LSE RICAFE

Working Paper NO. 001

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November 2003

RICAFE - Risk Capital and the Financing of European Innovative Firms

A project financed by the European Commission, DG Research
Improving the Human Potential and the Socio- Economic Knowledge Base Programme.
Contract No : HPSE-CT-2002-00140

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*We gratefully acknowledge financial support from the European Commission (Contract HPSE-CT-2002-00140). This research has also been aided by the European Venture Capital Association and Fondation Banque de France. We would like to thank Didier Guennoc, Thomas Hellmann, Marco Pagano, Henri Pagès, Alessandro Sembenelli, Jan Mahrt-Smith and Per Stromberg and seminar audiences at Banque de France, EFA'2003 in Glasgow as well as the First RICAFE Conference in London for helpful suggestions.

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Abstract

This paper presents a study of contractual determinants of success in venture financing, by comparing the conditions in a mature venture capital market (United States) with those in a relatively new market for venture financing (Europe). Using data collected in an identical way, we look at the choices around the exit decision, and internal rates of returns calculated from reported valuations as two measures of the performance of venture-backed projects. Our data show that US venture capital firms show a significantly higher performance on average than their European counterparts, both in terms of type of exit and of rate of return. We argue that this performance gap may be attributable in parts to differences in the contractual relationship between venture capitalists and start-up entrepreneurs. First, venture capitalists in the United States assert more often contingent control rights, indicated both by the use of convertibles and decisions to replace the entrepreneur. Second, our findings are consistent with the hypothesis that US VCs have a better capacity to screen projects and to ensure their success in the early stages than European VCs.

1 Introduction

For many years and in numerous declarations and policy documents, officials in the European Union have exhorted the virtues of venture capital (VC) as a driver of future innovation and growth in Europe, and designated its development as a key policy priority. All the proclaimed goodwill notwithstanding, however, venture capital funding is still a nascent industry in Europe. Until recently, Europe has been considered as an emerging market as far as venture capital is concerned (see e.g. Black-Gilson (1998))[1], and a venture capital industry geared towards innovation and early-stage financing has really taken off only in the late 1990s, reaching an aggregate investment volume of 12 billion euros in 1999, roughly a quarter of the US level (EVCA (2001)).

The difference between developed and emerging VC markets is also mirrored by a widely asymmetric situation on the research side: while the overwhelming majority of research on venture capital investigates North America, there is a dearth of empirical research of the characteristics of European venture capital. The contracting, organization of VC firms, exit decisions etc., and the peculiarities of Europe as well as the features it has in common with the United States as the sole benchmark of a developed market are poorly understood. Rigorous comparative studies directly comparing the US to non-US VC industries are virtually absent.

In this paper, we undertake a comparative micro-level study of the performance of venture financing between the United States, the prime example of a mature venture capital market, and Europe, arguably the most important region representing the emerging markets for venture financing. Trade associations and data providers have long indicated a considerable gap in realized returns[2] between both continents, and practitioners in Europe have pointed to this gap as the reason for their hesitation to enter early-stage financing. If the prior of such a performance gap is confirmed in the data, what explains it? And is the performance gap still true for the period since the late 1990s, when early-stage financing increased rapidly in Europe?

The purpose of this paper is to analyze drivers of venture capital success on a micro-level basis, by identifying characteristics in the relationship between venture capital firms and

[1] A distinction shared with every region in the world except North America and perhaps Israel.

[2] In the venture capital industry, rates of return are typically expressed as internal rates of return (IRR); aggregate figures are sporadically released by NVCA in the US, EVCA in Europe as well as some of the national associations.

portfolio companies (the term universally used for *VC*-funded start-ups) and investigating empirically how they contribute to the success of the funded projects. To the best of our knowledge, this is the first comparative research based on data that have been collected in a truly comparable and identical way on both sides of the Atlantic. By doing so, we also attempt to remedy the virtual absence of knowledge on the organization of venture capital markets outside the United States. Furthermore, we pursue a new agenda on studying the microeconomics of venture capital: by mapping contractual features[3] and firm characteristics into return and success measures, we seek to identify and quantify the determinants of venture capital performance.

Gathering data about the performance of European venture capital markets is a challenge, as *VC* firms are private equityholders also in the sense that many insist the privacy of their data, especially value-related data.[4] To circumvent the problem of getting access to performance-sensitive data, we have taken a two-pronged approach. On the one hand, we have directly contacted a large number of venture capital firms with a questionnaire asking them to provide details of their contractual practice, experience and scope. On the other hand, we use the *VentureXpert* database that provides for a large number of portfolio companies and worldwide details of investments, participants and valuations in every financing round.

For the hand-collected questionnaire dataset, proxies for performance have been gathered only in a rather indirect way, by asking about the exit routes taken and the conditions surrounding the exit decision. This indirect approach has been undertaken in order to secure a high participation rate of respondents; in fact, in the questionnaire-based approach we measure performance with the same coarse grid used by Gompers (1995), i.e. good, intermediate or bad performance are proxied by fact that the firm went public in an IPO, was acquired or went bankrupt, respectively. The hand-collected data are aggregated by venture capitalists and represent a *VC* firm-based rather than a project-based data cut on the population (i.e., exit decisions are explained by *VC* characteristics rather than project

[3] We use the term "contractual" in a wide sense: besides the conditions and covenants in the explicit *VC* contract, it also refers to the implicit arrangements, like management turnover, staging, investor continuity, and monitoring intensity.

[4] As far as we know, the European Capital Venture Association (EVCA) holds the only comprehensive database on these matters, but it is strictly confidential and only used for aggregate figures published in its annual reports.

characteristics). The *VentureXpert* dataset offers a window to a project-oriented analysis, but it does not contain many of the important variables on the financing relationship collected in the questionnaire, like the use of control features such as hybrid securities and management turnover. The two datasets are thus quite complementary in the characteristics they record and they omit. The *VentureXpert* database allows us to measure the performance of a firm by the Internal Rate of Return (IRR) of the project between the first financing round and the last self-reported valuation of the project. This represents a departure from the existing literature and allows us to quantify the impact of *VC*s' behavior on the profitability of their project. To our knowledge, our study is the first one to use a valuation-based measure of the rate of return and to try to explain it with characteristics of the contractual environment.[5]

The fact that the reported valuation data have not been used previously to define performance proxies is somewhat surprising: they represent potentially an intriguing data source in venture capital funding. These pricing data typically determine the deal pricing in every financing round, i.e. the fraction of equity-linked securities afforded to investors in exchange for their cash injection. Thus, they report a valuation compromise between various stakeholders with conflicting interests, entrepreneurs and *VC*s. In our view, the fact that these valuations directly affect the wealth position and incentives of stakeholders makes them genuinely a harder piece of information than, say, accounting data or a merely hypothetical valuation exercise undertaken by an investment bank.

It should be mentioned that an important characteristic of our datasets is that most of the European firms were financed after September 1998. At this date, stock markets for young technological firms existed in Europe. As a consequence, one of the reasons suggested by Black and Gilson (1998) for the lower development of venture capital in Europe does not hold anymore.

Our main results are the following. As a starting point, our data confirm that there is a significant gap in performance between US venture capital firms and their European

[5] Our approach to determine rates of return from internal valuation is related to Cochrane (2001), but is also significantly different. Cochrane is primarily interested in the "private equity premium puzzle", and therefore computes the return for each financing round while we look at the entire financing horizon. Also, Cochrane uses self-reported valuation data only to compute the stake of the firm acquired by a *VC* (i.e., the ratio amount invested over self-reported valuation), and restricts the final valutions to exits via IPO or acquisition, while our IRR concept is based on self reported valuations both for the begin and the end of the investment.

counterparts, both in terms of type of exit and of rate of return. We find evidence that this gap might be attributable, at least to a degree, to several important differences in the contractual relationship between venture capitalists and entrepreneurial teams, like the frequency and effectiveness of the use of instruments asserting an active role of venture capitalists in the value creation process. To be more precise, we identify three such determinants. First, venture capitalists in the United States are much more assertive in reserving contingent control rights: they use more systematically financial instruments that convey residual control in case of poor performance, namely convertible securities, and they activate contingent control more frequently, as measured by the replacement of entrepreneurs and the termination of projects..

Second, it seems that US VCs have sharper screening skills than their European counterparts. This translates into a larger fraction of the total investment invested in the initial round and a higher degree of translating initial investments and funding frequency into success.

Finally, there is some evidence for a more effective management od financing relationship and participation of different groups of investors in the United States. Interestingly, our results suggest that relationship financing, which is more pronounced for European companies, does not have any significant impact on performance there.

Overall, our results indicate that venture capital firms in Europe are more deal makers and less active monitors; they seem to be still lagging in their capacity to select projects and add value to innovative firms.

