

CORPORATE VENTURE CAPITAL IN EAST ASIA - ANALYSING THE SURVIVAL AND THE PROBABILITY OF GOING PUBLIC OF SOUTH KOREAN PORTFOLIO COMPANIES

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Overriding rationale of the study is to analyse the performance of South-Korean portfolio companies that received corporate venture capital funding, focusing on their probability of survival and of going public. The underlying method used is a survival analysis conducted in the form of bivariate life tables, survival functions, and the multivariate Cox Proportional Hazard model. Eight factors are tested for their influence. The data sample contains 370 portfolio companies. The findings suggest a general probability of survival of 81.5 percent while the general probability of going public is computed as 12.6 percent within the first six years after foundation.

INTRODUCTION

Corporate Venture Capital in South Korea

“The search for innovation needs to be organizationally separate and outside of the ongoing managerial business,” (Drucker, 1974, p. 799) is one of the most prominent perceptions in strategic management. A major source of innovativeness for corporations is considered to be corporate venture capital. Its central role is often linked to a strategic advantage through technology transfer between the investor and the investee.

At first glance, Asian nations may suggest an intensive corporate venture capital culture. Some of the largest corporations worldwide are originated in Asia such as the Japanese or South-Korean conglomerates which are in constant need of innovativeness. Against all odds, corporate venture capital though appears to play a minor role in most of the Asian countries. In Asia, talents seem to stick to cost-efficient production rather than to fundamental innovation (Siegfried, 2006). Interestingly, the only Asian nation that shows strong corporate venture capital activity today is South Korea.

The South-Korean economy has traditionally been dominated by large conglomerates, the chaebol, which were established after the Second World War. In 1989 the five largest chaebol (Samsung, Hyundai, LG, Daewoo and Sunkyong) out of 60 in total were responsible for roughly 15 percent of entire Korean GDP (Kang, Choi & Jang, 1991). The status of the chaebol had literally been untouched which had been underscored by real annual growth rates of 9 percent of the Korean economy from the 1950s through 1990s (Diamond & Kim, 2000).

In the beginning of the 1990s the chaebol, however, showed first signs of inherent weaknesses and the government envisaged first restructuring attempts to rejuvenate the economy (Doh & Ryu, 2004; Kim 2003). The Korean government initiated a number of measures to stimulate small firm growth and to relax the economic and fiscal dependency on the chaebol. The term venture business was introduced which enabled certain small firms to receive investments from venture capital firms and limited partnership funds (Baygan, 2003). These venture businesses were granted an array of taxation and financial benefits, for instance exemptions from or at least heavy reductions in income and sales taxes and the government itself poured unprecedented amounts of public money into them. Investments or lending of venture capital from public funds increased 36 times from US-Dollar 28m in 1997 to US-Dollar 1,030m in 1999 (SMBA, 2006).

The active promotion of venture activities coincided with the global surge in internet-related business as well as the large-scale restructuring of the chaebol. While the former security of lifelong employ-

ment and the economic rigidity that resulted from it began to tumble, a new “flexibility” of the labour market turned out to be fruitful for the economy. The number of newly founded companies per year rose from 19,277 in 1998 to 39,608 in 2001 (SMBA, 2006). Venture capital investments measured as a percentage of Korean GDP rose from less than 0.2% to more than 0.6% in the same time period, just as corporate venture capital investments in South Korea rose from slightly above US-Dollar 100m in 1998, to more than US-Dollar 600m in 2001. Today, South Korea has one of the largest corporate venture capital markets worldwide as share of GDP, but largely lacks scientific research dedicated to this (Baygan, 2003).

Though the recent surge in Korean corporate ventures is unanimously impressive in terms of pure numbers, little evidence has been brought about to assess qualitative performance. The present study thus attempts to deliver first empirical insights on the success of corporate venture capital-financed portfolio companies in South Korea by applying a large-scale survival analysis. The indicators of qualitative performance will thereby be linked to the probability of survival and the probability of going public for the observed portfolio companies.

THEORETICAL FOUNDATION

Literature Review

While the value-added from independent venture capital firms has already been studied in great detail, relatively little research has been specifically dedicated to the value-added by corporate venture capitalists. Especially studies investigating the influence of specific attributes of the investor, on the survival rates and probability of going public of their portfolio companies are scarce.

McNally (1997) constitutes one of the few studies surveying technology-based companies in the United Kingdom that had received corporate venture capital. His sample of 23 firms indicates that some of the most important forms of value-added of the corporate investors were considered to be help with short-term problems, access to corporate management expertise and enhanced credibility. Another study conducted by Kelley & Spinelli (2001) argues that newly founded companies may also seek strategic reasons for raising corporate venture capital. Their sample of 84 corporate venture capital backed portfolio companies reveals that firms that pursue business relationships with their corporate investor enter a higher number of strategic alliances with other firms than those without business relationships to their corporate investor.

Apart from the few studies that strive to identify the most important value drivers offered by corporate investors, some focus on the performance implications of corporate engagements. Gompers & Lerner (1998) find that the probability of going public for portfolio companies is higher if corporate venture capital-backed (as opposed to non-corporate venture capital-backed) and in particular if accompanied by a strategic fit between the firms. In a similar study, Maula & Murray (2000) observe that portfolio companies backed by Global Fortune 500 corporations in the same industry sectors received higher valuations at initial public offerings than those solely financed by independent venture firms. They conclude that these higher valuations were due to endorsement benefits, operational synergies and better selection. From the perspective of the corporate investor, Dushnitsky & Lenox (2005) find that increases in corporate venture capital engagements are associated with subsequent increases in firm patenting indicating greater innovativeness.

Specifically focussing on the survival of corporate venture capital backed portfolio companies, Johann, Golla & Klandt (2006) examined 240 start-ups founded in German-speaking countries and observed a probability of 74 percent to surviving the first six years after foundation. Regarding the probability of survival an interesting study was conducted by Chang (2004), that focus on the effect of venture capital financing and strategic alliances on newly created companies' ability to acquire the necessary resources for growth. In his article, he constitutes a negative relationship between venture capital firm and strategic alliance reputation and the time to the initial public offering of the portfolio company.

Literature on related topics using South Korean data is extremely rare. To the knowledge of the author, there is no extant research dedicated to the performance of South-Korean portfolio companies that have received corporate venture capital.

Hypotheses

The resource- and the knowledge-based view are used to formulate hypotheses regarding the influence of the investor's size, experience and strategic fit on the probability of survival and going public of the portfolio company.

