

Does Venture Capital Syndication Spur Employment Growth and Shareholder Value? Evidence from German IPO Data

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ABSTRACT. This study empirically examines the syndication of equity by multiple venture capitalists in Germany. Following the literature, there are mainly two competing views as to why venture capitalists syndicate investments. First, syndication can be viewed as a means of risk-sharing. Second, venture capitalists may provide important productive resources to firms: capital and information. I test hypotheses based on these two aspects. The results show that the syndication of equity and the number of venture capitalists involved cannot be fully explained by firm characteristics like size, age, or industry affiliation. Although syndicated investments do not differ significantly in stock-market performance, they do show significantly higher growth rates.

KEY WORDS: Firm Performance, Human Capital, Syndication, Venture Capital

1. Introduction

Venture capitalists play a crucial role in the economy for at least two reasons. First, they incubate new and small firms by supplying them with equity capital (Gohrman and Sahlman, 1989). Second, they bring firms to public and thus increase their equity base to finance their future growth (Cumming and MacIntosh, 2002, Forthcoming; Hellmann and Puri, 2002; Kaplan and Stroemberg, 2002). Theoretical and empirical studies emphasize the advantages of venture capitalists in financing high-tech firms compared to other sources of finance (Admati and Pfleiderer,

1994; Berger and Udell, 1998; Hellmann, 1998; Sahlman, 1990).

Despite the crucial role venture capitalists play in financing high-tech firms, there is little attention in the academic literature on venture capital syndication. Although some firms are backed by a single venture capitalist, a closer look at the working practice of the venture capitalist industry shows striking evidence that investments are often undertaken by multiple venture capitalists. This practice of financing firms by two or more venture capitalists, termed “syndication”, involves several venture capital firms taking equity stakes in a firm. Thus, syndication involves a group of venture capitalists, providing necessary resources in a joint production function under uncertainty, which results in a payoff that has to be shared jointly among them (Wilson, 1968). In the presence of team-effects and the resulting moral-hazard incentives, the question remains, why do venture capitalists syndicate private equity, when the practice of syndication may create both, ex-ante and ex-post managerial problems.

These questions are addressed empirically in this paper using a hand-collected dataset of German IPOs. Although it is proclaimed to be the largest venture capital market in continental Europe (see Bottazzi and Da Rin, 2002), there is scarce empirical evidence about venture-backed firms in Germany. The history of the venture capital industry in Germany dates to the mid-1960s (Becker and Hellmann, 2000) – in contrast to the US, where it dates back to the 1940s (Gompers and Lerner, 2001). German venture capitalists also differ from those in the US by their lack of experience (Dittmann et al., 2001, Schefczyk and Gerpott, 2001) and in

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organizational form (Bascha and Walz, 2001; Becker and Hellmann, 2002).

The study supports the hypothesis that syndicated ventures show higher growth rates than standalone ventures. This may provide further evidence for the value-adding hypothesis of venture capital syndication. The results show that the resources provided by multiple venture capitalists lead to higher growth rates by overcoming growth restrictions, but may not necessarily lead to higher returns on the stock market. However, the stock market evaluates the trade-off between the costs and benefits of syndicated firms at the same rate as for standalone investments. Thus, from the standpoint of policy makers who are interested in higher growth rates of employees, as it should be the case for Germany, the syndication of equity by venture capitalists should be fostered.

The remainder of the paper is as follows. The next section summarizes the literature on venture capital syndication. The hypotheses on venture-capital syndication are presented in Section 2. Section 3 provides the data and how the variables are measured. The descriptive statistics, econometric analysis, and empirical results are discussed in Section 4. Section 5 concludes.

2. Venture capital syndication: risk sharing and value adding

Although syndication of private equity by venture capital firms is a widespread phenomenon, it has received little attention in the academic literature. Based on this literature, there are two principle competing views as to why venture capitalists syndicate investments. First, syndication can be viewed as a means of risk-sharing. Second, venture capitalists may provide important productive resources to firms: capital and information. The first perspective looks only at the risk-diversification side of the venture capitalist, while the second perspective focuses more on the strategic aspects of syndication in providing necessary tangible (equity) and intangible (information) assets.

The risk-sharing hypothesis is put forward by Lerner (1994). The underlying argument is that venture capitalists use syndication in order to

diversify their portfolio and reduce overall risk. Since firm risk arises from ex-ante information uncertainty regarding investment decisions, syndication by venture capitalists to avoid and/or share risk is assumed to be highest during early stages of the firms. There is one important factor which undermines the risk-sharing motive for equity syndication. In contrast to the stock market, the venture capital market is less liquid (Lockett and Wright, 1999). As a result, equity cannot be traded easily. Therefore, it is important to the venture capitalist to access the diversity of deals at initial investment stages (see Gompers, 1995). This risk-sharing explanation may hold in cases when the lead investor underwrites the entire deal and then subsequently syndicates down the investment to other firms. However, this may induce adverse effects due to asymmetric information between the lead investor and the uninformed venture capitalists.

