diversification benefits from syndication the VC has to involve a number of new partners into his existing network in order to be able to gain a significant effect on the portfolio. Or putting it differently, joining an already successful syndicate to take the route to a new industry for which the VC does not possess the skills to survive. Thus, the option to diversify is driven by syndicating with a number of new partners in an industry outside of the predominant industry focus of the investment portfolio in place. We therefore suggest that syndication is used as a tool to strengthen focus on core industries, whereas syndication with a larger number of new co-investors or the decision to join a new syndicate can achieve substantial diversification benefits for the portfolio and open up potential for new business.

This paper extends the empirical literature on Venture Capital by shedding light on the Syndication behavior of market participants. Instead of focusing on questionnaire data we use a unique hand collected dataset of actual deals to make inferences. As such our results differ from other studies focusing on the European and in particular the German VC market as we find evidence on both resource and diversification reasons that can explain the syndication practice among Venture Capitalists. Using outcome data we stress the fact that the resource driven motive and the diversification motive of syndication are not mutually exclusive

and need to be taken into account simultaneously to deepen our understanding of Venture Capital Syndication.

The reminder of the paper is organized as follows. Section 1 discusses the particularities of Venture Capital investments and introduces the competing views on Venture Capital Syndication. Section 2 describes the dataset and the sample characteristics. Section 3 presents the empirical findings on the syndication behavior along with the corresponding interpretations. Section 4 concludes.

1 Syndication Motives: Mutually exclusive or Complementary?

The principle of venture capital is to provide high potential growth companies with the required funds and market expertise they need to make their business model a success. Venture capitalists strive for substantial capital gains and returns in the medium or sometimes long term, compensating them for the high risk and uncertainty [Sahlmann (1990)]. The ability to select investment opportunities from a wide range of expected returns is vital to any venture capital organisation. Different to other institutional investors, venture capitalists face an informational disadvantage as they do not invest in public quoted companies [Fama (1991)]. With regard to deal selection and monitoring, venture capital firms have developed different strategies to reduce uncertainty in their high risk environment. Among these strategies staging of Venture Capital is a common mean to react to an uncertain environment. Moreover in recent years VC companies have been striving to syndicate investments with other venture capitalists [Manigart et al. (2002), Wright and Robbie (1998)].

Lerner (1994) points out, that cooperation among financial institutions is an enduring feature of the equity issuance process. An equity syndicate involves several venture capitalists taking an equity stake in an investment [Lockett and Wright (2001)]. It involves "[...] a group of individuals who must make a common decision under uncertainty that will result in a payoff to be shared jointly among them" [Wilson (1968), p. 119]. There exist two dominant competing views as to why venture capitalists syndicate, which are the traditional finance-related perspective and the resource-based perspective. All rationalees are described from a perspective to syndicate out an investment. Lockett and Wright (1999) find that the motivation to join a syndicate is explained by the same factors to syndicate out an investment: the risk-mitigating perspective and the resource-based perspective.

The Risk Mitigating Perspective is to see syndication as a mean for venture capitalists to build up a well-diversified portfolio and reduce risk without reducing

return. The relevant risk-consideration for a VC investor is the contribution of an investment to the overall risk of his portfolio. This depends on the covariance of the portfolio and the investment opportunity. There are two subdivisions of risk involved in an equity investment. While the market component is systematic and cannot be eliminated, the firm specific risk component is non-systematic and can therefore be reduced by holding a well-diversified portfolio. In a well-balanced VC portfolio there exists a minimum level of co-variance between the different investments [Manigart at al. (2002), Lockett and Wright (2001), Markowitz (1959)].

The constraints on investment activities are based on Modern Portfolio Theory. Its main principle is the efficient diversification of investments ([Elton and Gruber (1995)]. Firstly, venture capitalists encounter the difficulty to obtain a well-diversified portfolio, since they do not invest in listed stocks as institutional investors. The difficulty arises on the one hand from ex-ante asymmetric information and also from the size of the funds required (capital restraints). This demonstrates that through syndication smaller venture capitalist can actually invest in deals with a high amount of required funds.

The resource-based approach, however, sees the VC market as a pool of productive resources in which a VC organisation can access resources of another venture capitalist through syndication [Manigart et al. (2002), Bygrave (1987)].

At the *pre-investment stage*, Lerner (1994) suggests the *Selection Hypothesis* as a rationale for VC syndication. Under this hypothesis the evaluation process before the selection of an investment opportunity is undertaken by more than one venture capitalist. The evaluation of the same venture proposal by different VC companies operating in a syndicate reduces therefore the potential danger of adverse selection [Lerner (1994) and Houben (2002)]. The combined effort to assess the quality of a venture helps VC investors to overcome informational asymmetries as the entrepreneurs typically know more about the investment opportunity they seek funding for and might overstate the attractiveness of his business proposal [Sorenson and Stuart (1999)]. Sah and Stiglitz (1986) compare the decision-making process under different scenarios: In the first scenario the project is already accepted when a single party thinks that it is worth undertaking. In the second scenario, however, two or more separate parties must be convinced by the investment opportunity before the project is undertaken. Sah and Stiglitz (1986) conclude that the decision making process is more efficient and leads to better results if the project is only undertaken when approved by two or more parties.

The Value Added Hypothesis in terms of managerial activities is a resource-based motive for syndication which holds for the *post-investment stage*. Under the Value Added Hypothesis venture capitalists are considered to add value to the perfor-

mance of the venture after they invested their capital. This contrasts with the selection hypothesis, where syndication helps investors to select the best projects, but does not influence the performance of the investee company (Brander (et al. 2002)). A lead investor acts according to the Value Added Hypothesis when he believes that the involvement of other venture capitalists would add some value to the venture. The benefit of involving co-investors is derived from heterogeneous skills and information different venture capitalists can contribute to the management of the venture company. The need for such additional resources is anticipated to be greater in earlier stages of an investment, than in later-stage investments. This is mainly due to the fact that more mature investee-companies already have an established management structure and market position and have already built relationships with suppliers and customers [Lockett and Wright (1999), Brander et al. (2002)].

Considering the possibility that both motives and hypothesis could operate at the same time it could be assumed that "Syndication is a response to the need to share informational resources in the ex ante selection and ex post management of investments."(Lockett and Wright (1999), p. 307).

The literature so far, has seen both, the risk mitigating perspective and the resource based rationale as mutually exclusive. We, however, argue that both motive could be present at the same and shall be considered simultaneously in order to be able to shed light on the syndication behavior of venture capital investors. The scope of the upcoming analysis is therefore on disentangling the driving forces of Venture Capital Syndication. Having in mind that risk mitigating and resource motive might well complement each other and need not be seen as strategic substitutes in the tool box of a VC company we will investigate further to which extent the different motives might affect the decision to syndicate a deal. The goal of the forthcoming sections therefore is to reveal the mechanics and motives that foster the propensity to syndicate and to show based on actual outcome date the explanatory power of differing theoretical arguments on how and why Venture Capitalist syndicate.

2 Data and Methodology

2.1 The VC Investment Sample

The sample consists of Venture Capital transactions in Germany within the period 1996 - 2005. The transactions have been compiled by using public sources and the Thomson Venture Economics (TVE) Database. We have identified the involved parties in each transaction and the corresponding information on the Venture

Capitalist along with the funded firms. In order to obtain transactions beyond those covered by TVE for our sample we figured out publicly available information on venture capital companies and scanned the news for disclosures regarding deals and associated information. As such we have identified the funded firms and the corresponding companies that injected capital. The result was a deal survey exhibiting who has funded a new company and was joined by which partner. In addition we supplemented the database with information regarding the VC firms and the funded firms in terms of size, age, industry active in, along with information specific on the actual deal, such as the stake actually acquired by the VC firm (in percentage of the firm´s equity).

Information about the size of the funded firm, measured in terms of sales and employees, have been collected from the Markus and Amadeus Balance Sheet Databases and have been combined with publicly available information from corporate websites.

We have used the information from TVE to identify the sector of a particular venture. Here we make use of the Venture Economics Industry Classification (VEIC) - a Venture Economics proprietary industry classification scheme. Moreover, we reviewed relevant information about the Company Business Description from the VE database and from the Balance Sheet databases. In order to draw more distinct conclusions we have further separated the industries in our sample to result in finer industry clusters. As such we have devided the Medical/Health classification in two separate categories. Moreover, we split the Industrial Sector into Industrial Products (such as Chemicals and Industrial Equipment) and Industrial Services (such as Transportation, Logistics and Manufacturing Services). In addition we created categories for Software and Internet Firms to cope with the particularities of investment into "New Economy" Firms over the period. Table 1 gives an overview about the investment targets and also reports the number of investors per funded firm. This number simply calculates how many different investors a company has. A number of four means that the company is funded by a co-investment of four different VC providers, for example.

