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Has Europe Been Catching Up? An Industry Level Analysis of Venture Capital Success over 1985–2009*

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Abstract

After nearly two decades of US leadership during the 1980s and 1990s, are Europe's venture capital (VC) markets in the 2000s finally catching up regarding the provision of financing and successful exits, or is the performance gap as wide as ever? Are we amid an overall VC performance slump with no encouraging news? We attempt to answer these questions by tracking over 40,000 VC-backed firms stemming from six industries in 13 European countries and the US between 1985 and 2009; determining the type of exit – if any – each particular firm's investors choose for the venture.

JEL Classifications: G24, G3

Keywords: Venture Capital, Private Equity, Entrepreneurial Activity, Performance Gap

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1. Introduction

Entrepreneurship, innovation, and venture capital (VC) are pivotal to economic development. Over the past decade, extensive research has compared the performance of VC financing in European Union (EU) countries to that in the US (Black and Gilson, 1998; Bottazzi and Da Rin, 2002; Da Rin, Nicodano, and Sembenelli, 2006; Aussenegg and Jelic, 2007; Hege, Palomino, and Schwienbacher, 2009). Differences in stock market development, contract and tax law, labor market regulations, and entrepreneurial spirit have often been cited in connection with the consistent underperformance of European VC investments relative to their US counterparts. Even as recently as the pre-crisis period of 2005–2007, there were no signs of the performance gap narrowing between European and US VC investments (Raade and Dantas Machado, 2008).

Although VC financing has experienced rapid growth over the last two decades (Aizenman and Kendall, 2008; Kräussl and Wuebker, 2011), the literature still lacks a comprehensive analysis of whether this EU–US performance gap is solely explained by the argument that "Europe is lagging behind" or by industry-specific and/or financing-stage–specific characteristics. Therefore, the objective of our study is to determine whether VC-backed companies active in specific industries across and within countries are more likely to become profitable so that venture capitalists can exit successfully.

A typical VC fund is liquidated after one decade. Consequently, if a prospective company does not have sufficient potential to be exited before the end of a decade, a venture capitalist is unlikely to invest in the company. Successful exits are critical to such investors to ensure attractive returns and, in turn, to raise additional capital. However, public investor interest in certain industries is susceptible to change, and therefore it is not equally easy to exit investments of all types at all times (Maksimovic and Pichler, 2001). For example, in recent years, the

popularity of “hot issue” markets—such as computer hardware, biotechnology, multimedia, and Internet—has appeared and disappeared. Concerns about the ability to exit investments may have led to too many private equity transactions undertaken in these hot industries (Gompers and Lerner, 2000; Lerner, 2002). On the flip side, industries that are not in the public spotlight may have received insufficient funds, causing an imbalance in the distribution of VC across industries.

We explore whether venture capitalists in certain industries are more likely to exit their investments via initial public offerings (IPOs), sales, or leveraged buyouts (LBOs). To this end, we examine VC investments and exits in the US and 13 EU countries during 1985–2009 while further classifying firms into six distinct industries. The wide dimensionality of our data set (detailed in Section 2) allows us to uncover significant relations and common factors that lead to VC-backed firms completing the exit phase. We also seek to understand the institutional features and legal environment associated with successful VC financing in the US and in Europe.

We also address the asymmetry in performance between VC-backed firms at different investment stages (i.e., seed/startup and early stage firms versus mature firms) and its effect on the performance gap. As shown by Jeng and Wells (2000), early and later stage venture investments are affected quite differently by the determinants of VC. Hence, we intend to find out whether the weak performance of European early stage venture investments relative to the US, as documented by Raade and Dantas Machado (2008), is more prevalent in certain industries.

To the best of our knowledge, our paper provides the first comprehensive comparative analysis between the success of European and US VC-backed portfolio companies. We uncover relations and common factors that lead to the successful exit of VC-backed portfolio companies and, as a result, strong VC fund performance. We control for industry-specific factors, the investment stage, macroeconomic conditions, and the legal environment in the European countries and the US that are known to affect the exiting environment. First, we determine the

industries in which the performance gap between VC-backed companies from 13 EU countries and the US is most prominent and those for which it is smallest. Subsequently, we try to identify whether perceptible differences exist between the successes of VC-backed companies that received financing at an early stage vis-à-vis those that received it at a later stage. Finally, we break our sample into two sub-periods, 1985–1999 and 2000–2009, to explicitly analyze whether the performance gap has narrowed (for specific industries), or, in other words, whether Europe has been able to catch up over the last years.