Following Maula, Erkko & Murray (2001), the corporate investor is assumed to deliver value-added through resource acquisition, knowledge acquisition and endorsement. Resource acquisition refers to

the portfolio company's preferential access to resources such as distribution channels or production capacity of the corporate investor. Knowledge acquisition stems from the portfolio company's preferential access to non-public information such as R&D or sensitive market data. Endorsement refers to the reputation effect resulting from cooperating with a corporate investor.

There are good reasons to believe that larger corporations possess more resources, have accumulated more knowledge and acquired more credibility over time. This suggests a higher transfer of these items between parent company and the corporate investor and ultimately the portfolio company, implying increased competitiveness of the latter. Previous studies have indeed confirmed a positive relation of the prominence of the corporate investor and the value-added to the portfolio company (Witt & Brachtendorf, 2001; Maula, Erkkö & Murray, 2001; Henderson & Leleux, 2002). In this study the size of the lead corporate investor's parent company is indicated by revenue, as this measure is largely independent from varying accounting standards. The first hypothesis states that:

(H1) The larger the parent company of the corporate investor, the higher the probability of survival and the higher the probability of going public of the portfolio company.

In line with the above reasoning is the assumption that a larger lead corporate investor possesses more resources, knowledge and credibility. A larger investor is thus assumed to be in the position to provide for a higher transfer of these items which would increase the competitiveness of the portfolio company. In order to coin the size of the corporate venture capital firm, the historical and current numbers of companies in the portfolio are considered, also a measure which has already been applied in previous studies (Engel, 2001). As a second indicator, the amount of capital under management will be used. It is hypothesized that:

(H2) The larger the corporate investor, the higher the probability of survival and the higher the probability of going public of the portfolio company.

The resource-based view also allows to control for the amount of experience of the corporate investor. Following a recent study, a more experienced lead corporate investor is likely to deliver a higher transfer of resources, credibility and especially knowledge. The amount of experience of the corporate investor is measured in this study by considering the number of years in which the firm is active in investment management (Baumgartner & Partner, 2001). The according hypothesis states that:

(H3) The higher the amount of experience of the corporate investor, the higher the probability of survival and the higher the probability of going public of the portfolio company.

Previous studies examined the relatedness of the industries in which the parent company of the corporate venture capital firm and the portfolio company operate. In fact, this has been identified as one of the most important drivers for the performance of the latter (Gompers & Lerner, 1998; Henderson & Leleux, 2002). The underlying assumption is that the potential transfer of relevant resources is enhanced if the parent company is active in a related industry. This implies greater competitiveness for the portfolio company and suggests the following hypothesis:

(H4) The higher the degree of strategic fit between the parent company of the corporate venture capital firm and the portfolio company, the higher the probability of survival and the higher the probability of going public of the portfolio company..

Implicitly recognizing and building on the knowledge-based view that explains the importance of knowledge transfer, the social capital theory provides a basis for analysing factors that facilitate this transfer and foster opportunities for cooperation between organizations. According to some scholars, dense social capital is the primary source to create value through competitive advantage (Nahapiet & Ghoshal, 1998; Tsai & Ghoshal, 1998; Yli-Renko, Autio & Sapienza, 2001).

The sample allows us to draw assumptions upon the density of social capital a newly founded company possesses by considering the number of investors engaged in this company. It is assumed that the more virtually independent investors are engaged, the higher the number of social ties, trusting relationships and value systems for the portfolio company which would imply increased competitiveness. Concerning this reasoning, a large corporate investor does not necessarily provide more social capital than a small one as in both cases an investment team is appointed to the portfolio company which may be independent from the size of the investor. The following hypothesis is drawn:

(H5) The larger the number of investors invested in the portfolio company, the higher the probability of survival and the higher the probability of going public of the portfolio company

While the resource- and knowledge-based view both strive to explain competitive advantage in the marketplace from firm-specific attributes, the theory of industrial economics adopts a more abstract approach by setting its focus on specific industry effects on firm performance that depend upon the structure of the industry.

A relevant aspect for this study is the optimal production output required in certain industries to remain competitive. This is particularly important for newly founded companies in these sectors as they have limited resources to meet the optimal production capacity as well as capital requirements. Following an argumentation that has already been addressed by a number of studies, the rate of survival is thus inherently linked to the industry's required production output and the firm's capability to reach it (Audretsch, 1994; Audretsch, 1995).

The analysis takes the above theory into account by looking at the time gap between the year of foundation of the newly founded company and its first round of corporate venture financing. As the portfolio company may benefit from an early engagement of the corporate investor due to increased chances to meet optimal production and capital requirements more quickly the following hypothesis is drawn:

(H6) The shorter the time gap between founding date of the portfolio company and its first reception of corporate venture capital, the higher the probability of survival and the higher the probability of going public of the portfolio company.

Also focusing on external influences organizational imprinting as a theory furthermore argues, that the context and conditions under which a company is established will be represented by the company many years after foundation. Economical, political and cultural aspects are considered to have a sensitive impact on the foundation of the company which can be traced back at a later point in time (Stinchcombe, 1965).

In this study organizational imprinting is applied by controlling for the context during the company's establishment. It is assumed that the dot.com hype during the years 1999 through 2001 had a significant impact on the investment criteria for newly founded companies. As research has shown, the screening process of financing requests is considered to have taken a too optimistic approach allowing financial resources to flow into firms regardless of their future profitability (Shin & Chang, 2003). First, companies in early stages of their lifetime might have been funded which normally would not have received any financing. This implies a greater number of newly founded companies with limited survival perspectives. Consequently, their proportion of the overall number of newly founded companies is expected to be higher. This would suggest a higher number of bankruptcies of companies founded during 1999 through 2001 in relative and absolute terms. Second, companies enjoyed facilitated access even to listings on the KOSDAQ which led to a huge surge of young firms going public shortly after foundation. In this context, the performance indicator of the probability of going public is thus of limited quality and will be explicitly controlled for in the analysis. The hypothesis built upon organisational imprinting is the following:

(H7) Portfolio companies that were founded any time other than during 1999 through 2001 have a higher probability of survival and a higher probability of going public within their early stages of existence.