Besides the pure risk sharing incentive to syndicate investments, the second perspective looks at the resource side of the firm. From this point of view, syndication is a means of accessing specific resources like capital and advice from multiple firms. First, syndication may lead to a superior selection of investments. Sah and Stiglitz (1986) contrast the decision-making in settings in which projects are undertaken only if one of the parties thinks it worthwhile – hierarchies – and where it is sufficient for multiple parties to approve the investments – polyarchies. They found it more efficient to undertake those projects that are approved by multiple parties.

Based on their findings, Lerner (1994) suggests that there may be an advantage to syndication by multiple venture capitalists. He assumes that it is preferable if the project is evaluated by two different parties. Two or more independent venture capitalists invest in information gathering, learn from the others' evaluation, and screen the projects more effectively and precisely than one venture capitalist. He supports his hypotheses of syndicated investment advantaged with data from the biotechnology sector.

Brander et al. (2002) included the framework by Lerner (1994) and enlarged the hypothesis of the selection advantage of multiple venture capitalists by introducing the advantage of

value-adding activities by venture capitalists. They base their assumption on the informal literature on the value-adding activities of venture capitalists and on empirical studies showing the advantage of venture capitalists in providing advice and other value-enhancing activities (such as Demougin and Fabel, 2004; Gohrman and Sahlman, 1989; Gompers and Lerner, 2001). The results of Brander et al. (2002) clearly show that average returns and growth rates from syndicated investments exceed standalone investments.

Hopp and Rieder (2005) introduce a real options model to analyze the determinants of venture capital syndication. Based on a dataset of 1,800 venture capital investments in Germany, their empirical study shows that a lower level of experience and expertise are the main driving forces to syndicate an investment. The authors conclude that the real options perspective gives rise to the resource-based view of venture capital syndication.

In the next section I will test these two arguments – the risk sharing and the value adding approach – to analyze empirically whether the determinants and effect of venture capital syndication can be explained by either, the risk sharing aspect, the value adding argument or both.

3. Venture capital syndication: determinants and performance

This section is started by debating whether syndicated investments differ from standalone investments by firm risk and the average amount of equity held by venture capitalists. First, if syndication is undertaken to share risk, I would expect that syndication is more prevalent in high-risk firms. Thus, I formulate the first two hypotheses:

H1a: The probability of being syndicated increases with firm risk.

H1b: The number of venture capitalists involved in a firm increases with firm risk.

A further test of the risk-sharing motive for syndication is the amount of equity held by venture capitalists. Although the total amount of equity invested by venture capital firms may

be larger than standalone investments, the average equity stake should be lower in syndicated investments.

H1c: Venture capitalists mean equity stakes is lower in syndicated firm investments than in standalone investments.

The second argument is based on the value added by venture capitalists. However, information and advice from venture capitalists can only be transformed to firm growth and firm performance if the firm possesses special kinds of receptors. In this vein, Rajan and Zingales (2000) and Fabel (2004), both point out that new economy firms differ from others by the modularity of their production function. Especially the complementary within the human capital endowment of the management teams and the complementary between human capital and physical capital are in the focus of researchers (Fabel, 2004; Wasmer and Weil, 2000). Since venture capital firms provide different advice and information, one would expect that the syndication of investment would increase with the human capital incorporated by the board of managers and directors. This leads to the following hypothesis:

H2a: Venture capital syndication is positively related to the amount of human capital incorporated by the board of managers and directors.

Finally, venture capitalists' contribution also depends on new firms' innovation level (Sapienza, 1992; Timmons and Bygrave, 1986). Complementary between the innovation level and the amount of advice and information provided by venture capitalists would lead to the hypothesis:

H2b: Highly innovative firms will have a larger number of venture capitalists.

The following hypotheses are about the effect of venture capital syndication on firm performance as measured by growth rates and stock market returns.

Since financial resources are one of the most critical obstacles for new firm growth (Berger and Udell, 1998), firms with syndicated investments

should have higher growth rates. Also the value adding argument suggests that firms with multiple venture capitalists should have even higher growth rates. Information and advice are basic resources for firm growth, which cannot easily be attracted by the market and thus are private assets for the firm. Thus, syndicated investments should be associated with higher growth rates.

H3a: The more venture capitalists are involved in a firm, the higher the growth rate.