Our results suggest that, inasmuch as some of the differences in performance can be explained by country-specific factors (particularly when considering early stage companies), there exist significant idiosyncratic differences in success across industries. We find that, for instance, venture capitalists invested in companies active in the biotech and medical, health, and life science (MHL) sectors are significantly more likely to successfully exit these investments via IPOs, while those invested in companies active in the computer industry and the communications and media (CM) sector are more likely to successfully exit via mergers and acquisitions (M&As). Significant differences across industries also emerge when considering early stage versus later stage VC-backed companies and the preferred method of exit.

The findings of our sub-period analysis show that during the second sub-period of 2000–2009 the difference between the success of European and US VC-backed companies became smaller, and that Europe has indeed been able to catch up. The number of European companies that received VC financing is almost on par with their US counterparts. Furthermore, the numbers of successful exits by IPOs have converged as well, although overall they show worse performance compared to the first sub-period. However, with regard to exits by M&As of VC-backed companies, the US clearly retains its edge over Europe.

The remainder of this paper is organized as follows. Section 2 provides an overview of the data used in this study followed by a description of how we construct the different variables associated with the VC success rate. Section 3 discusses our initial empirical results based on a set of summary statistics, while Section 4 presents the results of our regression analyses based on probit models that allow us to identify the relative importance of different determinants in the probability of successful exit. Finally, Section 5 concludes the paper.

2. Data and Measures

2.1. Sample

Our sample covers the period 1985–2009 and includes data on the exits of VC-backed firms and several determinants for the US and 13 EU countries (Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Portugal, Spain, Sweden, and the UK). The other two original EU-15 countries—Greece and Luxembourg—were excluded from the analysis because of missing information for some variables. From here on out, we refer to the group of 13 European countries that make up our sample as EU-13.

Data on VC-backed companies are from VentureXpert, which includes data on VC and private equity firms, funds, financing rounds, and industry benchmark statistics. The variables include company-specific information such as nation, date of the first round of financing, industry classification, and outcome/exit. Data on country-specific variables—gross domestic product (GDP), population, and research and development (R&D) figures—are obtained from Euromonitor and SourceOECD database. Our study controls for three legal system variables: *Rule of law* and *creditor rights,* originate from the seminal paper by La Porta, Lopez-de-Silanes,

Shleifer, and Vishny (1997), while a revised index for *anti-director rights* is obtained from Spamann (2010). The use of these variables in controlling for performance in financial markets is motivated by the works of La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1998), Cumming, Fleming, and Schwienbacher (2006), and Bottazzi, Da Rin, and Hellmann (2009). We measure the national level of entrepreneurship activity through the *Total Early-Stage Entrepreneurship Activity* (TEA) variable *TEA*, which is annually assessed by the Global Entrepreneurship Monitor (GEM) project.

We obtained data on the evolution of 41,266 firms that received VC funding during 1985–2009, which allows us to determine which investments venture capitalists exited—if at all—and how. Table 1 summarizes the composition of this data set. The statistics are presented by country, stage of development of the firm when it received its first round of VC financing (seed, startup and early stage, or mature), and industry. This latter classification is explained in more detail below. As expected, most VC-backed companies have their origin in the US (27,583, making up approximately two-thirds of the entire sample). In contrast, we collected information on only 250 and 222 firms for Portugal and Austria, respectively.

<Insert Table 1 about here>

Given that this paper seeks to determine whether industry-specific factors play a significant role in determining the likelihood of a successful venture exit, it would be beneficial to obtain as many independent industry-specific variables as possible that match the industry categories used by VentureXpert. Following Gompers, Kovner, Lerner, and Scharfstein (2008), we group firms into categories that exhibit similarities in technology and management expertise. To link the industry trend data to the firms obtained from VentureXpert, we matched

International Standard Industrial Classification (ISIC) codes with VentureXpert's industry classifications as follows. We initially mapped out a categorization table of the VentureXpert industry classification system from its broadest level, Major Group, down to the most detailed level, Sub-category 3. Then, by evaluating each line on the ISIC category list, we assigned each firm to its appropriate VentureXpert Sub-category 3 listing. The outcome is the following classification into six main industry groups: *computer software and hardware*, *semiconductors and other electronics*, *biotech*, *MHL*, *CM*, and *non–high-technology*. This allows us to keep the main recipients of VC disbursements (Gompers and Lerner, 2001) separated while allowing for a reasonable level of aggregation in the data that will assist us in our empirical analysis.