Table 1:
Firm Characteristics: Descriptive Statistics for Funded Firms

	Observations	Syndicated?		Average #
		Yes	No	Investors
Whole Sample	2474	1461	1013	4.21
Biotech	478	387	91	6.11
Consulting/Services	168	77	91	2.22
Consumer Products	45	22	23	2.68
Electronics	242	139	103	3.39
Utilities	26	14	12	4.14
Financial Institution	41	11	30	2.18
Industrial Products	218	68	150	2.74
Industrial Services	63	26	37	3.62
Internet/E-Commerce	325	214	111	3.61
Life Science/Pharma	105	70	35	7.19
Medical Products	100	58	42	3.71
Media/Communications	140	60	80	2.63
Software	523	315	208	3.43

The table indicates that roughly 60% of the deals have been syndicated and that the syndication behavior seems to be more pronounced for industries such as Biotech and Pharma, as well as for Internet and Software firms. Moreover, we can see that the number of investors per funded company differs widely across industries. Pharma and Biotech firms rank top with some 7 and 6 investors on average, whereas Consulting and Financial Firms exhibit the lowest number of investors per deal.

2.2 Additional VC characteristics

Based on the information identified in the TVE database and the industry classifications we have further collected information out the funded companies to investigate which factors play a decisive role in explaining the syndication behavior. As pointed out in Bygrave (1987) younger firms are more likely to fail and as such firm age at investment can serve as a proxy for the riskiness of a venture. Consequently, we have gathered data about the firms founding date and combined those information with the investment date to arrive at the age of the funded firm at the date of the capital infusion. Moreover, according to Lockett and Wright (1999) size variables play an important role for the decision to syndicate an investment, when VC firms want to avoid clustering risks or when the firm is simply to large for the corresponding VC firm. Therefore we have combined the information on age at investment with the firm sales and employees at

investment date. Table 2 reports the summary statistics for the sub sample of firms for which we were able to obtain information about age and size measured in terms of sales and employees (The age variable was available for 925 deals, however for the sake of simplicity we only report summary statistics for deals where information was available for age, sales and employees simultaneously)

Table 2 indicates that information was available for 278 among which 30% were syndicated. Among the industries we can see that funded firms in the Industrial Products sector differ in terms of age at investment and the number of employees. Firms that have been funded by only a single party have a larger number of employees and are older on average (differences are significant on the 1% and 5% level, respectively). The same holds for firms within the Media and Communication Sector, where firms funded by a single party are younger on average, employee more people and exhibit a lower level of sales. In addition, firms in the Electronics sector that have been funded by more than one party are of the same age at the investment date as their non-syndicated counterparts, exhibit, however, a lower level of employees and sales. As a consequence of the inclusion of additional variables, we experienced a reduction in available data points. As such, we will in section 3 make inferences from all datasets, that is, we will run separate regressions making use of the different variables collected.

2.3 VC Characteristics

In addition to shedding light on the syndication behavior by including variables of the funded firms, we have also included the characteristics of the VC providers to see how those factors impact the decision to syndicate. According to Tykvova (2004) VC affiliation plays an important role in explaining syndication behavior and Brander et al. (2002) find support for the view that VC experience and expertise drives the decision to syndicate an investment. To reflect those findings in our analysis we have devided the sample of VC firms into categories reflecting the affiliation of each investment company. We classify the companies as being an independent Venture Capitalist if there are no strings to other firms or banks attached. Secondly, we classify VC‘s as banking dependent when they have been set up by a private bank or a private bank holds more than 50% of the shares. Thirdly, we classify a VC as public if the shares are hold by either the German government or one of the German public banking associations, i.e. Sparkassen or Landesbanken. Moreover, we included Co-Operative VC´s if they are associated with one of the so called Volksbanken in Germany. Additionally, we have separated Business Angels and Corporate VC´s, with Business Angels being one time investors and Corporate VC´s having strings to a large Corporation or when the

Table 2:
Summary Statistics for funded Companies

	Observations Syndicated?		Age Syndicated?			Employees Syndicated?			Sales Syndicated?		
	Yes	No	Yes	No	Difference	Yes	No	Difference	Yes	No	Difference
Biotech	15	11	3.13	3.27	-0.14	34	44	-10	1,688	55,485	-53,797
Consulting	7	23	9.29	5.7	3.59	44	59	-15	213,267	18,943	194,324***
Consumer	0	2									
Electronics	10	26	5.5	5.81	-0.31	24	59	-35**	4,086	13075	-8,989*
Utilities	1	5	4	4.8		95	19		10,000	2,602	
Financial	0	2									
Ind. Products	6	39	9.5	29.44	-19.94***	160	735	-575**	36,701	94,894	-58,193
Ind. Services	1	11	1	9,82		10	49		400	5,937	
Internet	15	9	3.47	2.67	0.8	58	36	22	14,238	4,078	10,160
Pharma	0	5									
Media	4	12	14	6.25	7.75**	74	81	-7*	96,021	18,958	77.063*
Medical	8	1	3	7		224	180		41,854	58,000	
Software	26	39	5.23	6.77	-1.54	70	86	-16	9,220	9,814	-595

The table reports the Summary Statistics for the funded companies in the sample. The data has been obtained through the use of the Thomson Venture Economics Database and public sources for identifying transactions and the involved parties. Data concerning the size in terms of sales and employees have been collected from Markus and Amadeus Balance Sheet databases. The sample has been split into syndicated and non-syndicated deals. The subsample contains all venture capital firms for which data concerning sales and employees were obtainable. A t-test for equal means has been undertaken.
*, **, *** denotes significance at the 10%, 5% or 1% level respectively.

investee company has been set up by a larger corporation in a spin off, for example. The last category in the dataset are foreign investors, if the VC comes from a foreign origin and did not operate from a German branch. Table 3 reports that most of the VC´s in our sample are foreign and independent investors. However, the largest amount of deals on average has been undertaken by Banking affiliated investors and independent VC firms. For further analysis we also describe the investor companies by their *Syndication Ratio*. The syndication ratio describes the propensity to syndicate of the VC investors in the sample. The propensity of an investor to co-invest is expressed in this paper by its ratio of syndicated investments to the total number of deals undertaken. The higher the Syndication Ratio of an investor, the more he tends to invest in portfolio companies that are funded through a co-investment. A syndication ratio of "0" indicates that the specific investor invested exclusively on his own and was not involved in any co-investment of the sample. The syndication ratio is highest for Banking, Foreign and Corporate VCs. As the syndication ratio might be biased towards one time investors (with a syndication ratio of "1" or "0"), we have mitigated this problem by either excluding those investors with only one investment or those transactions with non-syndicated companies, depending on the particular problem set during the inductive statistical analyses later in the text.

In a second step we have also divided the venture capital sample into size categories to later on test the relationships and syndication behavior with respect to those size categories. Here we are referring to one time investors (apparently, those firms only involved in a single transaction), small VC´s that were involved in 2-4 investment, medium sized VC‘s that were undertaking 5-9 transactions, large VC´s who participate in 10-29 and lastly very large investors that were involved in 30 to a top of 104 transactions. The summary statistic are not reported here.

In order to draw better conclusions about the investment behavior we have included variables describing the VC investors further. TVE provides information about Capital under Management ("Cap") for the VC firms, along with information on the overall sum invested in Germany ("German Sum") and the German investment size as a percentage of the overall investment activity worldwide ("German Perc."). From table 3 we can infer that Foreign and Banking VCs have the largest amount of Capital under Management measured in Million USD. Moreover, Independent and Banking VCs invested the largest amount of capital in Germany, and also invested (along with Public investors) the largest chunk of their funds into the German market.

In addition, TVE provides information about the investment focus for the various investors in the sample. TVE distinguishes between firms that have a focus on

Table 3:
Summary Statistics for Venture Capital Investors

	Whole Sample			Subsample						
	Number	Av. Investments	Synd. Ratio	Number	Cap	German Sum	German %	Focus Medical	Focus Info	Focus Non-High-Tech
Foreign	201	2.82	0.77	120	894	22	14.0%	20	44	8
Banking	40	7.75	0.75	26	1,297	55	46.0%	4	7	1
Business Angel	44	1	0.64							
Co-Operative	4	5.25	0.37	2	40	19	100.0%		2	0
Corporate	69	2.36	0.41	17	242	10	33.0%		13	0
Independent	169	6.08	0.61	90	517	58	64.0%	5	44	5
Public	61	5.61	0.66	20	87	23	87.0%	1	9	0

The table reports the Summary Statistics for the Venture Capital Investors in the sample. The data has been obtained through the use of the Thomson Venture Economics Database. The syndication Ratio gives the number of syndicated deals to the total amount of deals undertaken by the Venture Capitalist. "Cap" is the Capital under management by the Venture Capital investor. "German Sum" and "German Perc." are the average amount of capital that has been invested by the VC in Germany and relative percentage of the German investments to the overall (worldwide) invested sum, respectively. The Focus indicates whether the a firm within the subgroups has a stated focus on one of the particular industries, as defined and published by TVE. The subsample contains all venture capital firms for which data concerning the Capital under Management, German Sum and Perc., along with the stated Focus have been obtained.