Previous literature related to our micro-level study of performance drivers and *VC* characteristics include the work by Gompers and Lerner (1999) and Kaplan and Stromberg (2001). Das et. al. (2001) provide a thorough study of deal characteristics on the US *VC* industry based on *VentureXpert* data. Our findings are consistent with a number of recent studies reporting wide differences in *VC* contracting between the US and other regions of the world. Kaplan, Martel and Stromberg (2002) extend their US-based analysis of incomplete contracting features in *VC* contracts to an international sample with a predominant European component, while Lerner and Schoar (2003) look at emerging markets in Eastern Europe and elsewhere and Cumming and Fleming (2003) at East Asia.

There is a small recent empirical literature on venture capital in Europe. Jeng and Wells (2000) is an early study based on aggregate data; Bottazzi and DaRin (2002) present an up-to-date overview of aggregate investment flows and the impact of *VC* financing on IPO

firms. Bascha and Walz (2001) have questionnaire-based evidence for a sample of German venture capitalists. Cumming (2002b) and Schwienbacher (2002a) use questionnaires to evaluate exit decisions, in the case of Schwienbacher in a comparison of US and European venture capital firms.

The rest of the paper is organized as follows. Section 2 presents the tested hypothesis. Sections 3 and 4 study *VC* performance through the questionnaire approach and the valuation approach, respectively. Section 5 concludes.

2 Theoretical Background and Hypotheses

In this Section, we bring together some of the testable hypotheses that guide our empirical investigation, as well as their theoretical backgrounds. An important theme in the theoretical venture capital literature points to the active contribution of venture capitalists to the value creation process, through advising and monitoring (e.g. Casamatta (2002) and Cornelli and Yosha (2002)). This theme is spelled out more specifically in our hypotheses below; notably, we expect the active role of venture capitalists to influence performance in several ways: the extent of syndication, stage financing and use of contingent control rights. Also, we expect venture capitalists' behavior and impact to differ according to their own source of funds (type of VC) as well as the maturity of the industry in which they operate.

2.1 VC Behavior and Performance

Syndication. Leading motives for venture capital syndication mentioned in the literature are (*1*) risk diversification; (*2*) improved screening by securing a second opinion in the due diligence process (Sah and Stiglitz (1986) and Casamatta and Haritchabalet (2003)); (*3*) the commitment of a corporate investor to avoid hold-up problems, to secure a distribution channel or a potentially important customer pool, see e.g. Hellmann (2001) and Riyanto and Schwienbacher (2002); (*4*) certification and reputation gains when syndicating with more experienced venture capitalists (Barry et al. (1990)); and (*5*) sharing of information and pooling of contacts in the exit phase.[6] Reasons *(2)* to *(5)* imply that syndication should have a positive impact on performance. Therefore, we test the following hypothesis:

[6] Other rationales for venture capital syndication are provided by Admati and Pfleiderer (1994) and Lakonishok, Shleifer and Vishny (1991).

HYPOTHESIS 1 (SYNDICATION): Performance is positively correlated with the extent of syndication.

Use of contingent control instruments. The theoretical literature has emphasized contingent control rights as an eminent tool in contractual environments characterized by a high degree of contractual incompleteness (Aghion and Bolton (1992), Dewatripont and Tirole (1994)). In the context of venture capital, Casamatta (2002) and Cornelli and Yosha (2002) have shown that convertible debt represents an appropriate tool to reduce moral hazard problems between financiers and entrepreneurs, and that the VCs' decision to replace the founding entrepreneur may be efficient (Hellmann (1998)). Furthermore, in case of bad prospects, it allows VCs to take control over the venture by converting their securities into equity and so to force liquidation more easily. This implies that:

HYPOTHESIS 2 (CONTINGENT CONTROL RIGHTS): Performance is positively correlated with the use of convertible securities and the frequency of replacement of the entrepreneur. It further allows to reduce downside risk by forcing bankruptcy more quickly.

Stage financing. Consistent with e.g. Bergemann and Hege (2002), a higher frequency of financing rounds should translate into a more effective use of the abandonment decision, and hence to a higher value.[7]

HYPOTHESIS 3 (STAGING): A more frequent and systematic use of staging instruments and related measures that assert real option component should mean smaller agency costs, hence higher performance.

Relationship financing. By appealing to a prominent line of thought in the financial intermediation literature (e.g. Rajan (1992)), we observe:

HYPOTHESIS 4 (RELATIONSHIP FINANCING): More continuity of venture capitalists (over the entire project lifetime) means a closer relationship that reduces asymmetric information hurdles to financing. This, on average, should increase observed returns.

Relationship financing, however, may not be the only explanation how observed continuity or discontinuity among venture capitalists correlates with performance. A possible alternative is how observed continuity or discontinuity among venture capitalists may be correlated with performance. Namely, venture capitalists may be specialized to accompany either initial stages or stages close to exit; specialization then clearly may be a source of value creation, as VCs presumably are more expert in the stage-specific skills of their con-

[7] Throughout, we use the term stage fiancing and financing stages to denote the number of financing rounds.

tribution. VC specialization is presumably linked to the development of the VC industry in an economy.

Composition of Syndicate. Venture capitalists differ whether they are affiliated with a specific corporation or financial group. Affiliated VCs are typically backed by a single (or very few) fund providers while independent VCs seek funds from a larger number of fund providers. For instance, a large corporation or a bank may start its own venture capital fund. Ventures syndicated by different types of venture capitalists may benefit from complementarity in expertise (e.g. a corporate VC may avoid hold-ups from corporate buyers or provide the venture with a better access to a channel of distribution, etc.). Therefore, we may think that syndication with a corporate VC at a later stage may enhance the venture's profitability since it has the commitment of a larger corporation.

Hypothesis 5A (Corporate Investors):Venture-backed companies may benefit from the presence of corporate investors besides independent venture capitalists. This increases the value of the company.

On the other hand, when the venture is financed only by independent venture capitalists, the objective of the VCs is most likely driven by pure profit maximization of the venture. But when also other types of VCs are involved, the objective function may vary; if a corporate VC is involved, the latter may also take into account the impact of the investment on the corporate group that backs him, while a public VC may have as objective function to maximize social value instead of the value of the venture only. In other words, independent VCs only maximize expected profits while other types of VCs also take into account of further externalities on their fund providers. This may not be in the best interest of the venture. We summarize this in the next Hypothesis.

Hypothesis 5B (Homogeneity of Objectives): The presence of only independent VCs guarantees that the objective of the investment is to maximize the venture's profits only. This should yield a higher value of the investment.

In the following, we present two complementary approaches of explaining venutre capital success with explanatory variables caputring these hypotheses. An important implicit hypothesis of our comparative study is that venture-backed companies on both sides of the Atlatic are drawn from a comparable pool of companies. Thus, if we find measurable performance differences, we attribute them solely to the impact of different modes of venture financing, and not to unobserved differences in underlying population, which could arise if for example European firms systematically underperformed their US peers. While we are

not aware of systematic evidence contradicting our hypothesis of population equality, this is clearly a limitation of our approach that we acknowledge.

2.2 Maturity of the VC Industry

Value creation. In a more developed *VC* market such as the US market, we expect *VC*s to be more experienced on average. Better screening, better network effects secure a tangible feeling of a higher project security and more project success; e.g., by channeling the staff to projects, in accordance to Hellmann and Puri (2001), or through network effects as mentioned in Black and Gilson (1998). However, when venture capital is thought of facing a fixed supply of valid entrepreneurial ideas, conceivably, a opposite hypothesis could be derived. More development of a venture capital market means more "money chasing deals" (Gompers and Lerner (1999a)), i.e. more competition and less rents for venture capitalists.[8] Therefore, we suggest two alternative hypotheses:

Hypothesis 6A (Development and Network Externalities): In a more mature *VC* market, we should observe a higher average level of return.

Hypothesis 6B (Competition): In a more mature *VC* market, there is more competition for a given pool of demand for funding and, therefore, rates of return are lower.

Use of contingent control instruments. As shown by Aghion and Tirole (1997), an efficient exercise of such control rights requires competence and knowledge. Consistent with this, earlier empirical findings[9] show that European *VC*s use less often convertible securities. More generally, we expect them to be less assertive about contingent control rights than their US peers, and to be less interventionist in management decisions and management recruitment:

Hypothesis 7 (Contingent Control Rights): In a more developed *VC* market, we should observe a more wide-spread use of securities and contract instruments that allocate contingent control rights to venture capitalists. Venture capitalists in a mature *VC* markets will more effectively and systematically assert control rights in case of conflicts of interest.

Exit options. In a developed *VC* market, venture capitalists have a richer set of exit

[8] This is also in line with the insights proposed by Inderst and Mueller (2002); they show that the effect of competition among VCs on value creation may exhibit an inverse U-shaped relationship as the contribution of VCs may decrease when competition becomes too fierce.