Table 1 also indicates that for both the EU-13 and US, the non–high-tech sector has the most transactions, while the smallest number of VC-backed firms can be found in semiconductors and other electronics and the biotech industry. Moreover, we see similar amounts of infant firms (infant firms include seed, startup, and early stage companies) and mature firms in the US. In sharp contrast, there is a roughly 5:2 ratio of mature to infant firms among the EU-13, revealing a bias against the provision of early-stage financing in Europe.

Our empirical analysis splits our sample into two sub-periods, 1985–1999 and 2000–2009, which allows us to explicitly investigate whether Europe has been able to catch up with the US with respect to successful exits of VC-backed firms. We note that since it is unlikely that venture capitalists have exited firms that received their initial funding (i.e., first financing round) in recent years, including these companies will likely bias our results downward. To address this issue, even though we consider exits up until July 2009, we exclude from the sample companies that have been operating less than four years since receiving their final round of venture funding. Hence, our sample includes companies that received funding through 2005 and exits that took place through July 2009. Other than correcting for this potential downward bias, an additional

advantage of this sample split is that it provides an almost equal distribution of transactions across the two periods. In addition, as we can verify from Table A in the Appendix, for IPOs the average success rate seems to have experienced a "downward break" in either 1999 or 2000. The same holds true for the years 2000 and 2001 for M&As; therefore, the choice of 2000 as the year of the sample split seems reasonably warranted.

We examine 20,283 firms that received VC between 1985 and 1999, and 20,983 that were VC backed on or after 2000. We provide further details as to the composition of the data per sub-period in Section 3.

2.2. Measuring success

Studies analyzing the historical performance of European and US VC investments have utilized to date diverging computational methods for returns, with consequently varying results. In particular, issues regarding definitions, investment classification, and valuation in addition to self-reporting and survivorship biases make these performance figures difficult to compare. Previous studies that deal with how to compute returns on VC investments include those of Cumming and MacIntosh (2003), who examine a sample of 248 hand-collected VC exits in Canada and the US, and Cochrane (2005), who analyzes exits using VentureOne data. Ideally, one would require data on the actual returns on VC funds' investments to measure their success. Unfortunately, this is not possible, because neither VentureOne nor VentureXpert, the two main databases, collect valuation data on all the companies that are or have been part of a VC fund. Therefore, we proceed to measure success as a binary variable: whether a venture capitalist has exited an investment and, if so, the exit strategy.

Following Gompers et al. (2008), our proposed measure of success takes the type of exit of a particular company into consideration. We define S*uccess by IPO (S1)* as the number of

firms that received VC financing and were exited via IPO; *Success by Merger or Acquisition (S2)* is defined analogously, this time considering VC-backed firms that were either merged with or acquired by other firms. Finally, we introduce the measure *Overall Success (OS)*, which is the sum of *S1* and *S2*.

We make one further classification that separates the performance of infant firms that received VC financing from that of mature firms. For all company data we record whether the firm was at a seed/startup or early stage when it received its first VC investment. The variable *Success of Infant Firms (IS)* is computed as the number of seed, startup, and early stage firms funded by venture capitalists who exited the firm by taking it public, or through a merger or acquisition. Similarly, *Success of Mature Firms (MS)* is computed as the number of mature firms funded by venture capitalists who exited the firm through any of the two abovementioned channels.

The success variables are constructed by analyzing the final sample of VC-backed companies, where the investment domiciles are set equal to the companies' nations. The success variables are then ordered by country, year, and industry to obtain a success rate defined as the number of VC-backed companies that were successfully exited in a given year for a given country divided by the total number of VC-backed companies for that given year and country. The year specified in this case is set to be equal to the year in which the firm received its first round investment. This means, for example, that the future success of all companies that received their first round of financing in 2000 would be attributed to the year the first investment round was received, in this case 2000, irrespective of the year in which they exited.

3. Have European Countries Closed the Performance Gap?

This section provides a first answer to the questions as to whether a gap still exists between the success rates of US and European VC-backed portfolio companies, if this discrepancy has become more or less pronounced, and whether this can be explained by industry and/or investment stage-specific characteristics by analyzing a set of sample statistics. We begin by providing a comparison between the success rates by IPOs (S1) and M&As (S2) of US and European VC-backed companies over the two sub-periods. Then, we explore whether a company's investment stage affects the likelihood for success. Finally, we present a comprehensive industry-by-industry analysis of success rates across the two regions, exit strategies, investment stages, and periods. The insights gained here form the basis of the comprehensive regression analyses in Section 4.

3.1. Comparison of success rates by exit strategy

We begin by providing a comparison between the performance of the US and European countries over the entire period of study, comparing their performances in both sub-periods. Table 2 presents a breakdown of the success rates of both US and EU-13 VC-backed companies by exit strategy.