With regard to the lack of empirical research dedicated to VC or CVC portfolio companies in South Korea and other Asian countries, there is a good reason to control the later analysis for cultural differences (Bruton et al., 2002; Lee, Lee & Souder, 2000). In particular, business relationships in Asia are of significantly different nature when compared to Western customs. It is assumed that the buyer-seller relationship is less driven by purely financial motives but rather considered as a long-term commitment (Backman, 2001). The economic contract is perceived as a relational contract (Dore, 1983; Kao, 1993). Some evidence for this may be the clique-like patterns of the Korean and Japanese business landscape as most large corporations are vertically integrated or pursue close strategic alliances (Gerlach, 1992). Hence, it is assumed that the concept of the buyer-seller relationship can be transferred to the relationship between the corporate venture capital firm and its portfolio company. Accordingly, the corporate venture capitalist in South Korea is less likely to apply and enforce strict financial performance criteria once entered into the relationship. As this is viewed as a long-term commitment, corporate investors are assumed to rather "throw good money after bad money" than hastily cutting these relationships. This would imply that South-Korean portfolio companies backed by corporate venture capital are less exposed to bankruptcy than comparable companies in the USA or Europe.

One facilitating assumption is necessary in this context. The factor is universalized to relationships across the entire sample assuming that South-Korean relationships on average show this long-term commitment as opposed to Western engagements. In order to test for this, the study compares the results with those of a previous study in a similar research design that focused on the survival of portfolio companies in German-speaking countries (Johann, Golla & Klandt, 2006). It is thus hypothesized:

(H8) Corporate venture capital-backed portfolio companies in South Korea have a higher probability of surviving the early stages of existence than portfolio companies of German-speaking countries.

This study is a performance-based study which above all operationalizes the likelihood of survival as the primary measure of success for the portfolio company. The likelihood of survival will be computed

by determining the lifespan of the portfolio companies in the data sample and their survival of the early development phase. This is done in line with previous studies that consider the survival of the early stages in the life cycle as an indicator of success (Schmidt, 2002; Johann, Golla & Klandt, 2006). This approach stems from the literature on the life cycle of the firm as it attaches changing probabilities of survival to different stages of the company. So it is assumed that newly founded companies have relatively high chances of failure during the first six years of existence compared to subsequent stages in the life cycle (Greenthal & Larson, 1982).

In addition, the likelihood of going public is addressed. This is due to the fact that an IPO is generally regarded as a success for the company because it has managed to raise public confidence in the expected growth perspectives (Engelmann et al., 2000). Though corporate investors typically do not envisage IPO's in their investment strategy, the relatively high number of floated companies in the sample size raised our interest in this analysis. These two factors will thus serve as the dependent variables for which the hypotheses will be challenged.

ANALYSIS

Data gathering and variable declarations

The data gathering focused on portfolio companies originated in South Korea which are legal entities and show at least one corporate venture capital firm engagement from any country in form of a minority stake holding. There is no limitation with regard to an observation period though the bulk of the investments start in the 1990s. Direct investments from corporations as well as corporate investments into independent venture capital firms were excluded from the observation. Also, subsidiaries of financial institutions, universities and research centres were not considered. The VentureXpert database assembled by Thomson Financial served as the primary source to set up the data sample.

The inquiry on South-Korean, corporate venture capital-financed portfolio companies in the VentureXpert database revealed 301 companies. Out of these 301 companies, 32 portfolio companies were excluded from the sample because their lead corporate investor is a subsidiary of a financial institution. Another 26 companies were erased because their lead investor is a university. Finally, one company was excluded because it is a non-Korean originated company. The data retrieved from VentureXpert used in this study thus covered 242 portfolio companies. In addition the websites of all active corporate venture capital providers in South Korea listed by VentureXpert were checked for further portfolio companies. This research added a further 128 portfolio companies to the dataset, so that the final sample consists of 370 portfolio companies.

In order to provide for a validation of the above outlined hypotheses, various data had to be collected, consisting of different specifications related to the portfolio company, the lead corporate venture capital firm and its parent company.

As the underlying performance measurement of this study, three dependent variables refer to the probability of survival, the lifespan and the probability of going public. The variable SURVIVAL is defined as a dichotomous dummy variable which may assume two possible parameter values, (0) survived or (1) failed. This variable is based on the discrete variable STATUS which accounts for the current status of the portfolio companies with the following classifications: (1) failed, (2) active investment, (3) acquisition, (4) merger, (5) leveraged buy-out (LBO) and (6) went public. The parameter value (1) failed, captures all types of failures of the business including bankruptcy, insolvency or voluntary going out of business. In contrast, the parameter value (2) active investment indicates that the portfolio company is still in operation and backed by a corporate venture capital firm. All other parameter values (3,4,5,6) indicate that the portfolio company has ultimately survived the early development phase. The continuous variable LIFESPAN measures the time frame from foundation of the portfolio company to either its exit date from the portfolio of the investor or the end of the observation period. In addition, a second dichotomous dummy variable is defined as IPO which may assume two possible values, (0) went public (1) not listed.

The various measures of the independent variables are rather self-explanatory. The definition of clusters was primarily derived from the hypotheses, but also takes into account the distribution of companies within the sample, so that no cluster dominates the others.

Sample description

The data sample consists of 370 portfolio companies that received corporate venture capital and were founded in South Korea between 1973 and 2003. The evolution is obviously dominated by a slight increase of newly founded companies in the beginning of the 1990s. The number of portfolio companies founded per year starts below 10 in 1990, raises to about 20 in 1994/95, constantly gains in momentum

towards the turn of the century and in particular after the Asian crisis in 1997, and reaches a peak of 123 companies established within one year in 2000 during the hype of the dot.com era. After the crash of the new economy and the capital markets, the years hereinafter experience a sharp decline of newly founded companies dropping to the levels of the early 1990s.

The sample of 370 portfolio companies yields a failure rate of 20.8 percent which is consistent with previous studies but appears to be at the lower end of the spectrum observed in other countries. Nearly the same percentage (19.2 percent) of the portfolio companies has gone public.

With exception of the services, business & financial sector that accounts only for 2.2 percent of the identified portfolio companies, the companies are quite equally distributed among the various industry sectors. Still, most of the newly founded companies pursue activities in internet specific businesses (20.3 percent) followed by computer hardware, software & other (18.4 percent), as the typical new technology based sectors. Remarkably the sector accounting for manufacturing, consumer related and transportation indicates an uncommonly high concentration of portfolio companies (17.3 percent) in comparison to the minor role of this sector in western venture capital engagements. Major reason for this may be the historically strong focus on labour-intensive production of the South-Korean economy. Most of the observed portfolio companies are financed by South-Korean corporate venture capital firms (91.1 percent) followed by US-American (3.5 percent) and Japanese (1.9 percent) investors. This composition appears to be in line with intuitive expectations that value geographical presence and cultural insight in venture capital financing.