Medical/Health and Pharmaceutical companies, Information Technology or Non-High firms. The distribution of the data reveals that Independent and Foreign investors comprise the largest amounts of focussed firms in all three segments.

The statements resulting from the statistical analysis of the 2.474 transactions have to be made with a note of caution: The data set provides limited information as to how many financing rounds each of the 1486 portfolio companies had or which investor joined the investment at what time. Information about the staging of investments is available for a subset of investments, but for the sake of consistency we have abstained from only looking at deals where information about the staged nature is available. This in fact, would have reduced our sample substantially, resulting in less meaningful results. From the number of transactions in the data set a portfolio company is involved in, one can only conclude on the total number of investors that invested in it during its life span. Thus, it may well be that there are investors who did fund an investee company during the first financing rounds on their own and not through a syndicate. However, if this investee company gets funded by more investors at later stages, who might even replace the original investor, it is recorded in the data set as being a syndicated company because it appears in two or more transactions with two or more different investors. However, we find the use of a broader definition of syndication justified by the strategies underlying the syndication behavior. Syndication can take place when two or more investors provide capital infusions over time. There is no urgent need to invest simultaneously and having another investor injecting capital in a later round can well fit into a predefined investment strategy. As such, investors can focus on earlier rounds and on the same token involve investors with a late stage focus, for a multitude of reasons ranging from diversification benefits to adding complementary resources. Consequently, we make use of a broader definition of venture capital syndication in our paper. Here, syndication takes place when more than one VC firm has provided capital over the life time of the funded firm. With regards to the Syndication Ratio of the overall sample the very correct interpretation is that the VC investors were at 60% invested in portfolio companies that have had more than one investor since their foundation. The analyses in this paper are therefore carried out on the basis of the broader definition of syndication and come to valuable findings on syndication patterns in Germany.

3 Empirical Evidence on Venture Capital Syndication

In the last Paragraphs we have laid out the likely motives that foster a firms propensity to syndicate an investment. However, the resource and financial mo-

tive seem to be mutually exclusive, whereas for more established markets such as the US the resource driven motives dominate. Moreover, the study undertaken by Manigart et al. (2002) suggest that in a European context venture capitalists are solely focusing on financial motives such as diversification arguments to build there portfolio and thus neglect the value added benefit of partner involvement. A recent paper my Fluck, Garrison and Myers (2005), however, stresses the value added effect of syndication patterns in Venture Capital financing. They present a model of venture capital contracting that incorporates moral hazard, and asymmetric information problems and show that later stage syndication of venture capital investments alleviates the agency problems between the venture capitalist and the entrepreneur. Syndication thus reduces the monopoly power of the financing firm and induces the entrepreneur to put in more effort, which consequently benefits the venture capital provider due to the increased value of the venture. Fluck et al point out that the commitment to syndicate can protect the entrepreneur from dilution and thus mitigates the problem of hold-up. The commitment to syndicate therefore assures a higher effort of the entrepreneur and yields more favourable financing terms in return.

It has been pointed out that the very true nature of the venture capital industry involving high levels of uncertainty and the trade off between large upside potential and low probability of successes fosters the need for higher levels of partner involvement to overcome informational asymmetries and to benefit investee companies from a combined pool of heterogenous skills. As such we will in the following analyse the motives behind the syndication patterns observed in the German Venture Capital market.

3.1 Firm Characteristics and The Impact on Syndication Patterns

The literature offers several explanations as to why VC companies form syndicates to fund investment targets. Bygrave (1987) found that there is more co-investing when there is a higher level of uncertainty. His comparison of the more conservative consumer and the more risky computer industry in the USA showed a clear tendency of co-investing in the high innovative computer sector. There was also more syndication in early-stage investments than later-stage investments, even though the investment amount required was on average 40% lower for early-stage investments. Thus, Bygrave (1987) concluded that the main motive for syndication was rather the sharing of experience and other intangible resources than capital restraints and the spreading of financial risk. In his findings he also refers to Pfeffer and Salancik (1978) who found similar evidence in their studies on joint ventures. In another publication, Bygrave and Timmons (1992) again emphasise the great role uncertainty plays in the decision to syndicate which can

be reduced by the sharing of information and the access to resources from the syndicate members.

Chiplin et al. (1997) found greater support for syndication as a mean to improve deal selection through joint decision making. They acknowledge the importance of costs in the VC market, but can only find weak support for the risk sharing perspective as a motive to syndicate. Contrary to this, Lockett and Wright (1999) find that the large size of a deal compared to the funds that are available to a single venture capitalist is significantly more important than all other factors. The need for additional information before making a decision turned out to be the least relevant explaining factor.

In the following we will investigate whether there is a relationship between the riskiness of a company or an industry on the propensity to syndicate an investment. The Risk mitigating perspective expects VC´s to jointly invest in firms exhibiting a much higher risk. So instead of the risk taken on by a single venture capitalist it would be necessary to spread the risk associated with an investment among a group of venture capitalist. However, once VC´s want to benefit from the upside potential of investee firms and keeping in mind that most of the firms are very familiar with taken on additional risk that is rewarded later on, we could likewise expect not to see much explanatory power of firm characteristics on the level of syndication and that the propensity to syndicate originates more from the VC´s side and their corresponding levels of experience and skill set.

Hypothesis 1: A higher firm risk increases the likelihood of an investment being syndicated

The first hypothesis to be tested is whether there is a relationship between a higher firm risk and the likelihood of an investment being syndicated. The corresponding dependent variable therefore is simply a zero/one variable indicating whether a specific deal has been syndicated (1) or not (0). In order to see whether there might be substantial differences in the corresponding industries we have also included dummy variables indicating whether a specific firm was in a particular industry. Table 4 summarizes the variables included in the analysis.

Table 4:
Independent Variables: Description

Variable	Description
Age	The variable Age measures the age of the investee company at the investment date. Age should proxy for the riskiness of the company as younger companies usually exhibit a higher rate of failure
Employees at Inv.	States the number of people employed at the investee companies at investment date. The Variable enters as the log of Employees.
Sales at Inv.	To Proxy for firm size we have included the total number of sales at investment date. The Variable also enters the regression as the log of sales at investment
Av. Employees	Employees states the average number of people employed at the investee companies for the period 1999-2004. Data prior to 1999 was not available. Variable enter as the log of Employees.
Av. Sales	To Proxy for firm size we have included the total number of sales. The Sales figure is also measured as an average over the period 1999-2004 and enters the regression as the log of sales.
Industry Dummies	In order to control for industry particularities we have included an Industry Dummy, that takes on the value 1 if the firm is in a particular industry and zero otherwise. The industries included are shown in table 2 and have been obtained from the company description on the website and Markus/Amadeus Database.

In order to see whether a higher degree of co-investing in riskier industries can be confirmed with the database, a multivariate logit model is run with the Syndication variable as the dependent variable and the investee company specific information along with industry dummies as the explaining variables. The model specification is as follows.

$$y(SYNDICATION) = f(AGE\,, EMP\,, AEMP\,, SALES\,, ASALES\,, Industry\ Dummy) + \epsilon_i \tag{1}$$

The results indicate that none of the size categories has a significant effect on the propensity to syndicate an investment. The Biotech dummy is significant at the 5% level in the first regression using the full dataset, indicating that the particularities within the riskier Biotech industry play a role for venture capital firms in deciding whether or not to make use of a partner. Additionally, we find in regression 2 that the age of the funded firm has a significant negative effect (at the 5% level) on the propensity to syndicate. This is in line with the findings of Bygrave (1987), that younger and more riskier companies call for a higher level of syndication. The point is further stressed by the fact that more established and mature industries such as Industrial Products and Services, along with Financial Institutions exhibit a much lower level of syndication activity (at the 5% level).

The significant impact for Industrial Products and Services can also be found in the last regression specification. Interestingly, none of the other variables has a significant effect on the likelihood of an investment being syndicated. Firm risk as measured by age does not appear to have an effect such that spreading of risk does not seem to drive the syndication behavior. The same holds for the size measures included. Although larger companies would require VC firms to take a much higher exposure when acquiring a sizeable equity stake, there does not seem to be any support for syndication behavior from this side either. To conclude we can see that the likelihood of an investment being syndicated is driven by industry characteristics, such that more mature and established industries exhibit a lower level of syndication. However, the syndication variable simply shows us one side of the medal and further conclusions about the extent of co-investing behavior are necessary.