<Insert Table 2 about here>

As expected, Table 2 reveals that the sub-period analysis is indeed a story of two tales. Until 1999, it is clear that the US dominated Europe in most relevant categories: For every European firm receiving VC financing between 1985 and 1999, more than four US firms were

financed during that same period. During that same period, US firms backed by VC were taken public in 22 percent of occasions and another 29 percent had been merged with or acquired by one or more other firms, compared with 15 and 20 percent, respectively, for the European companies, confirming previous studies (Black and Gilson, 1998; Murray and Marriott, 1998; Bottazzi and Da Rin, 2002). Finally, LBOs were particularly prevalent in the case of European firms (over 17 percent), but almost non-existent for US firms (less than 2 percent). These results are also in line with the seminal paper by Pagano, Panetta, and Zingales (1998) and the more recent empirical findings by Brau and Fawcett (2006) and Bancel and Mittoo (2009), who present in a survey of chief financial officers (CFOs) substantial differences regarding the preferred exit strategy. European CFOs favor maintaining control of the firm, while US CFOs value the ability of pre-IPO investors to exit and experience significant changes in ownership structure after the IPO.

Starting in 2000, Table 2 shows that the VC success story has been a more balanced one, albeit not quite as successful as between the mid-1980s and late 1990s. The number of European firms backed by VC is roughly equal to that of their US counterparts. The number of exits by IPO has also converged, although to a very low level of about 6 percent for all firms receiving funding; in fact, the average success rate for the 13 European countries is slightly higher than that for the US. Nevertheless, this mostly reflects a cooling down in overall IPO activity, as documented by Ritter and Welch (2002) and Gompers et al. (2008).

Regarding M&As of VC-backed firms, a slowdown is also observable, albeit much less dramatic compared to the slowdown in IPO activity. Here, the US clearly retained its edge over Europe: While nearly 22 percent of US firms merged or were acquired by others, their European counterparts exhibited only a less than 11 percent success rate during the same period. For illustration and comparison purposes, we again report the percentage of exits via LBOs, which

remained basically unchanged for European countries (16 percent) and slightly increased for US firms, to 5 percent. This is indicative that the exit strategies chosen differ substantially between the US and Europe: While M&As are more prevalent in US VC-backed firms, LBOs are more common among their European counterparts. We note that since LBOs do not necessarily constitute a successful exit, the reminder of the analysis does not include them when computing overall success.

3.2. Comparison of success rates by investment stage

Another decomposition worth analyzing is whether the relative maturity of a firm receiving VC financing affects its likelihood of success. Jeng and Wells (2000) describe how early and later stage ventures are affected quite differently by the determinants of VC. To assess whether there are differences by areas and periods, Table 3 compares VC investments and success rates between the US and Europe, separating infant and mature firms.

<Insert Table 3 about here>

During 1985–1999, roughly an equal number of mature vis-à-vis infant firms were financed in the US. On the other hand, for the average 13 European countries, mature firms receiving VC funds outnumbered infant firms by more than a 3:1 ratio. However, given that the success rate for infant firms was slightly higher than that for mature firms in European countries (while it was roughly similar in the US), the "survival," or ex post ratio—that is, the ratio of successful mature firms to infant firms—fell to 2.83 in Europe but remained close to par in the US.

The analysis of the second period paints a grim picture for infant firms in Europe: Even though the ex ante ratio between mature and infant firms is lower starting in 2000 (2.32), much of the underperformance in this period is due to the relatively low success rate for infant firms in Europe. Table 3 indicates that fewer than one in eight infant firms exited either via IPO or M&A, while almost twice as many mature firms had a successful exit via these two channels. The outcome is that successful mature firms outnumber successful infant firms in Europe by nearly four times; in contrast, for the US the ex post ratio after 2000 is again close to one.

The above-described results are consistent with previous findings in the literature: Seed/startup and early stage firms in Europe largely underperform in comparison to their US counterparts (see Murray and Marriott, 1998, for evidence during 1991–1997, and Raade and Dantas Machado, 2008, and Hege et al., 2009, for more recent evidence). In contrast, mature VC-backed firms have exhibited between a 20 percent and 30 percent probability of success in Europe and the US, respectively.

3.3. Comparison of success rates by industry

This section investigates whether there are significant differences in performance across the six different industries. Focusing on the first sub-period, our empirical findings included in Table 4 provide an industry-by-industry summary analysis for 1985–1999. Our results show that the US outperforms Europe in success by acquisition in all sectors, as well as in success by IPO (albeit only marginally in computer hardware and software, MHL, and CM). Moreover, the US outperforms Europe in the success of early stage and mature firms.