[9] See Kaplan, Stromberg and Martel (2002), Bascha and Walz (2001) and Schwienbacher (2002a).

options at their disposal, and the markets at the exit end of venture-backed projects are more liquid. The hypothesis that a lack of exit options, in particular for primary equity markets, is an essential impediment to venture capital development (Black and Gilson (1998)), implies:

HYPOTHESIS 8 (EXIT): In a more developed market for venture funds, we expect to see a more widespread use of IPOs, faster exits, and a faster conclusion of the exit phase.

Syndication and specialization. Another aspect of syndication is that in a developed *VC* market, reputation effects among *VC*s are a more powerful organization device and the market is more "complete", hence deal syndication is easier to organize.

HYPOTHESIS 9 (SYNDICATION): Syndicates tend to be larger and investors tend to be more specialized in a mature VC industry.

These hypotheses guide our two approaches in the empirical investigation.

3 Venture Capital Firms and Contracting: A Questionnaire Approach

3.1 Methodology and Data Collection

Questionnaires have been sent to venture capitalists in six different European countries (Belgium, France, Germany, the Netherlands, Sweden and the United Kingdom) during the months of June and July 2001. The sample of venture capitalists is composed of the European Venture Capital Association's (EVCA) and the national venture capitalists' member lists for the above mentioned countries. In total, about 600 venture capitalists have been contacted. The same questionnaire has been sent to about 600 venture capitalists in the US during the months of October and November 2001. The selection was done from the National Venture Capital Association's (NVCA) member list and the *Pratt's Guide to Venture Capital Sources* (Edition 2001).

In sum, in Europe 104 filled out questionnaires have been received (some only partially), and 67 in the US, which makes a total of 171 observations. European respondents are composed of 19 venture capitalists from Belgium and the Netherlands, 29 from Germany, 13 from France, 20 from Sweden and 23 from the UK. Figure 1 presents the number of respondents for each side of the Atlantic, disaggregated by year in which venture capitalists were established (or year of first fund). When established before 1970, they were added up

and considered in Figure 1 in the year 1970. It shows that many of the respondents are still "young"; i.e., they entered the venture capital market during the period of massive capital inflows (1997-2000).

A complete list of the questions included in the questionnaire is provided in Appendix C. Trivially, the money amounts were changed from EUR to USD; and in Questions 4 and 24, we used the geographical entity "State" instead of "Country" (while these entities are not perfectly identical, this is the best that can be done).

3.2 Definition of Variables

For what follows throughout the paper, we define the following variables for which we asked venture capitalists to report (aggregated) data for their investments or on themselves: AGE represents the age of the venture capital firm in the year 2001 (or time elapsed since the VC raised his first fund); AFFILIATION is a dummy variable equal to 1 if the venture capitalist has an affiliation to a financial or non-financial corporation (otherwise it is equal to zero); REGIONAL is a dummy variable equal to 1 if *VC* only invests in his own country (or in own State for the US respondents) and proximity (0 otherwise); COMPANIES represents the number of companies currently in the venture capitalist's portfolio; and SIZE is the average size of investments done (in million EUR (for European respondents) or in million USD (for the US respondents)). Respondents also reported their current portfolio composition in percentage of ventures (not amount invested). Three broad classes of stages (as used by EVCA) were considered: EARLY_STAGE (for seed and start-up stages), LATER_STAGE (for development and expansion stages as well as for replacement and refinancing stages) and BUYOUT (for the buyout stage).

Regarding the venture capitalist's track records in terms of exit, respondents were asked to provide information about the types and number of exits they had already done. For the already achieved exits, venture capitalists provided further aggregate information about timing of exit. DURATION represents the average investment duration in years (from entry to full exit); DUR_EXIT gives the average duration of exit stage in months (starting when *VC* really begins preparing his exit); and DUR_LIQU is the average duration of liquidation processes in months (only for investments done on own continent). Finally, the variable SYNDICATION represents the percentage of past deals that have been syndicated with at least one other venture capitalist, while SYNDIC_SIZE gives the average size of syndicates.

We also asked five pieces of information that proxy the venture capitalist's involvement

in the ventures: the variable BOARD represents the percentage of ventures in which *VC* has been present on the board of directors; REPORTS gives the average number of reports requested from ventures per year; ROUNDS is the average number of investment rounds until exit (for already achieved exits); CONVERTIBLES gives the percentage of ventures in which convertible securities were used; and the variable REPLACE provides the percentage of companies in which the former entrepreneur was replaced before the exit of *VC*.

3.3 Preliminary Descriptive Statistics

Table 1 summarizes the characteristics of the average venture capital firm in Europe and the US. Means and medians are based on all the available information. Since we occasionally observe some extreme values, we also report the median. The latter is more reliable for the variables AGE, COMPANIES, SIZE and REPORTS. The last column tests the difference in mean between Europe and the US and provides the corresponding p-value of the parametric test.

Table 1 shows that average investment duration (DURATION) is well below the typical fund duration of 10 years, which indicates that *VC*s are most likely not time constrained (except possibly for the projects funded few years prior to the expiration of the fund or *VC*s wish to use the gains for investments in other ventures). Investment duration is significantly lower in the US than in Europe, possibly due to some slight over-representation of younger *VC*s in the US sample.[10] A monthly reporting of financial activities by the investee seems to be a general rule; in both cases, the mode of REPORTS is 12. An interesting difference between both continents is the importance of affiliations (the variable AFFILIATION). In Europe, venture capitalists are significantly more often affiliated either to a financial or non-financial corporation (in 26% of the cases in the sample as compared to 15% in the US).

There are numerous similarities in VC behavior between the US and Europe. Perhaps surprisingly, there is no marked difference in the self-professed intensity of monitoring (REPORTS). But there are also many important differences, in particular with respect to the duration of exit stage, the use of convertible securities, the replacement of former management, the average number of financing rounds and syndication. Perhaps the most

[10] One reason why the average age is greater for Europe is due to the presence of some well-established buyout firms in the European sample. When taking them out, the difference in age vanishes. Notice however that the difference in AGE in Table 1 is not significant by a wide margin (p-value is 0.50).

striking difference between both sides of the Atlantic is with respect to the use of convertible securities (CONVERTIBLES); these are three times more often used in the US. The results also provide clear evidence that syndication (SYNDICATION) is more often used in the US, but also that the average size of syndicates is larger than in Europe. This is again in line with the idea that markets are less liquid and less developed in Europe.

Much of these differences can be brought to a common denominator, namely that European venture capitalists face less liquid markets. This is true for human resources that go into the ventures as well as for the exit markets. This forces European venture capitalists to shop around for longer periods when trying to sell their shares and it makes replacement of key employees more difficult. This is also reflected in the last two variables in Table 1 that represent different average exit durations (as well as differences in DURATION), which is related to the liquidity of exit markets. Similarly, liquidations seem to take longer in Europe, making write-offs more costly (DUR_LIQU).

3.4 Regression Analysis

Using the data collected with the questionnaires, we aim at testing some of the hypotheses stated earlier. In particular, we wish to test the Hypotheses 1 (syndication and performance), 2 (contingent control rights and performance), 3 (staging), 6A (development and network externatilies) vs. 6B (competition), 7 (contingent control rights and maturity), 8 (exit) and 9 (syndication and maturity).

We proxy the monitoring intensity of the venture capitalist through stage financing with the variable AVGDURATION, which is the ratio between DURATION and ROUNDS. In words, it represents the average time interval between each round of financing. According to hypothesis 3, whenever its value is low, monitoring is more intense, and we should expect a better performance, so we predict a negative sign on this variable. The second explanatory variable is SYNDICATION to examine Hypotheses 1 and 9. The variables REPLACEMENT and CONVERTIBLES take into account other aspects of *VC* involvement and concern Hypothesis 2. The variable EUROPE is a dummy variable equal to one if the venture capitalist is from Europe, otherwise 0. It captures the difference in industry maturity. We also add some multiplicative terms like SYNDICATION*EUROPE to examine the impact of industry maturity for individual monitoring aspects (in this case Hypothesis 9).

The first dependent variable for proxying performance through successful exit is denoted

by SUCCESS; this variable gives the proportion of exits that were done either through an IPO or through a trade sale, in other words the proportion of exits that were successful. In accordance with the literature (see, e.g., Black and Gilson (1998), Schwienbacher (2002b) and Cumming and MacIntosh (2000)), it is reasonable to assume that IPO is a stronger signal of success than a trade sale. We further capture this in a slightly modified dependent variable, SUCCESS2, in which we give twice as much weight to an IPO as a trade sale.[11] Since the dependent variable SUCCESS is only defined between 0 and 1, we use the Tobit regression technique to take into account of the truncated distribution. For robustness purposes, we also present results of an ordinary-least square regression. In the case of SUCCESS2, we only use the OLS technique.