General probability of survival

Figure one illustrates the computed survival curves for the portfolio companies. The unfactored curve illustrates the probability to surviving the first six years after foundation, disregarding any specific factors of influence. The computed probability to survive the observation period defined as the first six years after foundation is at 81.5 percent. Interestingly, after year six, the survival rate eases heavily and reaches a rate for the first nine years of 75.6 percent which is only slightly lower compared to the one after six years. Though not focus of this study, this confirms the argumentation of the literature that views the first six years as crucial to the going concern of a newly established company (Greenthal & Larson, 1982). It also serves to justify the defined observation period of the initial six years of the life cycle for this study. The graph becomes less defined towards the end of the entire period as more and more portfolio companies exit the sample due to failure or ultimate survival. The vertical line in year ten is meaningless indicating the end of the observation period.

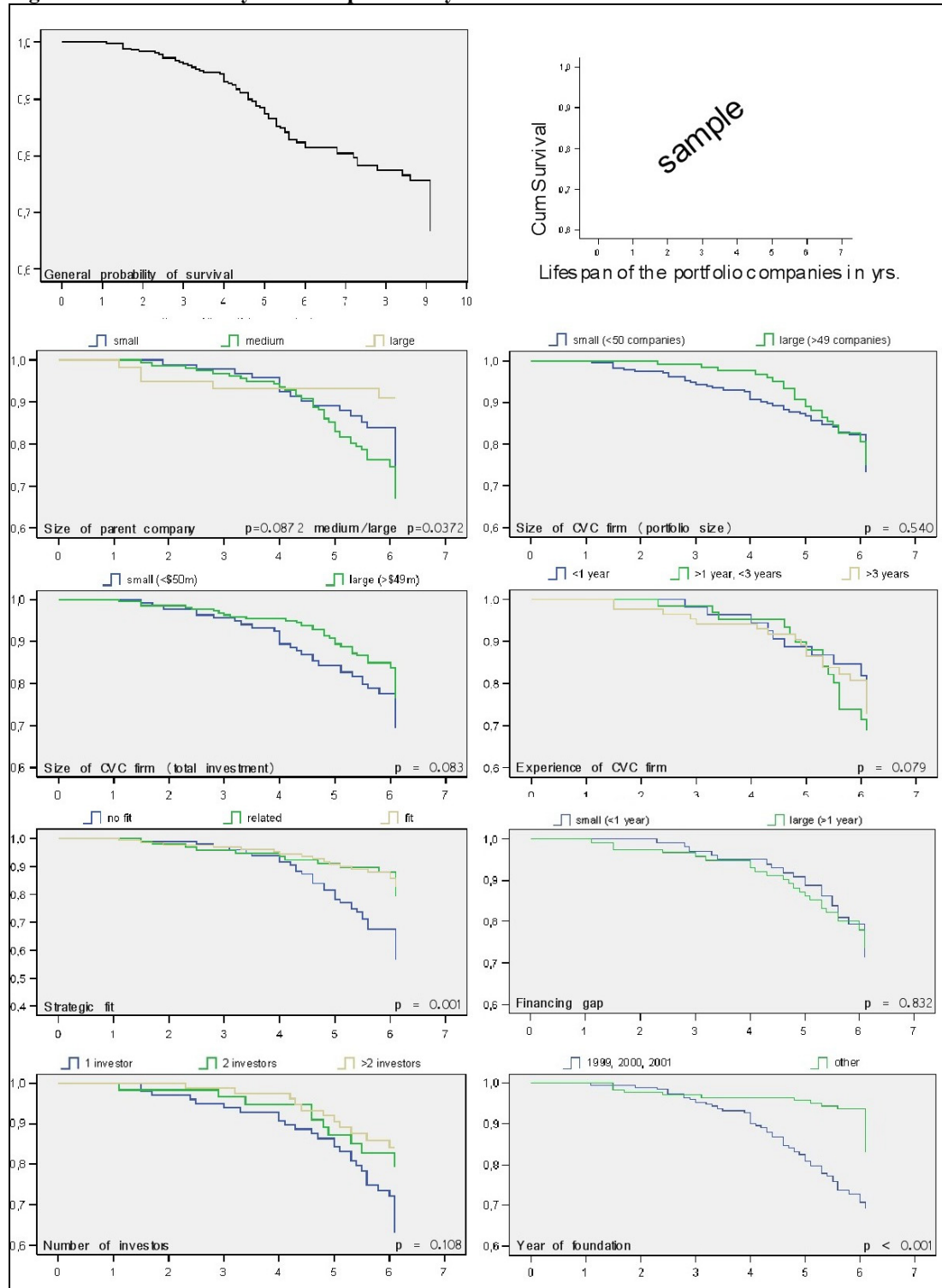
Influence of the independent variables on the probability of survival

The factored survival curves in figure one test for the hypotheses that were derived earlier on in the paper. The survival function illustrating the influence of the size of the investor's parent company shows that the portfolio companies backed by corporate investors of large corporations underperform those of both small and medium-sized corporations until year five, bearing the highest risk of failure. In contrast to the further decreasing survival rate induced by small and medium-sized corporations from this point on, portfolio companies of large corporations are characterized by a nearly stable survival rate which ultimately reaches 90.9 percent after six years. After four and a half years of identical survival rates for the portfolio companies financed by small and medium-sized corporations, the performance of these companies starts to diverge. After year six, companies financed by small corporations reach a survival rate of 84.0 percent followed by those of medium-sized corporations amounting to 74.4 percent. The pairwise comparison reveals a significant difference between portfolio companies of medium-sized and large corporations (0.0372).

The second indicator of size is the number of portfolio companies funded by a corporate investor. Throughout the period the probability of survival for companies backed by "large" investors tends to be higher than for those of "small" investors. The largest gap of ca. 7 percentage points occurs after four years. This difference however ceases towards the end of the period and is thus statistically insignificant. After six years, both clusters yield a similar survival rate of ca. 81 percent.

The third indicator of size refers to the portfolio of the corporate venture capital firm indicated in amount of US-Dollar investments. The two survival curves for portfolio companies backed by small and large corporate investors show a somewhat similar evolution compared to the preceding case. Again, portfolio companies of large corporate investors tend to outperform those of small corporate investors. This is in particular the case for the time after year three of the life cycle when the survival rate of those backed by large investors eases to a lesser extent. After six years these companies reach a survival rate of 83.7 percent whereas those of small investors face a 77.7 percent chance of survival.