Finally, we will analyze the effect of venture capital syndication on stock market performance, since the success of the venture capitalists is measured by the market value of their invested equity. If standalone investments are associated with lower risk, thus receiving less information, advice and other supporting values compared to syndicated ventures, then the expected returns should also be lower. Thus, syndicated ventures should outperform those firms.

H3b: Syndicated investments will outperform standalone investments.

However, if stock markets are efficient, each firm is forced to choose its optimal number of venture capitalists. Thus, the number of venture capitalists or the likelihood of syndication is endogenous and we should not expect that syndicated investments differ from standalone investments in stock market performance. If the syndication of equity is, *ceteris paribus*, associated with higher stock market returns, this would give an incentive to increase the number of venture capitalists. Thus, we would not expect to find standalone ventures on the stock market. Otherwise, if standalone investments should have higher returns on the stock market, the lead investor would have an incentive to cash out the other venture capitalists.

Since both, syndicated and standalone investments are listed on the stock market, the trade-off between the costs and benefits of syndication versus standalone investments may lead to the similar performance. Following Holmstrom (1982), such costs may appear in the form of free riding behavior. Venture capitalists with lower equity stakes thus have less incentive to monitor

the CEO and to offer additional advice. The alternative hypothesis is that syndicated investments do not outperform standalone investments:

H4a: Firms with syndicated equity stakes will not have significantly different performance on the stock market from firms with only one venture capitalist.

4. Data and measurement

To conduct this study, a hand-collected data set of firms listed on the German *Neuer Markt* from 1997 until 2002 was used. This market for young and highly innovative firms is the German equivalent to the United State's NASDAQ and allows venture capitalists to profit by selling their shares. The unique dataset consists of 341 firms listed on the *Neuer Markt* from 1997 until 2002. From those 341, we eliminated all firms based outside Germany, holding companies, banks, firms with a double listing, and non-IPO firms. This resulted in a set of 285 firms, from which 108 were backed by venture capitalists. The data was collected by combining individual balance sheet data from IPO prospectuses along with information from the *German Patent Office*, the *Deutsche Boerse AG*, *Datastream*, and *OnVista*.

From the IPO prospectuses I counted the number of venture capitalists who provided equity to each firm (SYNDICATION). The dummy variable STANDALONE is one for venture-backed firms with only one venture capitalist. Furthermore, the total amount of equity provided venture capitalists (VENTURE CAPITAL EQUITY) and the average amount of equity (AVERAGE) hold by venture capitalists was included in the dataset.

The first hypothesis states that probability of syndication is positively related to firm risk. Since most firms have no positive revenues in the past – such as those in the biotechnology sector – revenue variance as a measure of risk is not appropriate since it leads to a selection bias against technology intense and high-risk firms with no revenues yet. Since this study is based on IPO Data, the variance of the share price in the past as a measure for firm risk could not exist. As a substitute, the age (AGE) of each firm before IPO is used as a measure of firm risk.

This is done because, first, younger firms are associated with a higher degree of asymmetric information for outside financiers. It is expensive to gather information and may give an incentive to share those costs and risk with multiple venture capitalists. Second, a large number of empirical studies demonstrate that young firms have the greatest failure rates (Audretsch, 1995; Caves, 1998; Audretsch and Lehmann, 2005) and thus are associated with increased firm risk. The age (AGE) of the firm is measured in years since founding and enters the equation as the natural logarithm. The squared age is included to order to control for non-linear effects (AGE-square).

In Hypotheses H2a, it is assumed that whether a firms' equity is syndicated is positively affected by the quality of the board of directors and the management; in essence the quality of the human capital. The quality of the human capital is measured for the board of directors and the management by the number of doctoral degrees and professorships held (TITLE-MANAGEMENT and TITLE-DIRECTORS).

Beside the human capital the probability of venture capital syndication is assumed to be positively related to the innovation level of a firm, which is captured by the number of patents owned by the firm (FIRM-PATENTS) until the pre-IPO-year.

The third hypothesis is that syndicated venture-backed firms differ from single venture-backed firms in growth rates as measured by the number of employees. Thus, the log growth rate (LOG-GROWTH) is the difference of the log of the number of employees before IPO and one year after the IPO.