The results for SUCCESS and SUCCESS2 are shown in Table 2. The estimations of all the three regressions show several similarities and reveal some interesting results. First, the coefficients of the variable AVGDURATION are all negative (but not significant for the Tobit regression), meaning that a greater monitoring intensity through shorter time intervals between financing rounds (thus, a lower value of AVGDURATION) increases the likelihood of a successful investment. This result is consistent with Hypothesis 3 on the impact of stage financing by the venture capitalist.

Second, replacement of management and the use of convertibles have no significant effect on exit performance. We do therefore find no support for Hypothesis 2.

Third, the impact of SYNDICATION is surprising, since it has opposite effects for Europe and the US. More syndication has a negative impact for US venture capitalists but a positive one for European *VC*s (cf. the correction SYNDICATION*EUROPE). In the first two regressions, it is statistically significant. This certainly deserves further investigations and the data used in the next Section will allow to provide further insights. Notice although that when SUCCESS2 is used as the dependent variable, the Positive impact of syndication persists for Europe but the negative impact for the United States is not significant anymore.

Fourth, the coefficient of the dummy variable EUROPE is negative in the first two regressions. This provides some support for Hypothesis 6A.

Last, note that the likelihood of a successful exit is lower the more the venture capitalist invests in early-stage projects, which stylizes the fact that early-stage projects are riskier as

[11] SUCCESS2 is defined as equal to 2 × "number of IPOs done" + "number of trade sales done", all divided by "total number of exits done".

much of the technological risk still needs to be resolved. This result is strongly supported in all the three regressions.

Table 3 uses DUR_LIQU as dependent variable; this proxies the cost of exiting from unsuccessful portfolio companies. The longer lasts the liquidation process, the more the venture continues to burn money before it ceases operations and thus the lower the liquidation value of the venture. In these regressions we test hypothesis 8 and examine the determinants that potentially lowers these costs. We show one regression without and one with the multiplicative terms used in the previous table.

First, we find that the dummy variable EUROPE does not any significant impact on liquidation costs. Hence, we do not find any support for Hypothesis 8. Second, We find support for Hypothesis 2: the use of convertibles reduces significantly liquidation costs. Convertibles allows its holder (here the venture capitalists) to force a quicker liquidation by taking control over the company. However, there seems to be a significant difference also in the impact of convertible securities between Europe and the US; it seems to have a negative impact on costs only in the US. A possible interpretation for this difference is that the efficient use of contingent securities requires skills which take time to acquire. Last, we observe that liquidation costs are reduced through less stage financing (higher average duration of rounds), this result is the opposite of that suggested by Hypothesis 3.

4 Determinants of Project Returns: A Reported Valuation Approach

4.1 Dataset and Methodology

Our dataset is constructed from the *VentureXpert* database provided by VentureEconomics, a division of Thomson Financial. For Europe, we extracted from this database all portfolio companies for the EU-15 countries, provided that *VentureXpert* has at least one valuation observation for a portfolio company, i.e. the estimated total value of the company firm at one or more financing stages. Firm valuations are the self-reported values on which the contracts and share allocations at the beginning of each new financing round are based. Since the goal of the paper is to study early stage financing, we limited the search to the venture capital sample (i.e. excluding private equity deals). We get a sample of 394 firms. Among them are 188 from the United Kingdom, 65 from France, 51 from Germany, 25

from Ireland, 16 from Italy, 12 from Sweden, 11 from the Netherlands, 11 from Belgium, 7 from Spain, 5 from Denmark and 3 from Austria. We further excluded, to correct for firms possibly misclassified in the venture capital sample, and firms for which there was not a single round that was defined as "seed" or "early stage" in the database have been removed from the sample, leaving us with 274 observations.

For the United States, we extracted a random sample of comparable size: we randomly selected 234 companies (out of a total of close to 6000 for which at least one valuation entry was recorded, as of June 2003) under the conditions that at least two self-reported valuations are reported, of which one in the initial round, the first financing round took place in or after January 1997, and also that there is a financing round defined as "seed" or "early stage" funding.

We develop two measures of the return of each company. Initially we take the first and the last observed valuation entry of the project and calculate the internal rate of return (IRR) of the project, by taking into account all intermediate investments.[12] We follow the standard procedure and take logs of the IRR; the empirical frequency distribution of the resulting random variable $LogIRR$ exhibits an approximately normal distribution.[13]

The problem with the $LogIRR$ measure is that it calculates each projects' return in an isolated way, without adjusting for realized market returns and systematic risk. However, the self-reported valuation data presumably follow closely contemporaneous stock market valuations. An internal rate of return of +50% means something else if over the same period stocks with comparable systematic risk have returned +80% or -30%. To adjust for the dependence on the realized market return, we develop as our second return measure the excess return of the project compared with the reference market. We calculate the excess return as the difference between the IRR and the NASDAQ return over the same period and take again logs to obtain the log excess return ($LogEXC$) as our principal dependent variable.[14]

[12] The IRR is calculated as the rate r such that $\frac{V_T}{(1+r)^T} - \sum_t \frac{I_t}{(1+r)^t} - V_0 = 0$, where V_T is the final valuation, V_0 the initial valuation, and I_t the investment amount in period $0 < t \leq T$.

[13] Using logs is generally appropriate since raw returns are distributed asymetrically over the interval (-100%, ∞). In the case of venture capital returns, this adjustment is indispensable since outliers with extreme IRRs close to -100% or above +500% occur.

[14] Implicitly, this procedure assumes that the systematic risk of all observed projects is identical, and that from the point of view of an international investor it is the same for venture capital investments in the US and in Europe. Given the strong correlation between high-tech equity markets in the period over which our sample is mainly drawn (1997-2001), this simplifying procedure may appear as empirically justified.

For many European firms, we only have one valuation observation. For firms for which we had only a single valuation observation but at a round after the first stage, an estimated value $\hat{V}_1$ for the first stage valuation has been constructed as follows. For all the companies for which a valuation at stage 1 was available, we calculated a multiple $Q_i = V_{1i}/I_{1i}$; Q_i expresses the initial company value for company i as a multiple of the initial investment. We then defined seven industries $j = 1, \ldots, 7$,[15] and determined the average Q_j ratio of all the companies belonging to this particular industry. V_1/I_1 has been computed. Then, the missing observation of first-stage valuation $\hat{V}_{1i'}$ for a firm i' located in industry j has been estimated by $Q_j I_{1i'}$.

For companies for which we had only a single valuation observation and where this valuation concerned the first financing stage, an IRR could not be calculated. These companies were dropped from the sample, as were companies with a first investment round earlier than January 1997, to make sure that the time profiles of the European and US samples are comparable. We finally were left with a sample of 147 European companies, 72 of them being from the United Kingdom and 75 from Continental Europe or Ireland.

4.2 Description of Variables

We extracted following information about (portfolio) companies and financing rounds from the *VentureXpert* database: the activity of the firm, its age at the moment of the first financing stage (AGE), and for each financing stage, the date at which it took place, the name of the investors, their type (public, corporate or financial) and the amount they have invested. As explained above, for some stages we also have the post-money valuation of the firm. From this information, we construct several types of variables:

Total Financing. Two characteristics are used: the total amount of investment (TOTALAMOUNT) and the total number of investing *VC*s (TOTALINVESTORS).

Frequency and Periodicity of Financing Stages. We measure frequency and periodicity in two ways. First, we consider the total duration between the first and the last stage (TOTALDURATION) and the number of stages (TOTALSTAGES). Second, we measure the frequency of financing rounds by the average duration between stages (AVGDURATION)

[15] The seven industries are aggregated by following VentureEconomics' industry classification (VEIC) system. Our seven industries are (1) internet (2) communication and media (3) computer software (4) computer hardware and semiconductors (5) manufacturing and other services (6) medical and health care and (7) biotechnology.

which is the ratio TOTALDURATION/TOTALSTAGES.

Investor Continuity (over recorded lifetime). We measure this continuity in two ways. First, we define the dummy variable FUNDSINALLD which is equal to one if one *VC* was involved in all financing stages and 0 otherwise. Second, we define a measure of the average continuity of investors from one stage to the next, the variable AVGCONTI. The variable AVGCONTI measures the average percentage of continuing investors across stages and is constructed as follows. For each stage n, we compute the fraction of *VC*s participating in stage n who participated already in previous stages. This number is then divided by n times the number of *VC*s participating in stage n. We obtain CONTI(n). Then, AVGCONTI is defined as $(\sum_{n=1}^{\text{TOTALSTAGES}} \text{CONTI(n)})/\text{TOTALSTAGES}$.

Early Investor Continuity. We measure to which extent funds involved in stage 2 were also involved in stage 1. Two variables used are: EARLYCONT and EARLYCONTPROP. The first one is a dummy equal to one if a *VC* investing in round 2 had invested in round one, and 0 otherwise; and the second variable represents the fraction of *VC*s investing in Stage 2 who had also invested in stage 1.