Figure 1: Bivariate analyses of the probability of survival



Factoring the survival function by the indicator of experience of the corporate venture capital firm yields three survival curves. Until late in the observation period there is no trend identifiable. During the sixth year, however, portfolio companies financed by corporate investors of medium-termed investment experience show the highest drop in survival rate. At the end of the considered period, their probability of survival is computed as 71.4 percent. The survival rates for companies backed by investors of low and high levels of experience reach 81.8 and 80.7 percent respectively. The Wilcoxon-Gehan test indicates a probability of error for that difference of $p=0.079$.

The last factor derived from the research and knowledge-based view controls for the strategic fit between the corporate investor's parent company and the portfolio company. The development of the

survival curve is characterized by similar probabilities to survive the first four years of lifetime independently from a strategic fit. The survival rate after four years is ca. 92 percent for all portfolio companies. Henceforth, portfolio companies that are active in sectors fundamentally different from the industry focus of the corporate investor's parent company suffer from a huge decline in their probability of survival. While portfolio companies that are engaged in related or identical industries reach a survival rate of 88.1 and 85.3 percent respectively, those with no strategic fit have a 68.1 chance of survival after six years. The overall difference is statistically very significant with $p=0,001$.

The survival function that controls for the gap between the foundation of the portfolio company and its first reception of corporate venture capital does not show any remarkable differences. Both clusters ultimately reach a survival rate of ca. 79 percent.

Factoring the survival function with the factor that takes the number of all investors of the portfolio company into account gives three survival curves that indicate that the probability of survival tends to be higher for portfolio companies that are financed by several investors.

Finally, the life table differentiating between the portfolio companies that were founded during the internet hype of the years 1999, 2000, 2001 and those created anytime other than during this time leads to highly significant differences in the survival curves ($p<0.001$). Until year three of the life cycle, both clusters perform similarly reaching a survival rate of ca. 95 percent. From this point on, companies that were established during the internet hype show a strong decline in their probability of survival which drops by roughly 15 percentage points within the subsequent three years to 70.8 percent at the end of the observation period. The performance of those companies that were founded before or after the hype is in contrast somewhat stable reaching a considerably higher chance to survive the first six years of 93.6 percent.

General probability of going public

The second set of survival curves as illustrated in figure two is conducted for the event of an IPO. The unfactored curve depicts the development of the probability of going public for portfolio companies with origin in South Korea that raised corporate venture capital. The survival function computes a probability of 12.6 percent to go public for the companies in the sample after six years of existence. During the first two years after foundation the likelihood for an IPO is 0.00 percent. After the second year, this probability increases almost constantly by ca. 3 percentage points per year until the end of the observation period.

Influence of the independent variables on the probability of going public

Based on the resource and knowledge-based view, one factor was defined to control for size of the parent company measured by revenue. Breaking the survival function down by this factor reveals a significant dominance of smaller as opposed to larger corporations for the entire period ($p=0.044$). This dominance of small parent companies gains in momentum after year four and ultimately reaches a probability for floatation of their portfolio companies of 22.1 percent. Those financed by medium-sized and large corporations show a chance of 10.0 and 3.9 percent respectively.

The IPO curves for the two indicators of size of the corporate venture capital firm, i.e. the number of portfolio companies funded and the total amount of US-Dollar investment, reveal similar developments. Both considerations have however a very high probability of error with $p=0.403$ or 0.392 respectively.

The experience of the corporate venture capital firm, measured in number of years that it was active prior to the first provision of financing to a particular portfolio company only, only slightly appears to influence the probability of going public and does not lead to statistically significant results.

The survival curve taking into account the strategic fit shows a superior performance of portfolio companies that operate in one of the core industries of the corporate investor's parent company. During year five and six of the observation period, their probability of going public breaks away from other clusters and reaches a relatively high probability of going public of 19.0 percent after the first six years ($p=0.016$). Portfolio companies that pursue activities that do not provide a strategic fit to the parent company's business only show an 8.8 and 8.3 percent chance of an IPO.

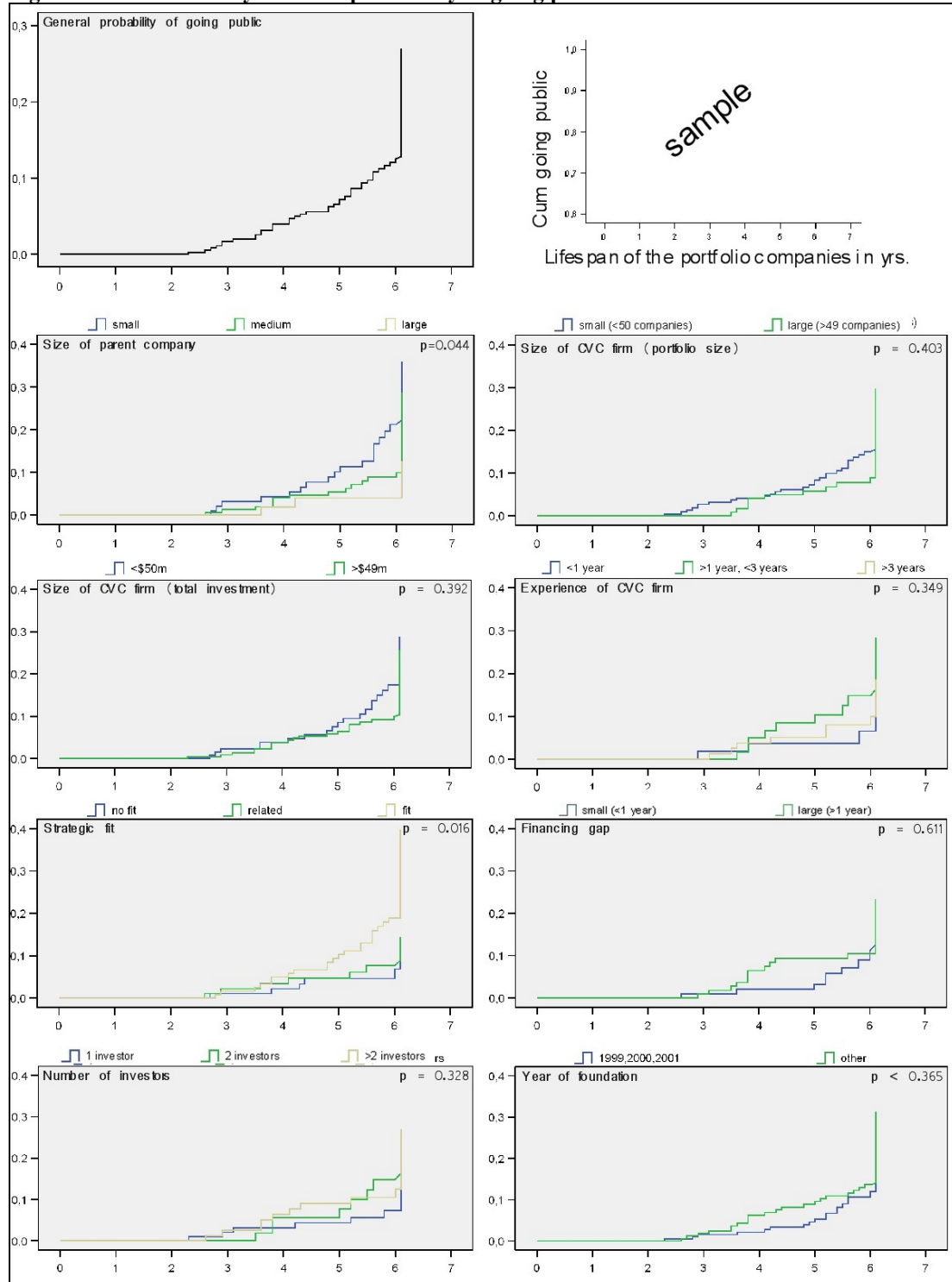
The survival curve factored by the time gap between foundation of the portfolio company and its first reception of corporate venture capital shows that companies with a large financing gap, i.e. that raise capital after the first year, seem to have a slightly higher probability of going public starting from year three. Towards the end of the period this dominance however shrinks and both clusters reach a quite similar probability of going public of a little less than 10 percent.