Finally, the log of the abnormal rents is taken to measure stock market performance. This variable is created as follows:

$$\begin{aligned} \text{Annual} - \text{abnormal} - \log - \text{rent} = & \{ [\ln \text{price}(30.\text{June } 02) - \ln \text{price}(\text{IPO})] \\ & - [\ln \text{NEMAX}(30.\text{June } 02) \\ & - \ln \text{NEMAX}(\text{IPO})] \} \frac{52}{\text{weeks}} \end{aligned}$$

The $\ln \text{price}(\text{IPO})$ is natural logarithm of the stock price and $\ln \text{NEMAX}(\text{IPO})$ is the logarithm of the market index at IPO. The $\ln \text{price}(30 \text{ June } 02)$ and $\ln \text{NEMAX}(30 \text{ June } 02)$ are the values taken from 30 June 2002. Capital increases and dividend payments are considered in the stock prices. The term is divided by the number of weeks from IPO to 30 June 2002. Multiplying by 52 gives us the annual abnormal rent. The underlying performance measure of abnormal rents measures long term performance from IPO through the first half of 2002. This time horizon includes both, the dramatic increases through March 2000 and decreases March 2000 through June 2002 on the stock market.

To control for time effects, we include the IPO Date as a dummy variable for the years 1997–2001. Dummy variables were also included for the following industries: Software (SOFTWARE), E-Services (SERVICE), E-Commerce (ECOMMERCE), Computer & Hardware (COMPUTER), Telecommunication (TELOCOM), Biotechnology (BIOTECH), Medicine & Life Science (MEDTEC), Media & Entertainment (MEDIA), and Technology (TECHNOLOGY). Firm size

TABLE I
Descriptive statistics of the data set

Variable	Mean	S.D.	Median	Minimum	Maximum
Number of VC	2.14	1.79	2	1	12
Average share	22.09	18.63	18.02	0.13	76.89
Firm age	9.31	8.038	8	0.1	35
Employees before IPO	185.61	268.44	89	2	1370
Employees post-IPO	322.578	496.873	174	10	3683
Log growth-rate	0.588	1.534	0.498	−3.236	7.518
Firm patents	3.70	10.40	0	0	52
Academy of Titles Board	0.72	0.927	0	0	5
Academy of Titles Directors	1.65	1.221	1	0	5

This table provides the descriptive statistics of the included 110 firms before IPO, which are backed by venture capital firms. Syndication refers to those firms, which are financed by two or more venture capitalists.

(FIRMSIZE) is measured by the logarithm of the number of employees before IPO.

5. Descriptive statistics and empirical results

5.1. Descriptive statistics

First, the descriptive statistics are provided. Table I shows that, on average, two venture capitalists are involved in each firm. With standalone investments as the minimum value, the maximum number of venture capitalists involved in one firm is 12. The median IPO Age is eight years. The number of employees increased dramatically after the IPO. Firms also differed in their growth rates and firm patents. While some firms had no registered patents, the maximum number of patents recorded was 52.

Table II shows the differences between standalone and syndicated investments. About half of the firms are financed by only one venture capitalist at IPO (53 firms) and the other half were syndicated investments.

At first glance, both standalone and syndicated investments differ significantly in the amount of equity provided to the firm. While standalone projects are financed by less than 20% of equity, syndicated investments are on average financed to 25%. Although the means differ between the two groups in the number of employees before and after the IPO, in the age of a firm, and the log growth rates, the differences are not significant at the 10% level. The

number of employees in firms with only one venture capitalist exceeds the mean number at syndicated ventures by about 40 employees. This difference disappeared after the IPO.

5.2. Determinants of syndication and the amount of venture capital

In this section the results from probit and negative binomial estimations (NBE) are provided to analyze the determinants of venture capital syndication (H1a). Then the amount of equity is taken as the endogenous variable in order to test hypothesis H1b, the risk sharing hypotheses.

In the first model (I), I use the dummy variable SYNDICATION as the endogenous variable. It takes the value one if multiple venture capitalists hold an equity stake in the firm, and zero, if only one venture capitalist is involved. The results in Table III show that none of the explanatory variables significantly explain venture capitalist syndication. Also the number of venture capitalists could not be significantly explained by the included variables (model II in Table III). Based on those results, we reject the hypothesis that syndication is more likely in young firms and firms with intangible assets.

Table IV shows that both, the absolute and average amount of equity differ significantly between standalone and syndicated investments. While the total equity held by venture capitalists is larger in syndicated investments, the average

TABLE II
Two-sample *t*-tests between standalone and syndicated investments

Variable	Mean		S.D.		<i>t</i> -value	H(1)	H(2)	H(3)
	Alone	Syndication	Alone	Syndication				
Numbers of firms	53	57						
Average share	18.982	24.991	20.66	16.18	1.7045	0.045	0.091	0.954
Firm age	9.752	8.91	8.163	7.97	0.547	0.707	0.585	0.292
Employees before IPO	208.307	164.912	302.665	233.747	0.841	0.799	0.401	0.200
Employees post-IPO	260.077	379.595	287.021	627.829	1.257	0.105	0.211	0.894
Log growth-rate	0.407	0.750	1.514	1.54	1.160	0.124	0.248	0.875
Academy of Titles Board	0.716	0.736	0.840	1.009	0.117	0.455	0.911	0.544
Academy of Titles Directors	1.622	1.678	1.004	1.415	0.237	0.406	0.813	0.593
Firm patents	2.830	4.526	8.233	12.096	0.853	0.197	0.395	0.802