Initial Stage Characteristics. Three characteristics are used: the amount invested in the first stage AMOUNT1, the ratio AMOUNT1 over the discounted total investment (INV1TOTAL) and the number of investing funds in the first stage, NBFUNDS1.

Others. First, we differentiate European firms from US firms. Therefore, we define the dummy EUDUMMY which is equal to 1 if the firm is European and 0 otherwise. Second, we differentiate firms by their industry. We define the dummy TMT which is equal to 1 if the activity of the firm is either internet specific or Communication and Media, and 0 otherwise. Last, we want to take into account market conditions, and more precisely the so-called "internet bubble" on valuations and returns. To do so, we define two dummy variables: BUBBLE START and BUBBLE END. The first one is equal to 1 if the first stage took place between September 1998 and March 2000 and 0 otherwise, and the second dummy is equal to 1 if the final valuation took place between September 1998 and March 2000 and 0 otherwise.

4.3 Summary Statistics

Summary statistics of the explanatory variables used in this study are presented in Table 4. Tests of differences in means between Europe and the United States are presented in Table 5.

We observe that the total number of investors, the total amount invested, and the ratio amount invested in the first round over total discounted investment is significantly larger in the United States at the 0.1% level. The first result suggests that syndication is more important in the United States than in Europe confirming the results of Section 3. Results about investment show that US projects are of a larger scale and that the timing of investment is different in Europe and in the United States.

European venture capitalists exhibit a significantly larger continuity than US ones: when measured by at least one investor being present in all stages (FUNDINALLD), the continuity is significantly larger in Europe at the 0.1% level; when measure by the average continuity (AVGCONTI), the continuity is also significantly larger in Europe at the 1% level. These results suggest that US VCs are more specialized than European ones, consistent with our Hypothesis 9.

Finally, we also find the presence of at least one corporate (and public) investors in the syndicate is significantly more frequent (at the 0.1% level) in the United States.[16]

Summary statistics for the performance measures are given in Table 6. We observe that performances are strongly better in the United States than in Europe. This difference is highly significant (at the 0.1% level), both for the unadjusted returns as for the returns in excess of the Nasdaq return, when returns are measured in logs.[17]

It could be argued that our results are sample biased since the number of US firms having their final valuation before March 2000 is significantly larger (at the 0.1% level) in the United States. This seems not to be the case, however, as the results are unchanged if we consider only firms that had their last valuation after March 2000 (168 observations in the United States and 130 observations in Europe).

The large number of UK firms present in the European sample is a cause of concern: are the results driven by a single country? We calculated and tested returns separately for the UK and for Europe: returns (both LogIRR and LogEXC) are lower in the UK, but not significantly so.

[16] Public investors are not reported separately since there are only 4 European and 3 US public investors in the sample.

[17] The reason why the t-test is less significant for the non-log rates of returns is the extremely high cross-sectional variance of realized IRRs in venture financing.

4.4 Regression Analysis of Realized Returns

Finally, we perform standard OLS regressions in order to find out which characteristics influence the performance of a firm. We have split the regressions in two sets: the first two regressions consider contract variables that should play a role during the entire life cycle of the venture project, whereas the last three regressions look at variables that specifically capture the conditions in the first financing stage. We perform the same regression for the entire sample (Table 7), and then separately for the EU (Table 8) and the US (Table 9). The dependent variable is always LogEXC, the logarithm of the excess return over the NASDAQ.

OLS regressions for the combined sample as dependent variable are presented in Table 7. The EUDUMMY variable comes out significant at the 0.1% level in all regressions. This result confirms the results of the $t-$test analysis of returns in Table 6, and supports Hypothesis 6A on the importance of a developed VC market and the benefits of network externalities. To make sure that our results are not driven by outliers, we report the estimation results for the winsorized sample where 1% of the upper and lower tail of observations in the dependent variable are excluded. The results are virtually idential for the sample winsorizing, so outliers seem not to be a major concern.

The dummy variable for corporate investors (which also includes a handful of public investment vehicles) is significantly positive either at the 1% or at the 0.1% level. This provides support of Hypothesis 5A that heterogeneity of VC types increases value, and against Hypothesis 5B that only independent VCs are value oriented.

Concerning the final three regressions where we consider the initial conditions, we observe that AMOUNT1 is significantly negative at the 5% level in regressions (3) and (4) and at the 10% level in regression (5). It is worth noting that TOTALINVESTMENTS is never significant; this finding seems to capture something more than just a mechanical negative impact of an increase in investment on the internal rate of return. More interesting, therefore, is the significant positive impact (at the 0.1% level) of INV1TOTAL. This suggests that good projects received a larger fraction of their financing in the initial round with respect to other projects and that the capacity to identify and promote good projects early on is decisive for performance. This result also provides an additional explicative factor for the better performance of UC VCs. In Table 5, we had the result that INV1TOTAL is significantly larger in the United States than in Europe at the 0.1% level.

These results are consistent with the interpretation that US VCs have better screening

skills (due to greater experience and transparency) than their European counterparts. If US VCs are better at sorting out good projects from bad ones, then they can be more discriminatory in their funding and abandonment decisions. It follows that they will provide good projects with generous initial funding and relatively less financing is necessary in later stages. Also, US venture capitalists can lead good project to a relatively rapid success. Conversely, European VCs face more uncertainty about the quality of the project in the initial round. As a consequence, they postpone a larger fraction of their investment, and the total duration of good projects should be longer.

Consistent with the screening interpretation, we find the most striking contrast between the two samples with respect to the TOTALDURATION variable. The total length of a project is strongly negatively linked to performance in the US, but almost as strongly positive in Europe. If venture capitalists have a higher screening capacity, the most deserving projects get more attention and can be developed more rapidly than other projects. On the other hand, if the screening capacity is low, then venture capitalists learn about the quality of the projects over time, and stay longer involved with good projects, as seems to happen in Europe. This result is virtually unchanged if we replace TOTALDURATION with AVGDURATION, the average length per stage (results not reported). This hints that there is also an effort interpretation to this finding: a higher frequency should be good for performance (as it is in the US) if it means that a higher involvement of venture capitalists is truly value creating. It should be negatively correlated to performance (as in Europe) if a more frequent involvement of *VCs* is a sign that the projects has problems, while *VCs* remain distant, with long financing intervals, as long as all is going well.

The difference in the meaning of *VC* involvement on both sides of the Atlantic could also explain the following finding: while we find that "relationship financing" (measured by early continuity, average continuity, and the presence of at least one VC in all rounds) is significantly more important in Europe than in the United States, it seems to have no significant positive or negative impact on performance on either side.

We also observe that the TOTALSTAGES is significantly negative at the 10%. Although, it is weak, this result is at odds with standard manager-shareholder agency theory that predicts that stage financing and monitoring are value increasing.

To conclude the comparison between the separate regressions of the Europe and the United States sample (Tables 8 and 9), we observe that there are three main differences between the two continents. First, in Europe, the presence of a Public or Corporate investor

has a significant positive impact (at the 0.1% level) while it has no impact in the United States. Second, DURATION1 is significantly negative at the 0.1% level in the United States while it is not significant in Europe. This suggests that in the United States, early monitoring increases performances. Third, TOTALDURATION is significantly positive for Europe (at the 1% level in regressions (1) to (4) and at the 5% level in regression (5)) while it is significantly negative for the US (at the 0.1% level in regressions (1), (2) and (5) and at the 1% level in regressions (3) and (4)). These findings appear to be consistent with an advantage of the US venture capital investor both in the dimension of project screening as in the dimension of value enhancement of projects that have been accepted.

5 Conclusion

This paper has presented a study of the determinants of performance in the European *VC* industry and a rigorous comparative study with US *VC* industry. Performance is measured in two different ways: the type of exit and the internal rate of return of the financed project. This second way of measuring performance represents a departure from the existing literature since it takes into account all financing rounds and uses self-reported valuation data.

We show that the US *VC*s perform better than European ones under both measures. Several differences in behavior may explain this difference in performances. First, the use of convertibles and replacement of the entrepreneur is more frequent in the United States. This reduces the importance of the manager-shareholder agency problem, hence increases performance.

We also find that syndication is more important in the United States than in Europe. However, its impact on performance is only significantly positive for European VCs when performance is measured by a successful exit.

When performance is measured by the IRR, the ratio initial investment over total discounted investment is larger in the United States than in Europe and has a strongly significant impact on their performance. A possible interpretation of this result is that US VCs have better screening skills (due to their greater experience) than European ones. It follows that US VCs are better at sorting out good projects from bad ones. Once good projects have been identified, VCs are willing to finance intensively these projects in the initial stage and relatively less financing is necessary in later stages.