Table 5:
Funded Firm Characteristics and the Likelihood of Investment Syndication

	Dependent Variable: Indicator = 1 If Investment is syndicated			
	(1)	(2)	(3)	(4)
Biotech	1.044391	0.4626848	0.8915364	0.3617342
	(0.014)**	(0.371)	(0.367)	(0.570)
Consulting	-0.0278637	-0.8502698	-0.9330893	-1.17719
	(0.950)	(0.121)	(0.351)	(0.078)*
Electronics	0.1808681	-0.4196427	-0.4748383	-0.845529
	(0.675)	(0.420)	(0.626)	(0.173)
Utilities	0.3342021	-0.6923599	-1.15252	-1.511223
	(0.652)	(0.410)	(0.421)	(0.209)
Financial	-0.6817185	-2.278076		
	(0.254)	(0.048)**		
Ind. Products	-0.71562	-1.271433	-1.131323	-1.525869
	(0.107)	(0.018)**	(0.262)	(0.023)**
Ind. Services	-0.4924765	-1.644529	-1.499357	-2.242104
	(0.365)	(0.022)**	(0.208)	(0.053)*
Internet	0.4928071	-0.1373318	0.6261075	0.5856402
	(0.244)	(0.793)	(0.518)	(0.369)
Pharma	0.3118963	-0.1562939	-0.8387271	
	(0.523)	(0.795)	(0.493)	
Media	-0.1670541	-0.7560713	-1.328578	-1.059294
	(0.713)	(0.178)	(0.232)	(0.162)
Medical	0.0953102	2.137718	2.227342	
	(0.845)	(0.404)	(0.136)	
Software	0.3184537	-0.3281648	0.2938748	-0.2749844
	(0.024)**	(0.959)	(0.757)	(0.962)
LN(A-Emp.)			-.00010844	
			(0.993)	
LN(A-Sales)			0.1013446	
			(0.257)	
LN(Emp./Inv.)				-0.0004283
				(0.555)
LN(Sales/Inv.)				1.59e-06
				(0.260)
Age at Inv.		-0.0240554	-0.0244372	-0.0144664
		(0.013)**	(0.248)	(0.370)
Number of obs	1485	925	394	278
$\chi^2 - Test$	0.0392	0.0659	57.21	0.1082
Pseudo R^2	0.0392	0.0659	0.1111	0.1082

The table reports a logit model estimating the likelihood of an investment deal being syndicated. The sample for the first regression includes 1485 venture capital deals that have either been syndicated (1) or not syndicated (0). For the second regression the sample has been reduced to 925 deals for which we can calculate the Age of the investment target at the date of investment. Column 3 and 4 use a reduced sample of deals for which we have further information on the average size of the target over the period 1999 to 2004 and the size at the investment date, respectively. The table reports the coefficient estimate along with the p-values in parentheses.Intercepts are not shown. The variable Consumer Products has been dropped.
*, **, *** denotes significance at the 10%, 5% or 1% level respectively.

3.2 Firm Characteristics and the Number of Investors

In order to draw inferences about the level of co-investment activity we analyze the number of co-investors per portfolio company if it actually comes to a syndication. The hypothesis under investigation is as follows:

Hypothesis 2: A higher firm risk increases the Number of Investors per company

Besides a different dependent variable we will leave the explanatory variables the same as in the first regression. However, as the number of investors is not bounded to be a zero/one variable but finite we run a ordered probit regression. The results are reported in table 6. From the results reported in Table 6 we can infer that among the Industry Dummys only the coefficient associated with the dummy variable Biotech is positive and significant. This indicates that the level of co-investment activity is higher in these industries. The more mature Industrial Products and Industrial Services Industries along with Media and Communication (for the last two regression specifications) show a much lower number of investors per funded firm.As pointed our earlier, we find evidence that industry characeristics (such as in Bygrave (1987)) are important when deciding on syndication behavior. Additionally, we can confirm that the number of employees has a positive and significant effect (for the employees at investment date as well as for the average number of employees), whereas the sales variable does have an impact on the syndication behavior. As a matter of fact we find that size as measured by the number of employees, which somehow also represents the future growth potential in terms of knowledge and skills, increases the number of investors per funded firm. We can infer that VC firms do not make use of syndication in order to reduce size exposure (as measured by the sales variable) but rather co-invest in companies with larger (and somewhat more uncertain) growth potentials (as measured by a larger number of employees).

All other variables do not exhibit a significant effect on the level of co-investment activity. Thus, we can see that for Biotech Investments there is a much higher level of co-investors involved during the different financing rounds and the number of investors per company is significantly higher when compared to other industries. Apparently, there seems to be a need for involving other partners in order to be better able to cope with industry particularities. We get the impression that Biotech with its ever changing technologies pose more challenges to the investors than do the more established industries, as for example industrial products or services. So clearly there appears to be a much stronger need to rely on outside help and expertise to secure future success and profitability for the venture under consideration. Thus, a complementary skill set helps VC´s to overcome the arising complications in deal making due to industry specifications and particularities.

Table 6:
Funded Firm Characteristics and the Number of Investors per Company

	Dependent Variable: Number of Investors per Company			
	(1)	(2)	(3)	(4)
Biotech	0.9569729	0.6517574	0.95192	0.4160098
	(0.000)***	(0.030)**	(0.101)	(0.321)
Consulting	-0.00471	-0.4019452	-0.4229229	-0.6570024
	(0.986)	(0.208)	(0.469)	(0.131)
Electronics	0.2433624	-0.112672	-0.1131586	-0.6202675
	(0.340)	(0.711)	(0.843)	(0.133)
Utilities	0.4812692	-0.0940139	-0.2661663	-0.6139745
	(0.257)	(0.843)	(0.733)	(0.349)
Financial	-0.4234859	-1.162402		
	(0.228)	(0.051)*		
Ind. Products	-0.3733178	-0.678216	-0.8641099	-1.576081
	(0.152)	(0.029)**	(0.149)	(0.002)***
Ind. Services	-0.0809653	-0.7486239	-0.6286773	-1.13664
	(0.794)	(0.057)*	(0.343)	(0.053)*
Internet	0.4247574	0.0100222	0.3179499	0.0053781
	(0.089)	(0.974)	(0.576)	(0.990)
Pharma	0.3598728	0.1642243	-.1386862	
	(0.211)	(0.638)	(0.842)	
Media	-0.0313365	-0.3866111	-1.210668	-1.400573
	(0.907)	(0.240)	(0.089)*	(0.028)**
Medical	0.2516524	-0.0628654	0.9721944	
	(0.378)	(0.850)	(0.160)	
Software	0.3217388	-0.0209573	0.2109437	-0.3609383
	(0.187)	(0.943)	(0.707)	(0.349)
LN(A-Emp.)			0.1403343	
			(0.039)**	
LN(A-Sales)			0.0293999	
			(0.547)	
LN(Emp. at Inv.)				0.2416084
				(0.021)**
LN(Sales at Inv.)				-0.0780369
				(0.336)
Age at Inv.		-0.0156145	-0.0203374	-0.0036353
		(0.004)***	(0.108)	(0.790)
Number of obs.	1485	925	394	242
$\chi^2 - Test$	127.27	119.65	86.37	5.63
Pseude R^2	0.039	0.056	0.091	0.1873

The table reports an ordered probit regression model estimating the number of investors per investment target. The sample for the first regression includes 1485 venture capital deals. For the second regression the sample has been reduced to 925 deals for which we can calculate the Age of the investment target at the date of investment. Column 3 and 4 use a reduced sample of deals for which we have further information on the average size of the target over the period 1999 to 2004 and the size at the investment date, respectively. The table reports the coefficient estimate along with the p-values in parentheses.Intercepts are not shown. The variable Consumer Products has been dropped.
*, **, *** denotes significance at the 10%, 5% or 1% level respectively.

3.3 Venture Capitalist Characteristics and The Propensity to Syndicate

As one could see from the results there seems to be an influence of industry factors on the overall propensity to syndicate as well as on the number of investors that participate in such a deal. As a matter of fact we are therefore interested in turning the wheel around to see which factors from the venture capitalist side do actually affect the likelihood of an investment being syndicated. Several other studies have explained that experience and sharing of resources plays a distinctive role in explaining the reasons behind the syndication patterns. Maula and Murray (2000) identify the need for complementary resources, including intangible assets like industry experience or tangible assets like warehousing. They offer no explicit findings regarding to what extent the financial perspective is involved as a motive for syndication. Brander et al. (2002) concentrate on the resource-based rationale. In their conclusion, they clearly favour the Value Added Hypothesis. This is underlined by the finding that syndicated investments have higher rates of return than stand-alone investments. They acknowledge the value of a second opinion in the investment selection process, but state that their empirical analysis identifies the value added effect as the driving force behind VC syndication. They conclude that risk-sharing might play a role, but emphasize at the same time that they see capital constraints only as an issue in some special cases and rather not for large VC firms which do most of VC investing.