This table provides the descriptive statistics of the included 110 firms before IPO. Syndication refers to those firms, which are financed by two or more venture capitalists. The underlying null hypothesis of the two-sample *t*-test is [mean (standalone) (mean (syndication))] = "difference" = 0. H(1): "difference" < 0; H(2): "difference" ~ = 0; H(3): "difference" > 0; *t*-values and respective *p*-values are shown in the table. Degrees of freedom: 108.

TABLE III
Estimation of the likelihood of standalone investments

Variable	(I) Probit coefficient (z-values)	(II) NBE coefficient (z-values)
Firm patents	0.0135 (0.82)	0.007 (0.48)
Academy of Titles Board	0.068 (0.44)	0.052 (0.32)
Academy of Titles Directors	0.060 (0.49)	0.053 (0.41)
LNSIZE	0.146 (1.13)	0.074 (0.56)
LNAge	0.095 (0.78)	0.057 (0.44)
LNAge2	-0.039 (0.71)	-0.017 (0.30)
IPO 97	0.298 (0.38)	0.363 (0.40)
IPO 98	-0.240 (0.42)	(0.103 (0.16)
IPO99	-0.054 (0.18)	(0.028 (0.09)
Software	0.206 (0.42)	0.189 (0.35)
Service	-0.305 (0.75)	-0.237 (0.50)
E-Commerce	1.696 (2.21)**	0.865 (1.49)
Computer & hardware	-0.808 (1.34)	-0.795 (0.97)
Telecommunication	0.058 (0.11)	0.113 (0.20)
Biotechnology	0.705 (0.94)	0.326 (0.48)
Medicine & life science	0.612 (1.00)	-0.494 (0.63)
Media & entertainment	0.759 (1.43)	0.491 (0.95)
Constant	-0.826 (1.29)	-1.242 (1.77)*
LL	-65.323	-88.944
Pseudo R-squared	0.110	0.043
LR chi-square (df)	16.26 (16)	7.67 (17)
N	106	108

This table shows the results of a Probit and Negative Binomial Estimation (NBE). In the first model (I), the dependent variable is a dummy variable, which takes the value 1 if the firm is financed by only one venture capitalist and 0 if the firm is financed by two or more venture capitalists. In the second model (II), the number of venture capital firms is taken as the endogenous variable. ***, **, and * denote statistically significant at 1%, 5%, and 10% levels, respectively. The technology sector and the IPO-Dummy for the year 2000 are taken as the control group. The df is degree of freedoms.

size of the equity stake is significantly lower. The equity stakes held by venture capitalists are significantly positively influenced by firm size. However, a major explanatory variable for the equity stakes held by venture capitalists, firm age, enters the regression insignificantly.

The results also show that venture capitalists' equity financing increased over time. At the beginning of the era of the *Neuer Markt* in 1997, the equity stake amount held by venture capitalists is significantly lower compared to the following years. The "window of opportunity", as proposed by Ritter (1991) may also hold for venture capital firms. In summary, the results fail to reject hypothesis H1b.

TABLE IV
Estimation of the equity held by venture capitalists

Variable	Total equity of coefficient (t-values)	Average equity of coefficient (t-values)
Syndication	7.049 (2.13)**	-8.177 (2.94)***
Firm patents	0.114 (0.67)	0.063 (0.36)
Academy of Titles Board	0.384 (0.19)	1.302 (0.87)
Academy of Titles Directors	2.197 (1.43)	0.986 (0.81)
LNSIZE	4.462 (2.96)***	3.441 (2.54)**
LNAge	-1.328 (0.78)	-0.225 (0.18)
LNAge2	(0.760 (0.96)	-0.863 (1.35)
IPO97	-16.667 (3.07)***	-8.739 (1.69)*
IPO 98	2.640 (0.35)	2.323 (0.32)
IPO99	3.947 (0.94)	3.168 (0.87)
Software	2.467 (0.65)	2.682 (0.91)
Service	4.894 (1.07)	5.959 (1.52)
E-Commerce	13.746 (1.99)*	8.482 (2.06)**
Computer & hardware	13.691 (1.74)*	14.369 (1.78)*
Telecommunication	9.636 (1.24)	8.909 (1.28)
Biotechnology	10.346 (1.21)	2.641 (0.50)
Medicine & life science	7.878 (1.33)	8.763 (1.68)*
Media & entertainment	12.619 (1.73)*	10.826 (2.27)**
Constant	-8.494 (1.19)	-3.260 (0.54)
Adjusted R-squared	0.264	0.295
N	108	108

The dependent variable is the amount of equity held by venture capitalists before IPO and the average amount of equity held by a venture capitalist. The data are not censored on the left (zero) and right (100) side. ***, **, and * denote statistically significant at 1%, 5%, and 10% levels, respectively. All regressions are run using the White-heteroskedasticity consistent estimator. The technology sector and the IPO-Dummy for the year 2000 are taken as the control group.