Looking at the number of investors of a particular portfolio company, comprising both independent venture capital firms as well as corporate venture capital firms, does not allow to identifying any clear or significant trend.

The survival curve that is factored by two clusters of portfolio companies based on their date of foundation shows a slightly different development in the probability of going public of those companies es-

established in 1999, 2000 and 2001, from those created anytime before or after this period. The high probability of error is however does not allow for a valid interpretation.

Figure 2: Bivariate analyses of the probability of going public



Multivariate analysis of the probability of survival

The preceding section computed survival functions accounting for bivariate relationships. This section delivers a multivariate approach with the help of the Cox Proportional Hazard model. The covariates enter the equation conditional upon their statistical significance. Figure three illustrates the different steps and outcomes of the performed Cox's regression, testing for the influence of the independent variables on the portfolio companies' probability of survival.

Using the Cox proportional hazard model, many scholars propose a criterion for inclusion of a covariate that is less stringent than the typical significance level of 0.05, because it may be likely to misinter-

pret the exclusion of a predictor. Hosmer & Lemeshow (2003) recommend a probability of error of 0.20 which shall be used in this study. The values for Exp(B) indicate the predicted change in hazard rate induced by a one unit increase of the explanatory variable (Tabachnick & Fidell, 1996). Thus, the probability of failure for companies founded prior to or after the internet hype of 1999, 2000 and 2001 have a 76.3 percent lower chance of failure than those established during the hype.

Regarding the strategic fit the risk of failure is 25.4 percent lower for those portfolio companies that operate in the same industry as the investor, in contrast to those operating in a related sector. Considering the number of investors engaged, portfolio companies experience a reduced hazard rate by 22.7 percent in case they are financed by two corporate investors instead of one investor.

Figure 3: Multivariate analyses of the probability of survival

| Significance ranking of covariates - survival rate | | | |
|--|--------|----|------|
| | Score | df | Sig. |
| YEAR OF FOUNDATION PC | 12,587 | 1 | ,000 |
| STRATEGIC FIT | 5,550 | 1 | ,018 |
| GLOBAL INVESTOR | 2,601 | 1 | ,107 |
| CVC EXPERIENCE | ,833 | 1 | ,362 |
| CVC SIZE NUMBER | ,478 | 1 | ,489 |
| FINANCING GAP | ,038 | 1 | ,845 |
| CVC SIZE CAPITAL | ,018 | 1 | ,893 |
| PARENT SIZE | ,002 | 1 | ,965 |

| Omnibus tests of model coefficients - survival rate | | | | | | | | | | |
|---|-------------------|-----------------|----|------|---------------------------|----|------|----------------------------|----|------|
| Step | -2 Log Likelihood | Overall (score) | | | Change From Previous Step | | | Change From Previous Block | | |
| | | Chi-square | df | Sig. | Chi-square | df | Sig. | Chi-square | df | Sig. |
| 1 ^a | 330,046 | 12,587 | 1 | ,000 | 14,430 | 1 | ,000 | 14,430 | 1 | ,000 |
| 2 ^b | 328,086 | 14,434 | 2 | ,001 | 1,960 | 1 | ,161 | 16,390 | 2 | ,000 |
| 3 ^c | 326,315 | 15,813 | 3 | ,001 | 1,771 | 1 | ,183 | 18,161 | 3 | ,000 |

a. Variable(s) Entered at Step Number 1: YEAR OF FOUNDATION PC
b. Variable(s) Entered at Step Number 2: STRATEGIC FIT
c. Variable(s) Entered at Step Number 3: GLOBAL INVESTOR

| Covariates in the equation - survival rate | | | | | | | |
|--|-----------------------|--------|------|--------|----|------|--------|
| | | B | SE | Wald | df | Sig. | Exp(B) |
| Step 1 | YEAR OF FOUNDATION PC | -1,590 | ,492 | 10,435 | 1 | ,001 | ,204 |
| Step 2 | YEAR OF FOUNDATION PC | -1,448 | ,505 | 8,239 | 1 | ,004 | ,235 |
| | STRATEGIC FIT | -,301 | ,218 | 1,904 | 1 | ,168 | ,740 |
| Step 3 | YEAR OF FOUNDATION PC | -1,438 | ,503 | 8,174 | 1 | ,004 | ,237 |
| | STRATEGIC FIT | -,293 | ,221 | 1,757 | 1 | ,185 | ,746 |
| | GLOBAL INVESTOR | -,258 | ,197 | 1,704 | 1 | ,192 | ,773 |

| Correlation matrix of regression coefficients - survival rate | | |
|---|-----------------------|---------------|
| | YEAR OF FOUNDATION PC | STRATEGIC FIT |
| STRATEGIC FIT | -,175 | |
| GLOBAL INVESTOR | -,016 | -,025 |