Until very recently, most of the past research on venture capital has focused on the United States, and if only for the reason that this industry was hitherto underdeveloped in other parts of the world. The bull market for high-tech firms in the late 1990s has changed this exclusivity, making comparative studies like the present one possible. Overall, our findings suggest one of two things: Either US venture capitalists are more sophisticated than their European counterparts (in the sense that their behavior is more aligned with theoretical predictions) and this difference in sophistication explains differences in performance. Or the importance of network effects: a successful venture capital industry is in fact a delicate environment, based on a web of institutions, experience and sufficiently transparent and deep markets and networks for human resources and knowledge, which could explain why the rapid emulation of the US role model was not rewarded with an instant success elsewhere. Future research will tell whether the long run prospects of European venture capital will be more promising.

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Appendix A: Questionnaire-Based Approach

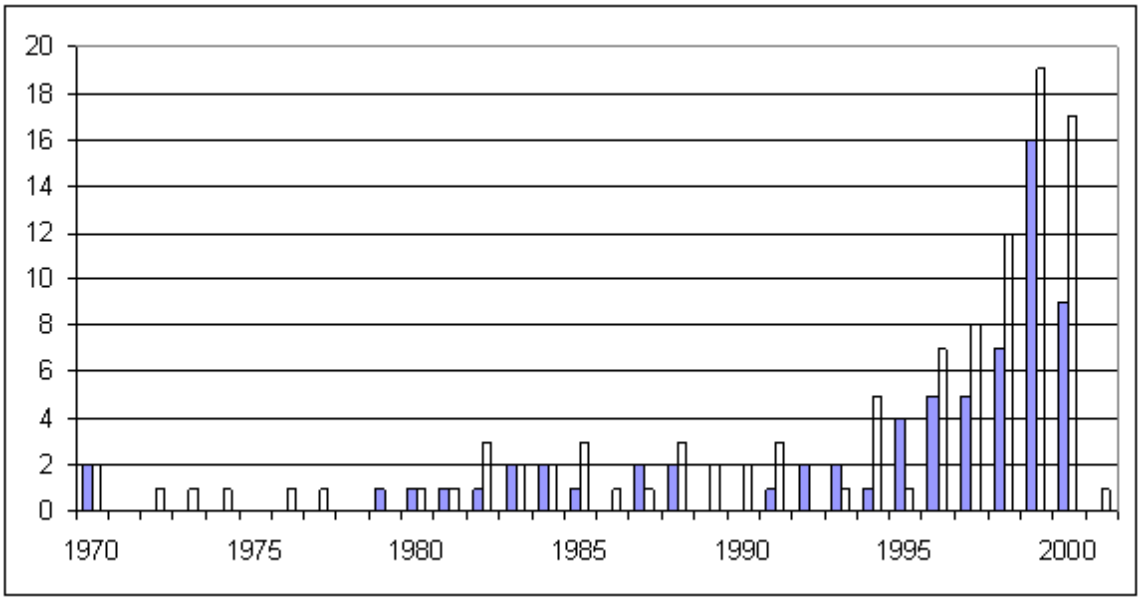

Figure 1: Number of Respondents Aggregated by Year Established (or Year of First Fund). The white bars refer to European respondents, the gray bars to the US respondents. In total, 171 positive answers were received, where 104 from Europe and 67 from the US. All the respondents that were established before 1970, have been added up and considered in this figure in the year 1970.

Variable	Europe		United States		Difference
	mean	median	mean	median	p-value
AGE (in 2001)	7.6 years	4 years	7.1 years	4 years	0.50
AFFILIATION	26 %	—	15 %	—	0.03
DURATION	3.7 years	3.5 years	3.0 years	3 years	0.02
ROUNDS	2.3 rounds	2 rounds	2.4 rounds	2 rounds	0.43
COMPANIES	39 ventures	14 ventures	24 ventures	15 ventures	0.10
SIZE	7.0 mio EUR	2.0 mio EUR	4.4 mio USD	3.0 mio USD	0.08
REPORTS	9.5 per year	12 per year	9.3 per year	12 per year	0.43
CONVERTIBLES	20 %	10 %	59 %	68 %	0.00
BOARD	69 %	94 %	66 %	80 %	0.35
REPLACE	22 %	10 %	34 %	33 %	0.02
REGIONAL	53 %	—	43 %	—	0.11
SYNDICATION	54 %	60 %	80 %	95 %	0.00
SYNDIC_SIZE	2.7	3	4.5	4	0.00
EARLY_STAGE	38 %	30 %	50 %	55 %	0.01
LATER_STAGE	45 %	46 %	45 %	40 %	0.44
BUYOUT	17 %	0 %	5 %	0 %	0.00
DUR_EXIT	8.5 months	6 months	7.4 months	6 months	0.10
DUR_LIQU	7.3 months	6 months	5.3 months	4.5 months	0.03

Table 1: Comparison of Average Characteristics of Venture Capitalists in Europe and the US. All variables are defined in Section 3.2. The mean refers to the unweighted arithmetic mean of responses, based on all available information. Since we sometimes observe extreme values, the median is also reported. The last column tests the difference in mean between Europe and the US. For the difference in mean of the variable SIZE, we corrected the European mean by using 1 EUR = 0.9 USD as exchange rate.

Explanatory Variables	SUCCESS (Tobit)	SUCCESS (OLS)	SUCCESS2 (OLS)
CONSTANT	0.945 ***	0.900 ***	1.230 ***
EUROPE	–0.338 **	–0.279 **	–0.253
SYNDICATION	–0.003 **	–0.002 **	–0.003
SYNDICATION*EUROPE	0.007 ***	0.006 ***	0.007 ***
AVGDURATION	–0.054	–0.060 **	–0.114 ***
EARLY_STAGE	–0.002 ***	–0.002 ***	–0.004 ***
DURATION	0.026	0.031 *	0.069 **
REPLACEMENT	0.002	0.001	0.003
REPLACEMENT*EUROPE	0.001	0.001	–0.00002
CONVERTIBLES	–0.0002	–0.0002	0.001
CONVERTIBLES*EUROPE	–0.001	–0.001	–0.003
REPORTS	–0.003	–0.004	–0.012 ***
R^2 (Adjusted R^2)	—	0.38 (0.28)	0.40 (0.30)
P-value of F-Statistic	—	0.000	0.000
Number of Observations	82	82	82

Table 2: Effects of Syndication, Staging Frequency and Control Rights on Investment Success. The dependent variable for the first two regressions is denoted by SUCCESS, and gives the proportion of all exits done that occurred either through an IPO or a trade sale. For the third regression, SUCCESS2 gives also the proportion of exits through either IPO or trade sale but by giving twice as much weight to an IPO than a trade sale (i.e., SUCCESS2 := (2 × "number of IPOs done" + "number of trade sales done")/ "total number of exits done"). Since the dependent variable SUCCESS is only defined between 0 and 1, we use the Tobit regression technique to take into account of this truncated distribution (truncated at zero to the left and one to the right). For the OLS regressions, the standard errors and covariances are White heteroskedasticity-consistent. Levels of significance: *=10%, **=5%, ***=1%.

Explanatory Variables	Dependent Variable is DUR_LIQU	
CONSTANT	7.431 **	8.561 ***
EUROPE	–0.902	–3.300
SYNDICATION	–0.012	–0.009
SYNDICATION*EUROPE		–0.003
AVGDURATION	–1.859 ***	–2.221 ***
EARLY_STAGE	–0.004	0.011
DURATION	1.734 ***	1.707 ***
REPLACEMENT	–0.067 ***	–0.068 **
REPLACEMENT*EUROPE		–0.023
CONVERTIBLES	–0.039 *	–0.060 **
CONVERTIBLES*EUROPE		0.116 ***
REPORTS	–0.025	0.046
R^2 (Adjusted R^2)	0.30 (0.19)	0.37 (0.23)
P-value of F-Statistic	0.011	0.009
Number of Observations	63	63

Table 3: Effects of Syndication, Staging Frequency and Control Rights on Liquidation Costs of Failed Ventures. The dependent variable is denoted by DUR_LIQU, and gives the average duration of the liquidation process (in months) for failures. For both OLS regressions, the standard errors and covariances are White heteroskedasticity-consistent. Levels of significance: *=10%, **=5%, ***=1%.