5.3. Syndication and performance

As previously shown, syndicated investments do not differ significantly among firms. This allows us to test directly the hypotheses H3 and H4 using OLS without needing instrumental regressions to endogenize the SYNDICATION variable.

First we test whether syndicated investments show higher growth rates than standalone investments. The results from the OLS regression strongly support this hypothesis. Although, as seen in Table II, the number of employees in standalone investments exceeds those in syndicated investments by an average of 40 at IPO, the employee growth rates of firms with syndicated investments are significantly higher after IPO.

Firm size is negatively significant in this regression. Although this result contradicts evidence

TABLE V
OLS estimation of growth rates and abnormal returns

Variable	(I) Growth rate coefficient (<i>t</i> -values)	(II) Abnormal rate coefficient (<i>t</i> -values)
Syndication	0.5223 (2.26)**	-0.174 (0.98)
Firm patents	0.0118 (0.75)	-0.0006 (0.12)
Academy of Titles Board	0.088 (0.74)	-0.067 (0.88)
Academy of Titles Directors	0.102 (0.96)	0.039 (0.66)
LNSIZE	-0.874 (7.13)***	0.1068 (1.48)
LNAGE	0.075 (0.65)	0.1068 (2.17)**
LNAGE2	-0.064 (1.26)	—
IPO 97	-1.258 (2.29)**	1.795 (4.12)***
IPO 98	-0.034 (0.09)	1.369 (8.84)***
IPO 99	-0.177 (0.68)	0.750 (3.86)***
Software	-0.124 (0.31)	-0.343 (1.40)
Service	0.679 (2.37)**	-0.523 (1.63)
E-Commerce	-0.611 (1.27)	-0.150 (0.44)
Computer & hardware	-0.611 (1.27)	0.0299 (0.12)
Telecommunication	0.321 (0.63)	-0.072 (0.37)
Biotechnology	0.428 (0.53)	0.392 (2.10)**
Medicine & life science	0.486 (1.08)	-0.1420 (0.35)
Media & entertainment	0.032 (0.07)	-0.302 (1.48)
Constant	4.002 (6.13)***	-0.2763 (5.49)***
Adjusted <i>R</i> -squared	0.561	0.399
<i>N</i>	107	107

The dependent variable is the growth rate of firms and is measured by the difference of the log(employees) before and after IPO. ***, **, and * denote statistically significant at 1%, 5%, and 10% levels, respectively. All regressions are run using the White-heteroskedasticity consistent estimator. The technology sector and the IPO-Dummy for the year 2000 are taken as the control group.

supporting Gibrat's Law of constant growth rates independently from firm size (Sutton, 1997; Caves, 1998), it is in line with studies based on small and high innovative-firms financed by venture-capitalists (Davila et al., 2003; Delmar et al., 2003). Firms that entered the stock market in 1997 show significant lower growth rates, compared to those firms, which entered in 2000.¹

Finally, we test the two related hypotheses H4a and H4b. The results in Table V (model II) clearly shows that the dummy variable SYNDICATION is not statistical significant and therefore Hypothesis H4a is rejected. Abnormal rents are significantly higher for older firms and for firms, which entered the stock market in the earlier years. If the squared term of AGE is included, firm age ceases to be significant.

6. Summary and conclusion

The purpose of this study was to empirically analyze whether syndicated investments differ from standalone investments. The results show that both the likelihood of syndication and the number of venture capitalists cannot be explained by firm characteristics like age, size, industry affiliation or the year of the IPO.

However, the study supports the risk-sharing argument, because equity shares held by venture capitalists were higher in syndicated investments but also that the average size of equity held by venture capitalists was significantly lower compared to standalone investments.

The study strongly supports the hypothesis that syndicated ventures show higher growth rates than standalone ventures. This may provide further evidence for the prominent value-adding hypothesis of venture capital syndication. The results also show that the resources provided by multiple venture capitalists may lead to higher growth rates by overcoming growth restrictions (see Audretsch and Elston, 1997, 2001), but may not necessarily lead to higher returns on the stock market. This result shows that the stock market evaluates the trade-off between the costs and benefits of firms with syndicated investments as the same as for standalone investments.