Multivariate analysis of the probability of going public

The following part concentrates on a second Cox Proportional Hazard model dedicated to the event of going public. Again, the entry of the considered covariates into the model is dependent on their pre-implementation significance level. The first covariate implemented in the algorithm is GLOBAL INVESTOR. This covariate improves the function as indicated by chi-square at a significant level (0.031). In a second step, the next covariate, YEAR OF FOUNDATION PC, enters the model that is slightly improved thereby. All other covariates, also STRATEGIC FIT, are excluded from the model

as they do not impose a considerable contribution to the model. This is measured by chi-square which computes a residual value of 4.370 for the remaining six covariates, or just 0.627 per single covariate. Here, the values for Exp(B) even imply a 2.225 times higher risk of not becoming listed for companies that were founded during the internet hype as opposed to those established prior to or after the hype which equals a one unit increase of the dummy variable. Portfolio companies that are only financed by one investor as opposed to those backed by two investors face a 1.649 times higher risk of not going public. Table 16 also indicates that the significant influence of the factor GLOBAL INVESTOR is slightly lowered as the second covariates YEAR OF FOUNDATION PC enters the model. A weak, negative correlation however confirms that both factors nearly independently impact the function.

Figure 4: Multivariate analyses of the probability of going public

| Significance ranking of covariates - IPO rate | | | |
|---|-------|----|------|
| | Score | df | Sig. |
| GLOBAL INVESTOR | 4,653 | 1 | ,031 |
| YEAR OF FOUNDATION PC | 2,658 | 1 | ,103 |
| STRATEGIC FIT | 2,546 | 1 | ,111 |
| PARENT SIZE | 1,109 | 1 | ,292 |
| CVC SIZE NUMBER | ,874 | 1 | ,350 |
| FINANCING GAP | ,919 | 1 | ,338 |
| CVC SIZE CAPTIAL | ,268 | 1 | ,605 |
| CVC EXPERIENCE | ,005 | 1 | ,946 |

| Omni bus tests of model coefficients - IPO rate | | | | | | | | | | |
|---|-------------------|-----------------|----|------|---------------------------|----|------|----------------------------|----|------|
| Step | -2 Log Likelihood | Overall (score) | | | Change From Previous Step | | | Change From Previous Block | | |
| | | Chi-square | df | Sig. | Chi-square | df | Sig. | Chi-square | df | Sig. |
| 1 ^a | 186,016 | 4,653 | 1 | ,031 | 4,662 | 1 | ,031 | 4,662 | 1 | ,031 |
| 2 ^b | 183,832 | 6,882 | 2 | ,032 | 2,184 | 1 | ,139 | 6,846 | 2 | ,033 |

a. Variable(s) Entered at Step Number 1: GLOBAL INVESTOR
 b. Variable(s) Entered at Step Number 2: YEAR OF FOUNDATION PC

| Covariates in the equation - IPO rate | | | | | | | |
|---------------------------------------|------|------|-------|----|------|--------|--|
| | B | SE | Wald | df | Sig. | Exp(B) | |
| Step 1 GLOBAL INVESTOR | ,525 | ,251 | 4,390 | 1 | ,036 | 1,691 | |
| Step 2 YEAR OF FOUNDATION PC | ,811 | ,563 | 2,078 | 1 | ,149 | 2,250 | |
| GLOBAL INVESTOR | ,500 | ,251 | 3,975 | 1 | ,046 | 1,649 | |

| Correlation matrix of reression coefficients - IPO rate | |
|---|-----------------------|
| | YEAR OF FOUNDATION PC |
| GLOBAL INVESTOR | -,066 |

DISCUSSION AND IMPLICATIONS

This study set out to analyse the probability of survival and the probability of going public as basic performance measures for newly founded companies. The data sample of 370 corporate venture capital-backed portfolio companies founded in South Korea between 1973 and 2003 shows a plain failure rate of 20.8 percent. This percentage, however, also includes those companies that may or may not have failed for instance 20 years after foundation though they were no longer considered a newly founded company according to the theory of the life cycle of the firm (Greenthal & Larson, 1982). Focusing on the first six years in the lifespan yields a slightly lower failure rate of 18.5 percent that is globally in line with previous studies but appears to be at the lower end (Gompers, 1995; Wanzenboeck, 1997; Manigart, Baeyens & Hyfte, 2002; Golla et al., 2005; Johann, Golla & Klandt, 2006). Wanzenboeck (1997) e.g. conducted a survival analysis of Austrian companies founded in 1990 and

constitutes a survival rate of 72 percent in 1995. Johann, Golla & Klandt (2006) examined in a recent study 240 portfolio companies founded in German-speaking countries and observed a probability of 74 percent to survive the first six years after foundation. Another interesting study was done by Golla et al. (2005) who analysed 5,736 VC-financed and non-VC-financed internet and e-commerce start-ups founded in Germany between 1990 and 2004 computing a plain failure rate of 21.3 percent.

Analysing the development of hazard risks along time, furthermore nicely illustrates a sharp bend in the general survival curve between year six and seven of the portfolio companies' lifespan. Though not focus of this study the observed break is clearly supportive for the rationale of the theory of the life cycle of the firm, which assumes that the risk of hazard for a start-up company is noticeably reduced after having survived the early development period of about six years after foundation.

Out of the 370 portfolio companies 19.2 percent went public during the entire timeframe. Following the observation period of the survival rate, the probability of going public within the first six years is computed as 12.6 percent. Naturally, a considerable number of companies were floated beyond the first six years of the life cycle explaining the higher percentage for the sample without an explicit timeframe.

The first set of hypotheses derived from the resource and knowledge-based view controls for the size of the corporate investor and its parent company. Considering both the probability of survival and going public, the path between enhanced acquisition opportunities of resources and knowledge as well as endorsement effects through larger corporate investors did not receive statistically significant support. The findings suggest no significantly fundamental contribution of larger investors to the performance of their portfolio company. However, disregarding the probability of error, the direction of influence is in line with the hypotheses, showing slightly higher chances to survive for portfolio companies backed by larger corporate investors.