Appendix B: Reported Valuation-Based Approach

	Obs.	Mean	Std.Dev.	Median	Min.	Max.
Age at 1st Stage (years)	319	2.694	8.218	1.071	0	123
Total Duration (years)	381	1.807	1.040	1.666	0.065	5.307
Total Stages	381	3.400	1.425	3	2	11
Average Duration (years)	381	0.538	0.267	0.489	0.033	1.573
Total Number of Investors	381	6.858	4.976	6	1	36
Total Investment Amount ($ Mill.)	381	40.775	51.208	26.159	0.054	391.375
Amount per Investor ($ Mill.)	381	6.096	6.951	3.952	0.054	60
Funds Present in All Stages (dummy)	379	0.430	0.496	0	0	1
Funds Present in All Stages (number)	379	0.654	0.962	0	0	5
Corporate and Public Investors (dummy)	381	0.307	0.462	0	0	1
Average Continuity	381	0.320	0.280	0.257	0	1
Early Continuity (dummy)	381	0.682	0.466	1	0	1
Initial Duration (years)	381	0.826	0.549	0.668	0	3.145
Number Investors First Round	381	2.486	1.721	2	1	18
Initial Amount ($ Mill.)	381	5.768	8.040	3	0	79.569
Initial Amount / Total Amount	381	0.1584	0.1378	0.1196	0	0.8277
Initial Q	232	6.287	26.711	2.838	1	396
Started Prior to Sept. 1998 (dummy)	381	0.0919	0.2892	0	0	1
Initial Value Sept. 1998 - March 2000	381	0.4882	0.5005	0	0	1
Final Value Sept. 1998 - March 2000	381	0.16535	0.3720	0	0	1
Sector Internet & TMT (dummy)	381	0.4829	0.5004	0	0	1

Table 4: Sample Characteristics. This table records sample means and related statistics for the combined sample of US and European venture-backed companies. The table includes all companies in the sample with a first financing round in 1996 or later, if the companies were seed or early stage in at least one round, and had at least one successive valuation recorded. Age at 1st Stage is the difference between the first recorded financing round and the company's founding date. Total Duration is the time elapsed between the first financing round and the last round for which a valuation is recorded. Total Stages is the total number of financing rounds, and Average Duration is Total Duration / Total Stages. Total Investors reports the number of investors participating in at least one financing round. Total Investment Amount is the combined sum of financing in all rounds. Amount per Investor is Total Investment amount / Total Number of Investors. Funds Present in All Stages (Dummy) is equal to one if at least one investor provided funds in all rounds, and zero otherwise. Funds Present in All Stages (Number) is the number of investors that provided funds in all rounds. Average continuity is the average percentage of prevous

investors providing funds in the next stage. Early continuity is a dummy that is equal to one if at least one investor participated in the first and second round. Initial duratin is the duratin of the first stage. Number Investors First Round the number participating in the first round. Initial Q is the ratio of valuation and investment in the first round, provided both numbers are reported. Started prior to 1998 is a dummy equal to one if the first stage commenced prior to September 1998. Final Value 1998 - March 2000 is a dummy equal to one if the last stage with a recorded valuation falls onto these 19 months commonly associated with the internet bubble. Sector TMT is a dummy equal to one if the company falls into internet or telecommunications, media.

	Mean Europe	Mean USA	Difference	P-value
Age at 1st Stage (years)	3.4686	2.2455	1.12231	0.202
Total Duration (years)	1.698	1.875	-0.177	0.106
Total Stages	3.320	3.448	-0.128	0.390
Average Duration (years)	0.519	0.549	-0.031	0.281
Total Number of Investors	5.374	7.790	-2.416****	0.000
Total Investment Amount ($ Mill.)	27.332	49.218	-21.882****	0.000
Amount per Investor ($ Mill.)	5.906	6.204	-0.299	0.683
Funds Present in All Stages (dummy)	0.5205	0.3771	0.1434***	0.006
Funds Present in All Stages (number)	0.6944	0.6313	0.06308	0.535
Corporate and Public Investors (dummy)	0.2054	0.3728	-0.1674****	0.001
Average Continuity	0.3827	0.2782	0.1043****	0.000
Early Continuity (Dummy)	0.7615	0.69036	0.0711*	0.094
Initial Duration (years)	0.8565	0.8075	0.0491	0.396
Number Investors First Round	2.363	2.550	-0.188	0.301
Initial Amount ($ Mill.)	5.539	5.810	-0.270	0.749
Initial Amount / Total Amount	0.117	0.183	-0.066****	0.000
Initial Q	5.335	6.419	-1.084	0.844
Started Prior to Sept. 1998	0.0616	0.1101	0.0485	0.111
Initial Value Sept. 1998 - March 2000	0.4490	0.5128	-0.0638	0.226
Final Value Sept. 1998 - March 2000	0.0544	0.2350	0.1806****	0.000
Sector Internet & TMT	0.4830	0.4829	0.0001	0.998
Number of Observations	147	234		

Table 5: Test of difference in means for sample characteristics. This table tests for differences in sample means between US and European venture-backed companies. The table includes all companies in the sample with a first financing round in 1996 or later, if the companies were seed or early stage in at least one round, and had at least one successive valuation recorded. All variables are as defined in Table 3. The number of observations is as recordded in the last row, except for Funds in All Stages (2 ob. missing), Age (62 obs. missing), and Initial Q (149 obs. missing). Two-sided t-test for difference in mean (equal variance in both samples), H_0: Difference is equal to zero. Levels of significance: *=10%, **=5%, ***=1%, ****=0.1%.

Panel A:	**Full Sample**					
	Number of Obs.	Mean	Std.Deviation	Median	Min.	Max.
IRR	381	4.0760	24.920	0.2159	-0.9999	222.533
Excess Return	381	4.0658	24.488	0.3511	-1.687	222.376
Log IRR	381	0.0460	0.8729	0.0849	–6.886	2.350
Log Excess Return	381	0.0773	0.8576	0.1335	-6.769	2.359

Panel B:	**Europe and USA**					
	Europe		US		T-test	
Number of Obs.	147		234		Diff. in means	
	Mean	Median	Mean	Median	Difference	P-value
IRR	1.0590	-0.2514	5.9711	0.6137	-4.912**	0.023
Excess Return	1.1303	-0.0865	5.9099	0.5974	-4.780**	0.026
Log IRR	-0.3478	-0.1258	0.2934	0.2078	-0.6413****	0.000
Log Excess Return	-0.2791	-0.0492	0.3012	0.2199	-0.5803****	0.000

Panel C:	**By Year of First Financing Stage (Full sample)**				
	1997	1998	1999	2000	2001/02
Number of Observations	35	82	121	111	32
log IRR	0.1821	0.2351	0.2874	-0.1230	-0.9141
log Excess Return	0.0801	0.1349	0.2460	0.1117	-0.8300

Table 6: Summary Statistics for Returns. This table records sample means and related statistics for the full sample (Panel A) of US and European venture-backed companies. The table includes all companies in the sample with a first financing round in 1997 or later, if the companies obtained seed or early stage funding in at least one round, and had at least one successive valuation recorded. Panel B reports the means for the subsamples in Europe and the US, and two-sided t-tests for differences in sample means (unequal variances according to Satterthwaite's method). H_0: Difference is equal to zero. Finally, we record the evolution of the return measures over time (Panel C). IRR: internal rate of returns, between first valution date 0 and last valuation date T, calculated as rate r such that $\frac{V_T}{(1+r)^T} - \sum_t \frac{I_t}{(1+r)^t} - V_0 = 0$, where V_T is the final valuation, V_0 the initial valuation, and I_t the investment amount in period $0 < t \leq T$. Log IRR: IRR in logs. Excess Return (Log Excess Return): IRR – annualized return on Nasdaq over the same period (in logs). Levels of significance: *=10%, **=5%, ***=1%, ****=0.1%.

Full Sample

	(1)	(2)	(3)	(4)	(5)
Fundsinalld	0.3075	0.0192	-0.0724	0.0311	-0.0739
	(0.47)	(0.77)	(-1.09)	(0.51)	(-1.12)
Avgconti	-0.1746	-0.1401			
	(-1.16)	(-0.91)			
Earlycont.			0.1203		0.1284*
			(1.68)		(1.81)
Earlycontprop.				-0.1158	
				(-1.50)	
Public or Corp. Investor		0.1522***			0.1816****
		(2.82)			(3.80)
Totalstages	-0.0326*	-0.0363*			
	(-1.72)	(-1.88)			
Totalinvestors	-0.0007	-0.0035			
	(-0.10)	(0.49)			
Totalamount	0.9260	0.7578			
	(0.21)	(1.05)			
Amount 1			-0.0077**	-0.0072**	-0.0069*
			(-2.10)	(-1.97)	(-1.86)
Inv1Total			1.0641****	1.0874****	1.1039****
			(4.28)	(4.22)	(4.57)
Nb. Investors 1			-0.0207	-0.0176	-0.0247
			(-0.80)	(-0.68)	(-0.96)
Duration 1			-0.0146	-0.0326	-0.0008
			(-0.33)	(-0.69)	(-0.02)
EU Dummy	-0.4081****	-0.3953****	-0.3622****	-0.3654****	-0.3338****
	(-6.29)	(-6.26)	(-6.17)	(-5.96)	(-5.93)
Totalduration	0.0019	$-0.112*10^{-4}$	0.0029	0.0180	-0.01163
	(0.95)	(0.00)	(0.10)	(0.62)	(0.69)
Bubble End	0.0599	0.0623			
	(0.75)	(0.79)			
Bubble Start			0.1698****	0.1410***	0.1575***
			(3.38)	(2.79)	(3.14)
TMT	0.1257**	0.1238**	0.0857	0.0958	0.0806
	(2.16)	(2.14)	(1.49)	(1.66)	(1.43)
Const.	0.3086***	0.2937***	0.0042	0.0732	-0.0440
	(3.12)	(2.95)	(0.96)	(0.45)	(0.65)
R^2	0.1764	0.1893	0.2457	0.2439	0.2658
F	10.39****	10.37****	11.00****	10.50****	11.42****
Observations	374	374	374	374	374

Table 7: OLS regression with log Excess Return as dependent variable. Robust regressions for the full sample of US and European venture-backed companies. Heteroskedasticity-consistent (White) t-statistics in brackets. Levels of significance: *=10%, **=5%, ***=1%, ****=0.1%.