Thus, from the standpoint of policy makers who are interested in higher growth rates of employees, as it should be the case for Germany, the syndication of equity by venture capitalists should be encouraged. Future research should shed more light on the phenomenon of syndication on employment growth and performance, both theoretically and empirically.

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Note

¹ The adverse effects of the “New Economy Bubble” is captured and shown by the dummy variables indicating the year of the IPO. Thus, firms which entered the stock market in the earlier years may have a higher “quality” (see also Baker and Kennedy, 2002 forthcoming; Fama and French, 2001; Ritter, 1991 for such explanations for the NASDAQ).

References

- Admati, Anat R. and Paul Pfleiderer, 1994, ‘Robust Financial Contracting and the Role of Venture Capitalists’, *Journal of Finance* **49**, 371–402.
- Audretsch, David B. and Roy Thurik, 2001, ‘What’s New about the New Economy? Sources of Growth in the Managed and Entrepreneurial Economies’, *Industrial and Corporate Change* **10**, 267–315.
- Audretsch, David B. and Julie Ann Elston, 1997, ‘Financing the German Mittelstand’, *Small Business Economics* **9**, 97–110.
- Audretsch, David B. and Julie Ann Elston, 2001, ‘Evidence on the Impacts of Liquidity Constraints on Firm Investment Behavior in Germany’, *International Journal of Industrial Organization* **20**, 1–17.
- Audretsch, David B. and Erik E. Lehmann, 2004, ‘Financing High-Tech Growth: The Role of Banks and Venture Capitalists’, *Schmalenbach Business Review* **56**, 340–357.
- Audretsch, David B. and Erik Lehmann, 2005, ‘The Effects of Experience, Ownership, and Knowledge on IPO Survival: Empirical Evidence from Germany’, *Review of Accounting and Finance* **4**, 13–37.
- Baker, George P. and Robert E. Kennedy, 2002, ‘Survivorship and the Economic Grim Reaper’, *Journal of Law, Economics, and Organization* (December, forthcoming).
- Bascha, Andreas and Uwe Walz, 2001, ‘Financing Practices in the German Venture Capital Industry. An Empirical Assessment’, Working Paper, University of Tuebingen.
- Becker, Ralf and Thomas Hellmann, 2001, ‘The Genesis of Venture Capital – Lessons from the German Experience’, Working Paper No. 1705, Stanford University.
- Belke, Ansgar, Fehn, Rainer and Neil Foster 2003, ‘Does Venture Capital Spur Employment Growth?’, CESifo Working Paper No. 930, Munich.
- Bergemann, Dirk and Uli Hege, 1998, ‘Venture Capital Financing, Moral Hazard, and Learning’, *Journal of Banking and Finance* **22**, 703–735.
- Berger, Allan N. and Greg Udell, 1998, ‘The Economics of Small Business Finance: The Role of Private Equity and Debt Markets in the Financial Growth Cycle’, *Journal of Banking and Finance* **22**, 613–673.
- Black, Bernard and Ronald Gilson, 1997, ‘Venture Capital and the Structure of Financial Markets: Banks versus Stock Markets’, *Journal of Financial Economics* **47**, 243–277.
- Bottazzi, Laura and Marco Da Rin, 2002, ‘Venture Capital in Europe and the Financing of Innovative Companies’, *Economic Policy* **17**(1), 229–269.
- Brander, James A., Amit, Raphael and Werner Antweiler, 2002, ‘Venture-Capital Syndication: Improved Venture Selection vs. the Value-Added Hypothesis’, *Journal of Economics and Management Strategy* **11**(3), 423–452.
- Caves, Richard, 1998, ‘Industrial Organization and New Findings on the Turnover and Mobility of Firms’, *Journal of Economic Literature* **36**(4), 1947–1982.
- Cumming, Douglas and Jeffrey G. MacIntosh, 2002, ‘A Cross Country Comparison of Full and Partial Venture Capital Exits’, *Journal of Banking and Finance* (forthcoming).
- Davila, Antonio, Foster, George and George Mahendra Gupta, 2003, ‘Venture Capital Financing and the Growth of Startup Firms’, *Journal of Business Venturing* **18**, 689–708.
- Delmar, Frédéric, Davidsson, Per and William B. Gartner, 2003, ‘Arriving at the High-Growth Firm’, *Journal of Business Venturing* **18**(2), 189–216.
- Demougins, Dominique and Fabel, Oliver, 2004, ‘The Division of Ownership in New Ventures’, Working Paper University of Konstanz HU Berlin.
- Dittmann, Ingolf, Maug, Ernst G. and Johannes Kemper, (2001), ‘How Fundamental are Fundamental Values? Valuation Methods and their Impact on the Performance of German Venture Capitalists’, Working Paper, Humboldt University of Berlin.
- Fabel and Oliver, 2004, SpinOffs of Entrepreneurial Firms: An O-Ring approach’, *Journal of Institutional and Theoretical Economics* **160**, 1–23.
- Fama, Eugene and Kenneth R., French, 2001, ‘Newly Listed Firms, Fundamentals, Survival Rates, and Returns’, Center for Research in Security Prices, Working Paper No. 530 Chicago University.
- Gohrman, Michael and William Sahlman, 1989, ‘What do Venture Capitalists Do?’, *Journal of Business Venturing* **4**, 231–248.
- Gompers and Paul, 1995, ‘Optimal Investments, Monitoring, and the Staging of Venture Capital’, *Journal of Finance* **50**(5), 1461–1489.
- Gompers, Paul and Josh Lerner, 2001, ‘The Venture Capital Revolution’, *Journal of Economic Perspectives* **15**(2), 145–168.
- Hellmann and Thomas, 1998, ‘The Allocation of Control Rights in Venture Capital Contracts’, *Rand Journal of Economics* **29**, 57–76.
- Hellmann, Thomas and Manju Puri, 2000, ‘The Interaction between Product Market and Financing Strategy: The Role of Venture Capital’, *Review of Financial Studies* **13**(4), 959–984.
- Hellmann, Thomas and Manju Puri, 2002, ‘Venture Capital and the Professionalization of Start-up Firms: Empirical Evidence’, *Journal of Finance* **57**(1), 169–197.
- Holmstrom and Bengt, 1982, ‘Moral Hazard in Teams’, *Bell Journal of Economics* **10**, 74–91.
- Hopp, Christian and Finn Rieder, 2005, ‘Venture Capital Syndication through the Real Options Lens: Theoretical Implications and Empirical Insights’, Working Paper University of Konstanz.
- Kaplan, Steven N. and Per Stroemberg, 2004, ‘Characteristics, Contracts, and Actions: Evidence from Venture Capitalist Analysis’, *Journal of Finance* (forthcoming).
- Kaplan, Steven N. and Per Stroemberg, 2003, ‘Financial Contracting Theory meets the Real World: An Empirical Analysis of Venture Capital Contracts’, *Review of Economic Studies* **70**, 281–315.