Regarding the probability of going public, the analyses in contrast showed a significant opposite effect as assumed in hypothesis one or two. The portfolio companies backed by investors with smaller parent companies showed a significantly higher likelihood of going public than those backed by investors with larger parent companies. And despite high probabilities of error the same effect could be observed when testing for the influence of the size of the corporate venture capital firm itself. Though, far from being significant, a slight tendency that portfolio companies backed by smaller corporate investors have a higher probability of going public was indicated. One possible explanation is that smaller companies may tend to rely heavier on financial return than on a strategic rationale. Moreover, they may not be in the position for follow-up financing or ultimate acquisition due to limited financial resources. The hypothesized effect of the corporate investor's level of experience (H3) did not receive any confirmation either. The survival and IPO rates of the portfolio companies developed independently from the investment experience of the investor. These findings are inconsistent with previous studies that demonstrated the role of the complementarities as value-enhancing for the investments through resource sharing (Maula, Erkko & Murray, 2001). Hypothesis III could not be hold. The only variable derived from resource and knowledge-based view that showed a very significant impact on the survival and IPO rate, in line with the hypothesis, is the degree of strategic fit between investor and investee.

This suggests that a transfer of resources, knowledge as well as endorsement is particularly advantageous for the portfolio company, in case it operates in the same industry as the investor's parent company. Possible explanations may be that the parent company pursues great interest in the going concern of the enterprise due to the strategic rationale and thus provides for a transfer of relevant resources, knowledge and credibility. The consequence is a higher competitiveness and thus probability of survival and of going public for the portfolio companies. The multivariate analysis confirmed the significance of the strategic fit. Accordingly, there is empirical evidence for the validity of hypothesis four.

The second set of hypotheses derived from the theory of industrial economics argues that the earlier a newly founded company raises capital the higher the probability of surviving the early stages of the life cycle and the higher the chances to go public. However, neither the bivariate analyses dedicated to the survival rate and the probability of going public nor the multivariate models constitute a significant impact of this variable in the hypothesized direction.

The third set of hypotheses stems from social capital theory. It is assumed that the larger the number of social networks available to the newly founded company, the higher the probability to survive and the higher the probability to go public. The multivariate models confirm the statistical influence of this variable which takes the number of investors of a particular portfolio company into account, and also the bivariate models for survival and IPO rate, though being statistically not significant, indicate this direction of influence. This is in line with the literature that perceives the presence of social capital as a strong facilitator for a more efficient transfer of resources, knowledge and endorsement effects which implies greater competitiveness and better performance of the company (Kogut & Zander, 1992; Steensma, 1996; Bresman, Birkinshaw & Nobel, 1999; Steensma & Lyles, 2000). Hypothesis six is thus confirmed with the help of the multivariate models.

The theory of organizational imprinting served to formulate hypotheses controlling for the particular year of foundation of the portfolio company (H 7). As argued by the theory, the circumstances under which a company was founded tend to influence its subsequent performance. Excluding those that were established during the internet hype of 1999, 2000 and 2001 from the rest delivered a highly significant difference for the survival rate of the corresponding portfolio companies by both the bivariate and multivariate models. Accordingly, hypothesis seven receives empirical confirmation when considering the probability of survival. Looking at the probability of going public, the analysis does not indicate a significant impact of the variable. This may be intuitively clear because an enormous surge in new listings was one of the major developments induced by the so-called new economy. The “natural” IPO rate of the companies established prior to or after the hype offsets the “artificial” IPO rate of those companies founded during the hype. Thus hypothesis seven has to be rejected for the likelihood of going public. However, the multivariate model indicates a significant but small contribution to the predictive power of the function.

The last hypotheses constructed controls for cultural specifics and suggests that South-Korean portfolio companies are less exposed to bankruptcy than those of German-speaking countries due to the nature of the investor-investee relationship. A first, pragmatic approach to verify this assumption is a comparison of the plain failure rate of the sample. As stated at the beginning of this section, a 20.8 percent failure rate appears to be at the lower end. In fact, it is lower than the failure rate of 23.3 percent of a comparable study examining portfolio companies in German-speaking countries (Johann, Golla & Klandt, 2006). When observing the failure rates computed by the survival functions, this discrepancy even widens to 7.2 percentage points. This is supportive to the assumption of lower risk of failure for South-Korean portfolio companies and thus confirms hypothesis eight. However, as this is just a very first pragmatic approach this field obviously offers further research perspectives which take a closer look at cross-cultural issues.

Implications that can be drawn out of this study become particularly apparent when looking at the impact of strategic fit and number of investors, as these are aspects that can be actively influenced by the founder team of the portfolio company. To aim at a maximum probability of survival and going public it is recommendable to search for corporate venture capital investors whose parent company has not only a monetary but also a strategic interest in the company. These investors seem to be more willing to support the start-up also in difficult times during its early development. Trying to attract several investors is another option to enhance the chances for survival and an early IPO. The higher probability of early failure of the portfolio companies founded in times of the dot.com hype reminds investors to better not loosen their investment criteria too much in those times just to jump on the bandwagon.

CONCLUSION

Applying stringent statistical criteria, empirical evidence was only delivered for two hypotheses in the bivariate models with regard to the probability of survival. The variables STRATEGIC FIT (H4) and YEAR OF FOUNDATION PC (H7) showed a statistically significant influence. The presence of a strategic rationale as a basis for resource transfer between investor and investee seems to enhance the likelihood to survive early stages of the life cycle. The internet hype and its implied relaxed screening process furthermore seem to have given rise to the financing of an unprecedented number of new companies which partly turned out to lack competitiveness. With the help of the multivariate model, a third hypothesis, using the variable GLOBAL INVESTOR (H6), was proved to have a significant impact on the probability of survival. The survival rate observed in the sample appears to be enhanced in the presence of higher amounts of social ties.

Looking at the probability of floatation on the KOSDAQ, the only variable that delivers significant support for the hypothesized influence was STRATEGIC FIT in the bivariate model. In contrast, one hypothesis even received conflictive evidence indicated by the variable PARENT SIZE (H 1). The findings suggest that the smaller the parent company of the corporate investor, the higher the chance of going public during the first six years of existence. Possible explanations referred to a stronger focus on financial return articulated by smaller parent companies. Further, fewer resources and limited funds for follow-up financings of the corporate investor’s parent company may necessitate earlier exits possibly in the form of floatation. Using the multivariate model, the variable STRATEGIC FIT, however, no longer showed a significant influence. Instead, two other hypotheses, in line with the Cox regression for the probability of survival, received support, namely the variables GLOBAL INVESTOR and YEAR OF FOUNDATION PC. Possible explanations were that a stronger presence of social ties not only increases the probability of survival but also enhances the company’s position for going public.

The results of the analysis lead to valuable implications for founders and potential investors of corporate venture capital portfolio companies. Whereas founders should try to aim for enhancing the number

of investors and the strategic fit to their capital providers, investors are reminded of the risks associated with overly hyped industries.

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