First of all we want to have a look at how VC characteristics influence the propensity to syndicate an investment. The results on the investee companies suggested that there is an influence of industry particularities on the likelihood of an investment being syndicated. However, this of course gives us simply one side of the entire story and experience and expertise might also impact the likelihood of syndication as a VC might overcome industry riskiness when he is acquainted with the skills needed to survive and be successful in that market. As a consequence, being in the possession of experience and skills would also make him less prone to co-invest a deal. As a consequence we formulate the following hypothesis:

Hypothesis 3: Inexperience creates a need for additional expertise to ensure success in the management of the investments and therefore fosters the propensity to syndicate an investment

Here it is analysed how the affiliation and experience of VC investors influences their propensity to syndicate. Thus, we would expect to see differences in the syndication behavior of Foreign VC companies, independent VC´s, Bank dependent VC´s and so on. Table 3 in Chapter 2 summarizes the different categories of VC investors we consider for the following analysis. We want to test whether there is a significant influence of the VC background or affiliation on its propensity to

syndicate an investment. Thus, we test the relationship between VC background as the independent variable and the syndication ratio as the dependent variable. From the definition of the Syndication Ratio in Chapter 2 we can infer that it is bounded above and below by 1 and 0 respectively. As a consequence we need to run a multivariate Tobit model that is truncated at an upper and lower bound for the regression of the form:

$$y = \begin{cases} u_i & : \quad if\, y_i \geq u_i \\ y_i & : \quad if\, l_i \leq y_i \leq u_i \\ l_i & : \quad if\, y_i \leq l_i \end{cases}$$

where l_i and u_i represent the lower and upper censoring points for the regression. As a consequence the range for the syndication ratio will be between 1 and 0.

$$y(Syndication\ Ratio) = f(No.\ VC\ Investments\ , VC\ Dummies) + \epsilon_i \quad (2)$$

Table 7 indicates that the coefficient for the number of investments undertaken by a VC is negative and significant throughout 3 out of 4 model specifications. This indicates that experience, gathered through deal making and structuring leads to valuable insights and therefore reduces the need to depend on partners for complementary skills and knowledge. From table 7 we can also infer that the coefficient associated with the Dummy for Foreign Investors is positive and significant for the tobit specifications 3 and 4. Here we can see, that once we restrict our analysis to more time investors those with a foreign origin tend to syndicate more than their local counterparts. This seems to lend support to the hypothesis that experience and expertise, along with a certain market familiarity is necessary to successful manage venture investments. Syndicating as part of an entry strategy can therefore help to overcome the lack of experience within a foreign market by combining the financial resources of the foreign investor with the skills and expertise with a local VC. The table also reveals that the investment focus of a VC has an influence on the propensity to syndicate. VCs focusing on Non-High ventures syndicate to a much lesser extent (at the 5% and 10% level for the two regressions, respectively), while VCs that focus on Medical and Information technology firms syndicate to a larger extent. This effect disappears once we control for the experience of the VC firms by restricting the analysis to firms that have undertaken multiple investments. Moreover, we find that firms that invest a larger percentage of their portfolio in the German market make less use of financing. The coefficient is negative and significant at the 10% for all investors and at the 5% level for investors with multiple deals. Thus, firms that clearly concentrate their investments into one market, rely less on syndication. As such, we can see that experience and knowledge about local particularities influence the decision to syndicate an investment.

Table 7:
VC Characteristics and the effect on the Syndication Ratio

	Dependent Variable: Syndication Ratio			
	(1)	(2)	(3)	(4)
Investments	-.0107965	-0.0076817	-0.0018292	-0.0044799
	(0.030)**	(0.020)**	(0.454)	(0.048)**
Foreign VC	0.8002847	1.001335	0.9046751	0.6440691
	(0.206)	(0.031)**	(0.022)**	(0.029)**
Banking VC	0.5420354	0.7623876	0.4218244	0.4153956
	(0.409)	(0.100)*	(0.292)	(0.153)
Corporate VC	0.5419057	0.742247	0.653342	0.5637431
	(0.401)	(0.116)	(0.106)	(0.062)
Independent	.0480121	0.4198155	0.3081937	0.3006097
	(0.939)	(0.341)	(0.428)	(0.274)
Public VC	0.3231654	0.6116089	0.401304	0.3993877
	(0.616)	(0.184)	(0.314)	(0.174)
Business Angel	.2399122			
	(0.716)			
Cap		-.0000139		-0.0000355
		(0.616)		(0.240)
German-Sum		.0006844		0.0006189
		(0.205)		(0.101)
German-Perc.		-.1060492		-0.1631068
		(0.482)		(0.133)
Focus-Medical		.1373841		0.0481749
		(0.361)		(0.707)
Focus-Info		.133769		-0.0091241
		(0.156)		(0.898)
Focus-NonHigh		-.7391989		-0.4743252
		(0.000)***		(0.004)***
Number of obs.	588	275	251	151
$\chi^2 - Test$	38.56	73.68	42.91	48.29
Pseudo R^2	0.0332	0.1464	0.0903	0.2174

The table reports a tobit model estimating the impact of VC characteristics and affiliation on the syndication ratio. The sample for the first regression includes 588 venture capital firms. For the second regression the sample has been reduced to 275 for which information about the firm´s characteristics and investment policy have been obtained. Column 3 and 4 use a reduced sample of deals in which we have only included venture capital firms that have at least invested twice over the period 1996-2004. The table reports the coefficient estimate along with the p-values in parentheses.Intercepts are not shown. The variable Co-Operative VC has been dropped.
*, **, *** denotes significance at the 10%, 5% or 1% level respectively.

To further conclude on the effect of experience gathered through investment activities we have grouped the VC firms into size categories reflecting the number of deals undertaken by the firms. The model specification is analogues to the tobit regression using the affiliation dummies. As a consequence we used the same hypothesis as above and used size dummies instead of background dummies for the independent variables. In order to test the relation between experience and the propensity to syndicate a censored Tobit model is run again with the Syndication Ratio as dependent variable and the classified number of investments as independent variable.

Table 8 shows the results from the regression output. Here we can see that the coefficient associated with the dummy variable one time investors is positive and significant at the 1% level indicating that this investor group syndicates significantly more. Moreover, the dummy variable for small investment firms (with 2 to 4 deals) is also significant across the different model specifications. This therefore lends support to the hypothesis of lower experience levels being a main driver of deal syndication. Smaller VC firms tend to syndicate significantly more than larger VC investors. Moreover, we find the effect of the percentage of the overall investment portfolio more pronounced than in the last model specifications. Firms that invest more of their funds into the local market tend to syndicate less. Thus, experience and familiarity with local particularities do indeed influence the propensity to syndicate negatively. VC firms that have acquired skills during their previous investments and firms that are familiar to the market need to make less use of syndication to overcome a rather scarce knowledge base. In addition we find that the focus on Medical or Information Technology of a VC firm influences the propensity to syndicate positively,while the focus on rather mature Non-High Tech industries has a negative effect and leads firms to invest alone.

Overall we can see that experience and resources seem to play a role in explaining the syndication behavior of players in the German VC market, whereas we do not find evidence on risk spreading or portfolio diversification based on the outcome of the past analysis here. However, in the next subsection we tested further to which extent financial arguments as opposed to resource driven might have explanatory power in determining the effect on the observable syndication behavior.