- Lerner and Josh, 1995, 'Venture Capitalists and the Oversight of Private Firms', *Journal of Finance* **50**(1), 301–318.
- Lerner and Joshua, 1994, 'The Syndication of Venture Capital Investments', *Financial Management* **23**(3), 10–27.
- Lockett, Andy and Mike Wright, 1999, 'Venture Capital Syndication', *International Journal of Entrepreneurial Finance* **1**, 303–324.
- Rajan, Raghuram and Luigi Zingales, 2000, 'The Governance of the New Enterprise', in Vives and Xavier (eds.), *Corporate Governance*, Cambridge: Cambridge University Press.
- Ritter and Jay, 1991, 'The Long Run Performance of Initial Public Offerings', *Journal of Finance* **46**, 3–27.
- Sah, Raaj K. and Joseph E. Stiglitz, 1986, 'The Architecture of Economic Systems: Hierarchies and Polyarchies', *American Economic Review* **76**, 716–727.
- Sahlman and William, 1990, 'The Structure and Governance of Venture Capital Organizations', *Journal of Financial Economics* **27**, 473–521.
- Sapienza and Harry, 1992, 'When do Venture Capitals add Value?', *Journal of Business Venturing* **7**, 9–27.
- Schefczyk, Michael and Torsten J. Gerpott, 2001, 'Qualifications and Turnover Managers and Venture Capital-Financed Firm Performance. An Empirical Study of German Venture Capital-Investments', *Journal of Business Venturing* **16**(2), 145–163.
- Schmidt and Klaus M., 2003, 'Convertible Securities and Venture Capital Finance', *Journal of Finance* **58**, 1139–1166.
- Sutton and John, 1997, 'Gibrat's Legacy', *Journal of Economic Literature* **35**, 40–59.
- Timmons, Jeffrey A. and William D. Bygrave, 1986, 'Venture Capital's Role in Financing Innovation for Economic Growth', *Journal of Business Venturing* **1**, 161–176.
- Ueda, Masako, 2003, 'Banks versus Venture Capital, Project Evaluation, Screening, and Expropriation', *Journal of Finance* (forthcoming).
- Wilson and Robert, 1968, 'The Theory of Syndicates', *Econometrica* **36**, 119–132.

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