Europe

	(1)	(2)	(3)	(4)	(5)
Fundsinalld	0.1086	0.0623	-0.1277	0.0609	-0.1412
	(0.81)	(0.46)	(-0.96)	(0.51)	(-1.07)
Avgconti	-0.2804	-0.2250			
	(-1.02)	(-0.81)			
Earlycont.			0.2367		0.2511*
			(1.62)		(1.78)
Earlycontprop.				-0.1075	
				(-0.70)	
Public or Corp. Investor		0.3663****			0.3775****
		(3.84)			(4.23)
Totalstages	-0.0479	-0.0588			
	(-1.35)	(-1.58)			
Totalinvestors	-0.0062	-0.0140			
	(-0.39)	(0.84)			
Totalamount	0.1554	0.712			
	(0.07)	(0.30)			
Amount 1			-0.0146***	-0.0140***	-0.0125**
			(-2.84)	(-2.86)	(-2.49)
Inv1Total			1.9136***	1.8672**	1.8929***
			(2.70)	(2.43)	(2.64)
Nb. Investors 1			-0.0627	-0.0701	-0.0753
			(-1.17)	(-1.29)	(-1.47)
Duration 1			0.0799	0.0824	-0.07611
			(1.30)	(1.17)	(1.32)
Totalduration	0.1711***	0.1617***	0.1419***	0.1519***	0.1215**
	(2.95)	(2.91)	(2.91)	(3.12)	(2.58)
Bubble End	-0.0312	0.0002			
	(-0.09)	(0.00)			
Bubble Start			0.2505***	0.2114**	0.2588***
			(2.57)	(2.17)	(2.73)
TMT	0.2089*	0.1931*	0.1406	0.1576	0.1186
	(2.90)	(1.78)	(1.28)	(1.48)	(1.12)
Const.	-0.3221*	-0.3091*	-0.7529****	-0.6303****	-0.7666****
	(-1.84)	(-1.76)	(-4.30)	(-3.59)	(-4.47)
R^2	0.0872	0.1338	0.2251	0.2121	0.2764
F	1.96*	3.21***	4.24****	3.02***	4.59****
Observations	143	143	143	143	143

Table 8: OLS regression with logEXC as dependent variable. Robust regressions for subsample of European venture-backed companies. Variables and regressions are explained in Table 7. Heteroskedasticity-consistent (White) t-statistics in brackets. Levels of significance: *=10%, **=5%, ***=1%, ****=0.1%.

United States

	(1)	(2)	(3)	(4)	(5)
Fundsinalld	-0.0427	-0.04593	-0.0531	-0.0019	-0.0526
	(-0.72)	(-0.77)	(-0.81)	(-0.03)	(-0.80)
Avgconti	-0.0255	-0.0047			
	(-0.21)	(-0.04)			
Earlycont.			0.0560		0.0660
			(0.88)		(0.96)
Earlycontprop.				-0.0836	
				(-1.09)	
Public or Corp. Investor		0.0574			0.0860
		(0.94)			(1.57)
Totalstages	-0.0103	-0.0121			
	(-0.47)	(-0.56)			
Totalinvestors	-0.0008	-0.0016			
	(-0.12)	(-0.25)			
Totalamount	1.1849*	1.0821			
	(1.72)	(1.54)			
Amount 1			-0.0052	-0.0054***	-0.0049**
			(-1.55)	(-1.61)	(-1.47)
Inv1Total			0.9701****	0.9932****	0.9876****
			(4.09)	(4.11)	(4.21)
Nb. Investors 1			-0.0088	-0.0034	-0.0106
			(-0.53)	(-0.21)	(-0.63)
Duration 1			-0.1958****	-0.2115****	-0.1817****
			(-3.80)	(-3.99)	(-3.43)
Totalduration	-0.1411****	-0.1416****	-0.0941***	-0.0822***	-0.1025****
	(-4.09)	(-4.09)	(3.06)	(-2.72)	(-3.24)
Bubble End	0.0546	0.0551			
	(0.81)	(0.82)			
Bubble Start			0.1188***	0.1024**	0.1082**
			(2.35)	(2.01)	(2.08)
TMT	0.0599*	0.060*	0.2944	0.0351	0.0286
	(1.08)	(1.08)	(0.57)	(0.68)	(0.56)
Const.	0.5069****	0.4994****	0.3934****	0.4260****	0.3672****
	(4.39)	(4.29)	(3.90)	(4.32)	(3.66)
R^2	0.1384	0.1419	0.2389	0.2400	0.2478
F	5.49****	5.37****	6.36****	6.47****	6.66****
Observations	231	231	231	231	231

Table 9: OLS regression with logEXC as dependent variable. Robust regressions for subsample of US venture-backed companies. Variables and regressions are explained in Table 7. Heteroskedasticity-consistent (White) t-statistics in brackets. Levels of significance: *=10%, **=5%, ***=1%, ****=0.1%.

Appendix C: Questionnaire

We document the complete list of questions asked to venture capitalists in this survey. Questions 12 to 25 are related to the answers in Question 11; Questions 26 to 28 are of a more general nature.

1. Type of business (Independent VC – Subsidiary of financial corporation – Subsidiary of non-financial corporation – Government-international organization related – Other (what type?))

2. Do you manage closed-end funds? (Yes – No – No opinion)

3. Year of establishment of the venture capital firm (or year of first fund)

4. Geographical preference (Own country (+ proximity) – Europe – World (at least 2 continents))

5. Per cent of ventures (not amount invested) in your portfolio that are currently (% seed & start-up – % development & expansion – % replacement/refinancing – % buyout)

6. How often do you use convertible securities (in % of the ventures financed)

7. Proportion of your funds that are provided or guaranteed by the governmental sector (in percentage)

8. How many companies are currently in your portfolio (number of companies)

9. Average size of investments done in investee firms (in million EURO)

10. How frequently do your investee firms report their activities and financial situation (average number of reporting per year)

11. Track record in terms of exit in absolute number of exits or in percent (for already accomplished exits and planned exits (i.e. expected within two years))

12. In how many of the companies where you have exited have you been present on the board of directors/representatives (in percent)?

13. During your past exits, to which extent were your preferences on exit aligned with those of the management team (a) prior to first financing round, (b) during the exit process (in percent of the time)?

14. To which extent did the goals and aspirations of management affect the final choice of exit (in % of the companies)?

15. In your past exits, how often did former entrepreneurs express the wish to remain in the firm after your exit (in % of the time)?

16. In your past exits, how often did you replace the former entrepreneur prior to your exit (in % of the companies)?

17. In your past exits, on average how long did your venture capital investments last in general (from entry to full exit – answers in terms of years and number of financing rounds)?

18. In your past exits, how long did the exit stage last (in months – starting when you really begin preparing your exit)?

19. What was the approximate time that you spent looking for a buyer when exit occurred through a trade sale (in months)?

20. After an IPO (in case you did some), how many months did you stay in the venture (including the usual lock-up period)?

21. In your past liquidations, how many months did the liquidation process last (please answer only for investments done in Europe)?

22. In your past exits, percentage of past deals/companies that have been syndicated

23. What is the average size of syndicate that you have been in (answer in terms of number of partners involved, including yourself)?

24. In your past exits, percentage of your syndications that only included partners (a) from your own country, (b) from outside Europe

25. In your past exits, percentage of your syndications that involved at least one partner from the governmental sector

26. In general, to which extent do the following factors affect the choice of exit route (assume in this question that you had the choice between a trade sale and an IPO)? For each factor, please indicate its relevance by a number between 1 and 5, where 1 stands for "not important at all" and 5 for "extremely important"; please leave blank or mark 0 for no opinion.

27. In general, what is your preferred exit route to which you usually tend towards a priori (please mark your answer(s)): IPO – TS – Secondary sale/Refinancing – MBO – No preferred route – No opinion.

28. To what extent do you expect positive reputation benefits from a successful IPO ((Almost) Always – About 75% of the time – About half of the time – About 25% of the time – (Almost) Never – No opinion)?