Table 8:
VC Characteristics and the effect on the Syndication Ratio

	Dependent Variable: Syndication Ratio			
	(1)	(2)	(3)	(4)
One Time	0.9220807	0.7414938		
	(0.000)***	(0.000)***		
Small (2-4)	0.5030997	0.4722779	0.0578574	0.2078103
	(0.037)**	(0.001)***	(0.562)	(0.020)**
Medium (5-10)	0.0140301	0.0216411	-0.2720483	-0.1073
	(0.956)	(0.877)	(0.013)**	(0.234)
V. Large (> 30)	-0.0477578	-0.0282765	-0.2816935	-0.1479572
	(0.906)	(0.899)	(0.162)	(0.345)
Cap		0.0000118		-0.0000183
		(0.667)		(0.536)
German-Sum		0.0000402		0.0000636
		(0.932)		(0.842)
German-Perc.		-0.164618		-0.2693203
		(0.199)		(0.005)***
Focus-Medical		0.3028051		0.1471658
		(0.048)*		(0.238)
Focus-Info		0.1349512		-0.0022095
		(0.147)**		(0.976)
Focus-NonHigh		-0.8010952		-0.5554776
		(0.000)***		(0.001)***
Number of obs.	588	275	251	151
$\chi^2 - Test$	43.83	87.21	13.95	46.75
Pseudo R^2	0.0378	0.1732	0.0302	0.2087

The table reports a tobit model estimating the impact of VC size categories and characteristics on the syndication ratio. The sample for the first regression includes 588 venture capital firms. For the second regression the sample has been reduced to 275 firms for which information about the firm´s characteristics and investment policy have been obtained. Column 3 and 4 use a reduced sample of deals in which we have only included venture capital firms that have at least invested twice over the period 1996-2004. The table reports the coefficient estimate along with the p-values in parentheses. Intercepts are not shown. The variable Large VC has been dropped.
*, **, *** denotes significance at the 10%, 5% or 1% level respectively.

3.4 VC Investments and Portfolio Concentration

The results obtained in the last chapters favor the resource motives, whereas we still need to disentangle the effects of resource driven motives and a risk mitigation perspective in order to make more pronounced inferences when explaining the syndication behavior. In order to draw a meaningful distinction between the two motives or to conclude that the two might be complements rather than substitutes in explaining syndication patterns, we investigated the effect of VC characteristics on the overall portfolio concentration. Once VC firms specialize in certain industries we should see a much higher level of portfolio concentration. Theory predicts that according to the resource based rationale of Venture Capital Syndication firms syndicate in order to get access to deals in new industries by complementing their existing resources, that are limited to the skills needed in their existing portfolio industries, with a new set of capabilities from the partner firm that enables the company to make investment in new industries worthwhile. The benefit of involving co-investors is derived from heterogeneous skills and information different venture capitalists can contribute to the management of the venture company.

There could therefore be a tradeoff between the two competing views on Venture Capital Syndication. Investors could try to make use of syndication in order to diversify their existing portfolios and to reduce overall exposure to certain industries. However, investors could on the same token be less inclined to acquire additional information on firms and industry wide outlooks for non-core industries, as the additional costs of acquiring information might be higher than the benefits from additional diversification effects. Consequently, we looked at the portfolio concentration of the VC companies in the sample and figured what the effect of syndication patterns is for the overall constitution of the portfolio of investments. We formulate two hypothesis dealing with the competing tradeoff laid out above.

Hypothesis 5a: Syndication serves as a mean to reduce exposure to certain industries for reasons of diversification and decreases the level of portfolio concentration.

Hypothesis 5a would therefore speak in favor of the financial diversification motive for why VC firms syndicate. Here we would expect that syndication serves as a tool to decrease exposure to certain industries and to yield a better risk and return tradeoff. Alternatively, we could also formulate Hypothesis 5b.

Hypothesis 5b: Syndication serves as a mean to increase exposure to certain industries by bringing in a set of heterogenous skills and increases the level of portfolio concentration.

For hypothesis 5b we would expect VC firms to make use of syndication practice in order to get access to new industries or increase the exposure to existing

industries by adding more value to the companies under management with the complementing set of skills and resources brought in by the partner VC.

In the following we ran a 2 Stage Least Sqares regression in order to estimate the impact of the VC affiliation variables (independent, bank dependent etc.) along with the total number of investments, the syndication ratio and the total number of co-investors along with variables describing the investment activities of the VC (Capital under Management, Sum and Percentages invested in Germany and Focus) on the overall level of portfolio concentration as the dependent variable. The level of portfolio concentration is measured by:

$$H = \sum S_i^2 \tag{3}$$

Where S_i denotes the relative share of a certain industry in the overall portfolio. Therefore the closer H is to one, the more the deals are concentrated within a few industry segments. So apparently, the score will only be meaningful for venture capitalist having at least two deals, as otherwise the scores will be biased upwards. It serves as a proxy to which extent the VCs invest more heavily in specific industries or to which extent they diversify.

The syndication ratio is used as defined previously. The variable "Co-Investors" represents the total number of different co-investors with whom the VC has undertaken a deal. So, if for example a VC has been doing transactions with a single partner frequently, we will simply count this variable as 1 different partner. As such, the variable can account for the degree of diversity in partner selection. The other variables are as defined previously.

For the First Stage estimation we use the variable "Number of Total Investments" as the instrument to proxy the "Co-Investor" variable.

The Second Stage equation is as follows:

$$y(H) = f(CoInv.\ , Dummies, SyndRatio,\ Cap,\ GSum,\ GPerc,\ Focus\ ) + \epsilon_i \tag{4}$$

From the results (reported in table 9) we can see that the coefficient associated with the "Syndication Ratio" variable is positive and significant (at the 1% level), whereas the coefficient associated with the instrumented variable "Co-Investors" is negative and significant (at the 5% level).. All other variables are not statistically significant. Therefore we can interpret the results in the way that an increase in the number of different co-investors decreases the portfolio concentration. On the opposite an increase in the syndication ratio increases the overall portfolio concentration. The background of the VC does not have any influence on the level of portfolio concentration.

Table 9:
The Effect of Syndication on Portfolio Concentration

	Dependent Variable: VC Portfolio Concentration			
	1st Stage	2nd Stage	1st Stage	2nd Stage
Investments	1.762798		1.836787	
	(0.000)***		(0.000)***	
Co-Investors		-0.0022853		-0.0017092
		(0.001)***		(0.005)***
Syndication	26.6516	0.1907951	34.75287	0.2383061
	(0.000)***	(0.005)***	(0.000)***	(0.004)***
Foreign	3.188471	0.04533129	10.45881	0.0522024
	(0.769)	(0.817)	(0.062)*	(0.799)
Banking	9.549708	-0.0478916	17.59929	-0.0744838
	(0.384)	(0.808)	(0.005)***	(0.720)
Corporate	-4.49988	0.1961287	-10.92237	0.1749238
	(0.683)	(0.332)	(0.403)	(0.428)
Independent	2.528664	-0.0202043	10.919	-0.0506117
	(0.811)	(0.917)	(0.044)	(0.800)
Public	-.1377413	0.0531055	4.284693	-0.0638226
	(0.990)	(0.790)	(0.524)	(0.777)
Cap			0.0004542	-0.0000107
			(0.567)	(0.212)*
German Sum			-0.0126139	-0.0000525
			(0.396)	(0.717)
German Perc.			-0.0824838	-0.0021537
			(0.629)	(0.000)***
Number of obs	222	222	151	151
F-Test	113.5	7.33	58.33	15.88
R^2	0.7871	0.1911	0.7926	0.2539

The table reports a 2 SLS regression estimating the impact of VC characteristics on portfolio concentration. The table reports the First Stage regression in columns 1 and 3. The variable "Co-Investors" has been instrumented by "Number of Investors" in both regressions. Regression 2 in columns 3 and 4 differs in respect to the model in columns 1 and 2 as we have included additional VC characteristics into the regression to explain the effect on portfolio concentration. The table reports the coefficient estimate along with the p-values in parentheses. Intercepts are not shown. The variable Co-Operative has been dropped.
*, **, *** denotes significance at the 10%, 5% or 1% level respectively.

The results indicate that VC firms will increase their portfolio concentration via the route of syndication. Thus, syndication serves primarily as a tool to increase the ability to manage the companies within the core industry. As such, a company even strengthens their focus on certain industries via syndication with already existing partners and builds upon the existing resources with an increased collaboration within the established partnerships.

At the contrary, an increase in the number of co-investors decreases the portfolio concentration. So if VC firms feel the need to diversify their portfolio they opt for this route via an increased use of partnerships with new co-investors and therefore broaden the scope of investments by involving new partners. Thus, the step into a new industry is also driven by cooperating with a new partner. The diversity of partners in the network can therefore proxy for a more diversified portfolio of investments. Interestingly, none of the VC background dummies is significant indicating that diversification via an increased variety of co-investors seems to be the preferable way among all investor classes.

3.5 The Development of VC Investments and Portfolio Concentration

In a second step we arranged the available transactions over the time period 1996 - 2004 and analyzed the portfolios and more importantly the changes in the portfolios for the largest 22 Venture Capital providers in our sample. We thus investigate how the overall portfolio concentration changes over time with respect to new transactions and new partner involvement.

As such we want to estimate the impact that syndication and new partner involvement have on the level of portfolio concentration over time. Moreover, we included variables describing the entire market development. In particular we want to see whether the effects pointed out in the last subsection are consistent over time and how market factors influence the extent of portfolio decisions.

In the upcoming analysis we test the same hypothesis as in section 3.4. Additionally we have included some new variables to the regressions. Namely, we have included a variable describing the overall ability of VC firms to exit their investments. This "Exitability" variable proxies for the possibility of a VC to exit his investments and thereby reducing the investment exposure. A higher level of "Exitability" gives more room to withdraw money from deals and to avoid be caught in a course of action. "Exitability" is measured as the percentage of positive exits (either trade sales or IPOs) to the overall number of exits (including liquidations) within the German market. All market statistics have been calculated using the Yearbook of the German Venture Capital Association

(BVK (2004)). Moreover, we have included a variable describing the market conditions for IPO´s in the market. The "IPO" variable depicts on the one hand the visibility of investment exits which in turn could influence the new capital inflow and on the other hand gives an indication about the possibility of having a "golden bullet" exit. Thus, a higher number of IPOs compared to other sources of exits yields better chances of a successful exit. To control for capital inflows by the market we have included a variable controlling for fundraising activities. The "Fundraising" variable thus depicts the total capital inflow to the industry and proxies the market conditions for Venture Capital as an investment vehicle. In the regressions we have chosen the level of portfolio concentration as our dependent variable (as in chapter 3.4) and included the syndication ratio for each year along with the number of co-investors for each period. As opposed to the last sections we calculated the number of new co-investors for each period. So if, for example, a VC worked with a partner in 1996 and had deals in 1997 and 1998 this partner is only counted for in the first year of collaboration. As such the variable "Co-Investors" measures the number of new partners that get involved with each of the 22 VCs in a given period. The variable "Syndication Ratio" is as defined before. In order to control for endogeneity in our variables we use a 3SLS regression. The number of investments can well be influenced by the overall level of fundraising activities and also by the ability of a VC to take firms public, which increases the visibility of Venture Capital as an investment vehicle and could in turn drive up investments given the higher chances of a "golden bullet" exit. As before, we let the number of new co-investors be instrumented by the number of investments a VC has been made. Table 10 reports the results of the 3SLS estimation.

Table 10:
The Effect of Syndication on Portfolio Concentration over Time

	Dependent Variable: VC Portfolio Concentration		
	Simultaneous Equations, 3 SLS		
	Conc.	Co-Inv.	Investments
Co-Investors	-0.0412455		
	(0.002)***		
Syndication	.5353317	7.236368	1.363921
	(0.000)***	(0.000)***	(0.210)
L-Exit	0.5296636	2.874187	-2.445295
	(0.042)**	(0.688)	(0.676)
Investments		1.152139	
		(0.000)***	
L-Ipo	-2.499913	48.3392	57.47167
	(0.000)***	(0.001)***	(0.000)***
L-Fundraising	-.0000193	.0004139	0.0005111
	(0.026)**	(0.043)**	(0.000)***
Number of obs	176	176	176
χ^2-Test	26.42	74.86	46.08
R^2	0.0132	0.5570	0.2126

The table reports a 3 SLS regression estimating the impact of VC characteristics on portfolio concentration. The variable "Co-Investors" has been instrumented by "Number of Investments". Additionally, the variable "Number of Investments" has been instrumented by the variables "Fundraising" and "IPO". Both enter the regressions as lagged variables. The table reports the coefficient estimate along with the p-values in parentheses. Intercepts are not shown.
*, **, *** denotes significance at the 10%, 5% or 1% level respectively.

The results indicate the same effect that has already been pointed to in chapter 3.4. The coefficient associated with the variable "Co-Investors" is negative and significant (at the 1% level) and the coefficient associated with the variable "Syndication Ratio" is positive and significant. The results indicate that syndication serves as a mean to increase portfolio concentration and is a tool to increase the ability to manage the companies within the core industry. As mentioned before, a syndicating VC company even strengthens its industry focus via syndication with already existing partners and can build upon the existing resources with an increased collaboration.

At the contrary, an increase in the number of co-investors decreases the portfolio concentration. So if VC firms feel the need to diversify their portfolio they will do so via an increased use of partnerships with new co-investors. Which on the same token broadens the scope of investments as the step into a new industry is

also driven by cooperating with a new partner. The diversity of partners in the network can therefore proxy for a more diversified portfolio of investments.

Consequently, we need to distinguish two different perspectives on VC syndication behavior here. Firstly, syndication per se can not be associated with a pure diversification strategy. Diversification only comes into play when the VC firm also chooses to build up a new partnership with the syndication step on the same token. Moreover, in order to be able to actually achieve such diversification benefits from syndication the VC has to involve a number of new partners into his existing network in order to be able to gain a significant effect on the portfolio. Or putting it differently, he might be simply joining an already successful syndicate to take the route to a new industry for which he does not possess the skills to survive. Thus, the option to diversify is driven by syndication with a number of new partners in an industry outside of the predominant industry focus of the investment portfolio in place. To sum it up, syndication is used as a tool to strengthen focus on core industries, whereas syndication with a larger number of new co-investors or the decision to join a new syndicate can achieve substantial diversification benefits for the portfolio and open up potential for new business. In fact, there is an evolution within the industry in terms of formation and closure of syndicates by which the partners extent their investment scope and on the same token opt for either an increased benefit from diversification or a higher level of concentration on core industries. Financial and resource driven motives can thus be present at the same time and are not mutually exclusive but rather complement each other. In order to understand the driving forces of syndication behavior we have therefore shown that both factors alike contribute to the observable patterns, each in its own distinct way.

3.6 Quantifying the Value-Added effect of Syndication

In chapter 3.4 and 3.5 we have shown that syndication serves as a mean to increase portfolio exposure and as such one would assume that the concentration on certain industries helps the VC firms to lever upon their combined experience and know-how. Thus, the combined effort of the syndication partners should add value to the venture. It has been pointed out earlier that we can distinguish between two different dimensions in which a involved partner can add value to the venture under consideration. At the pre-investment stage, Lerner (1994) suggests the Selection Hypothesis as a rational for VC syndication. Under this hypothesis the evaluation process before the selection of an investment opportunity is undertaken by more than one venture capitalist. The evaluation of the same venture proposal by different VC companies operating in a syndicate reduces therefore the potential danger of adverse selection. The combined effort to assess the quality of a venture helps VC investors to overcome informational asymmetries as the entrepreneurs

typically know more about the investment opportunity they seek funding for and might overstate the attractiveness of his business proposal (Sorenson and Stuart (1999)).

However, it has to be stated that the Superior Selection Hypothesis does not hold in the case of a lead investor undertaking the whole deal at first and then syndicating down the investment to other investors. As such, it will be hard to argue with any differences in the performance of the venture accruing to superior selection when a second or third venture capital provider has entered at a later stage. In this sense we could, however, argue with a value added stemming from the involvement of other VC partners. The Value Added Hypothesis in terms of managerial activities is a resource-based motive for syndication which holds for the post- investment stage. Under the Value Added Hypothesis venture capitalists are considered to add value to the performance of the venture after they invested in it (Brander et al. (2002)).

It has been pointed out that a lead investor acts according to the Value Added Hypothesis when he believes that the involvement of other venture capitalists would add some value to the venture. The benefit of involving co-investors is derived from heterogeneous skills and information different venture capitalists can contribute to the management of the venture company. The need for such additional resources is anticipated to be greater in earlier stages of an investment, than in later-stage investments. This is mainly due to the fact that more mature investee-companies already have an established management structure and market position and have already built relationships with suppliers and customers (Lockett and Wright (1999), Brander et al. (2002)).

In the following we therefore investigate whether the fact that an investment has been syndicated does influence the performance of the venture. Moreover, we test whether the number of investors involved in a syndicate has an impact on the prospective performance. Thus, we formulate the following hypothesis:

Hypothesis 6: Syndication helps to lever upon a set of heterogenous skills and increases the performance of the portfolio company

Consequently, we estimate a regression having the sales growth and the employee growth of a VC financed firm as the dependent variable. The variable "Sales Growth", respectively "Employee Growth", is calculated as the average growth rate after the investee has been funded by a single VC or the first VC of a syndicate. The explanatory variables are the industries in which the investee companies are active in, in order to control for industry specific growth effects along with the age of the firm, as more mature companies with an already established management and social ties, might not benefit as much as younger companies from the experience of the VC firms involved (Brander et al. (2002)). Table 11 shows the results.

Table 11:
The Effect of Syndication on Firm Performance

	Dependent Variable			
	Sales Growth		Employee Growth	
	(1)	(2)	(3)	(4)
Syndicated (1/0)	3.399509		-0.0680984	
	(0.026)**		(0.910)	
No. Investors		0.7036584		0.1066621
		(0.120)		(0.559)
Biotech	-2.737629	-2.780774	-3.728515	-4.008911
	(0.713)	(0.713)	(0.197)	(0.169)
Consulting	-1.103569	-0.4377234	-4.01488	-4.028116
	(0.881)	(0.953)	(0.167)	(0.165)
Electronics	-0.0542175	0.3846458	-4.278532	-4.261153
	(0.994)	(0.958)	(0.140)	(0.141)
Utilities	-1.628885	-1.76073	0.4717115	0.5297976
	(0.855)	(0.844)	(0.893)	(0.880)
Ind. Products	-2.205319	-1.696061	-4.247958	-4.244977
	(0.762)	(0.817)	(0.148)	(0.148)
Ind. Services	-1.236531	-1.242741	-4.146538	-4.172626
	(0.881)	(0.881)	(0.222)	(0.219)
Internet	3.05159	4.17365	-2.057717	-2.135937
	(0.679)	(0.571)	(0.473)	(0.456)
Pharma	-0.907655	-0.4932567	-1.922684	-1.975652
	(0.919)	(0.956)	(0.570)	(0.560)
Media	3.991512	4.383208	-3.541049	-3.546498
	(0.600)	(0.566)	(0.231)	(0.230)
Medical	-1.498873	-0.5388895	-3.560982	-3.74967
	(0.857)	(0.949)	(0.283)	(0.258)
Software	-1.458231	-0.5361339	-2.940378	-3.010644
	(0.841)	(0.941)	(0.298)	(0.286)
Age at Inv.	-0.0278315	-0.0331789	-0.0068155	-0.0066063
	(0.528)	(0.453)	(0.765)	(0.772)
Number of obs	314	314	296	296
F-Test	1.25	1.04	1.02	1.05
R^2	0.01	0.002	0.001	0.002

The table reports an OLS regression estimating the impact of firm characteristics on firm growth. Columns (1) and (2) include all funded firms for which data on sales growth after the first funding event was available. Columns (3) and (4) include all funded firms for which data on employee growth was available. The table reports the coefficient estimate along with the p-values in parentheses. Intercepts are not shown. The variable "Financial" has been dropped.
*, **, *** denotes significance at the 10%, 5% or 1% level respectively.

We can see that the coefficient associated with the zero/one variable "Syndication" is positive and significant for the first regression but not for the third regression. We can therefore see that syndication has a positive impact on sales growth for the funded firms. Employee growth, however, remains unaffected by the syndication efforts. Moreover, we can infer that the coefficient associated with the number of investors per funded firm is insignificant in both, the sales growth and the employee growth, regression. While syndication has a positive effect on growth, the number of investors does not have an impact on the prospects of the company. Interestingly, syndication helps firms to grow in terms of sales but does not impact the number of employees in the same fashion. In this respect, our results speak for a value added through networking activities brought together by the investment partners.

Our results in this respect are in line with the results by Audretsch and Lehmann(2004) who found that in a sample of VC financed firms that went public at the "Neuer Markt" in Germany syndicated investment outperformed non-syndicated investments in terms of revenue growth. Moreover, Brander et al. (2002) also see the Value Added Hypothesis leading to higher returns of co- invested deals. In order to test if syndicated VC investments have higher or lower returns they used the Macdonald & Associates database for returns on Canadian VC investments and find that syndicated investment projects have significantly higher returns than investments of a stand-alone status. Additionally, we confirmed the theoretical arguments of Fluck et al. (2005) that syndication of Venture Capital Investments benefits the venture capital provider due to the increased value of the venture (measured here in terms of sales growth) stemming from the increased effort of the entrepreneur.

4 Conclusion

In this paper we made the effort to shed light on the syndication behavior of Venture Capitalists in Germany. Using a sample of 2.500 VC investments undertaken in Germany we hypothesized investment behavior and tested the potential consequences against the actual empirical outcome of the data set. Here we could see that analyzing the actual behavior helps us to better understand the rationales of VC syndication.

The results found in our analysis support the conclusions put forward by Chiplin et al. (1997) that with a higher level of experience VC firms are less inclined to syndicate a deal with a partner. Therefore more experienced VC firms do not have to rely on external expertise and the additional benefits of syndicating in order to acquire new information might not be as high as to overcome the additional costs associated with monitoring and coordinating the deal together.

Moreover, we showed that the actual outcome data gives rise to the resource-based rationale for VC syndication as informational asymmetry could be overcome when partners are involved into the decision making process in the pre- and post-investment stage. We find evidence that a lower level of experience and expertise fosters the need to syndicate an investment, which indicates the validity of the resource and value added concept. Also in line with Chiplin et al. (1997) we see less experienced venture capital firms as more likely to syndicate deals. The results indicate that, holding all other factors constant, a higher degree of experience of a VC firm lowers its likelihood to syndicate investments. Additionally, we have pointed out the evidence that syndication indeed can be contributed to a value added effect. We document that firms that can benefit from the complementary skill set of syndicate partners are associated with a higher level of sales growth after the funding events.

In addition we brought forward the need to consider financial and resource driven motives simultaneously as both might at the same time have an impact on the observed syndication pattern. Consequently we found that allthough syndication seems to be driven by industry characteristics and venture capital experience there is also evidence that indicates the need for diversification in a portfolio context. Here we also pointed out the complementarity of the two motives for Venture Capital Syndication that could at the same time affect a VCs decision to syndicate an investment. Additionally, we found that syndication per se does not act as a tool for portfolio diversification but at the contrary serves to strengthen the VC objective and focus on certain industries and thus increases the overall concentration in the portfolio. However, we also noted that the involvement of new (in the sense of being different from the existing ones) co-investors can decrease the level of portfolio concentration and thus VCs tend to broaden their investment scope by partnering with a larger number of new VCs in a new or

under-represented industry. However, one needs to better investigate the trade off between the additional costs of information acquisition as opposed to the additional benefits of portfolio diversification. Only then we are able to gain better insights into the formation and closure of networks within the VC industry and are therefore able to gauge new perspectives on how and why firms syndicate. However, in order to be able to draw further conclusions one would need longitudinal data to see how ties between the parties are built and how firms enter new markets an industries via the route of syndication. Additionally, this could also yield insights into the role of trust and reciprocity when extending existing networks. With our analysis we laid the ground to regard finance and resource motives as complementary alternatives that need to be investigated further having in mind the potential evolution of partnerships across time and space.

Moreover, the lack of additional comprehensive studies on the syndication behaviour of European venture capitalists calls for further research in this field. Recent literature refrains from transferring findings from the US VC industry one-to-one to Europe and pays growing attention to the individual characteristics of VC markets in different regions [Jeng and Wells (2000)]. As Sapienza et al. (1996) point out, there is a range of economic, legal, institutional and cultural differences influencing the environment in which VC organisations operate. Thus, the miscellaneous and comprehensive conclusions drawn on the North American VC market are not necessarily applicable to the European VC industry. Therefore, further comparisons on the syndication practices in Europe, the US and Asia are needed and an interesting avenue for further research. Further studies are also needed to reveal if the European VC industry is becoming more uniform and standardised and to what degree trans-national syndicates have helped to establish common norms and working methods. Also, the relationship between syndication and firm value of the investee company is far from being clarified and not even rudimentary researched for the European or even German VC market. In the style of Maula and Murray (2000), "hard" data such as IPO valuations or investment outcomes can possibly quantify the added value through syndication.

Finally, we want to stress the fact that more attention needs to be drawn to the difficulties and potential downsides syndicated investments may yield. The existing literature commonly discusses syndication in the light of the interest of what kind of advantages it can bring to a VC investor. The overall impression the existing studies and articles suggest is that syndication itself is a value, which then can be explained by different frameworks such as portfolio diversification or value adding. However, little effort has been made to research in depth why most VC investments are actually not syndicated. It is rather striking that there exists no study revealing the reasons why venture capitalists refrain from syndicating in or -out an investment and under which circumstances this is the case.

Overall, it can be concluded that our analysis yields valuable insights into the

motives behind VC syndication and that based upon our research we might be better able to understand in which cases it might be worthwhile to syndicate and how syndication affects the constitution of the investment portfolio. Furthermore, it is the first study of its kind explicitly focusing on the German market using actual outcome data. So far, the only two empirical studies on syndication practice in Europe by Manigart et al. (2002) and Lockett and Wright (1999) are wholly based on questionnaires. Another difference is that the sample does not only contain transactions by professional VC organisations being members of the BVK but also includes foreign investors, business angels, private- and one-time VC investors which were found to play an important role in the VC financing of German portfolio companies. This allows examining the whole spectrum of VC investments in Germany and helps to reveal the actual co-investment behaviour of the different VC types in the industry. The results of this paper also reveal some insights on the differences in the syndication behaviour of different types of VC investors that have not yet been discussed in the literature in this way and might provide a starting point for further research.

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