<Insert Table 4 about here>

Table 4 also indicates that exit by acquisition had a higher rate of success than exit by IPO, except for VC-backed biotech firms and, to a lesser extent, in the MHL sector. Exit by IPO provides significantly higher returns when compared to other exit strategies (Gompers and Lerner, 1998). The observation that the biotech sector is the "best" performer comes as no surprise: Over the last decade, this sector has been identified as one of the thriving new industries in the US (Gordon, 2002; Guo, Lev, and Zhou, 2005). Similarly, in Europe, biotech's characteristics confirm that it is one of the most dynamic industries. According to Popov and Roosenboom (2009), as of 2005, 55 percent of biotech companies in Europe were less than five years old, the rate of new business incorporation was 14 percent on average, 44 percent of biotech employees in Europe had been actively involved in R&D, and the industry spent 7.5 billion euros on R&D in 2004 alone, becoming one of the most R&D-intensive sectors in Europe.

Turning to the analysis of the second sub-period, between 2000 and 2009, we observe several important features. First, consistent with the aggregate numbers reported in Table 2, we note—without exception—a drastic reduction in the percentage of both European and US VC-backed firms from all industries that have been taken public. In terms of M&As, we see a drop in the success rates across all industries, although this reduction is not as sharp as in the case of IPOs.

When specifically looking at IPOs, we observe in Table 4 that the US no longer dominates Europe in all sectors; on average, the 13 European countries show better success rates in three industries: computer hardware and software, semiconductors and other electronics, and CM. Yet, success via M&As is still greater in the US: US firms outperform their European counterparts by ratios ranging between 3:2 and 5:2, depending on the particular industry. Finally, whereas the US continues to dominate Europe in terms of the success of infant firms, the gap

when it comes to mature companies has sharply decreased—mostly due to a fall in success rates for US firms—in all industries, except for the MHL sector.

4. Regression Analysis

The following determines the factors associated with successful VC investments by means of a multivariate probit regression analysis. We begin by brief discussing which indicators serve as a good proxy for determinants we expect play a significant role in enhancing the likelihood of a successful exit by a VC-backed firm.

VC investment by industry group

First, it is important to distinguish between funds raised and funds invested. A VC fund will raise resources each year; however, it may not necessarily invest those funds in the same year. VC funds actively manage current portfolio companies until the proper exit time and may not be ready to take on a new investment until a current company has exited because of management availability. Likewise, the amount of money raised may be inaccurate as a proxy, because often it simply corresponds to a rollover process of investment from one project to the next. To further elaborate, when a VC fund exits a portfolio company, the investment is then returned to the original investors, who often become repeat clients of the VC fund and reinvest their desired level of capital back into the fund, which then represents the way capital is reutilized in a VC fund. Another reason why the amount of money raised may not show a logical pattern in relation to actual investment is that VC funds may not have found what they consider high-potential

investments and may decide to wait and keep the funds sitting until an opportune venture is found.

In contrast, data on VC disbursements is exactly the capital given a designation into a venture company and best represents VC supply side activity regarding the investment level of funds. This variable is best suited to identify how much capital has been put into VC-backed companies in each industry and country. It is more interesting to see whether one industry or country is spending more or less and the type of impact it has had on the ability of each portfolio company to reach an exit stage.

Our probit analysis employs the *average investment per firm* (in millions of euros), classified by industry and country, over the two sub-periods (1985–1999 and 2000–2009). Since we do not have data for all firms, we compute the average investment based on the total reported divided by the number of firms that reported the amount of funds received, rather than the total number of firms. A priori, one would expect that the larger the amount of resources devoted to a representative firm belonging to a particular industry, the more likely this representative firm has a successful exit.

GDP

A high level of aggregate economic activity may indicate favorable entrepreneurial conditions, since periods of increased GDP may indicate that opportunities to commercialize technological innovations have increased (Gompers and Lerner, 1998; Jeng and Wells, 2000). Given that we are using averages over time and not carrying out a year-by-year analysis, we opt to use the average *GDP per capita* (in thousands of euro) for each of the sub-periods and for every country of interest. We expect, in general, a higher GDP per capita to be associated with a higher likelihood of a successful VC project. Since several studies that use cross-country data also

control for real GDP growth as a determinant of VC investment (Jeng and Wells, 2000; Gomes Santana Felix, Gulamhussen and Pires, 2007), we run a separate set of regressions employing real growth instead of GDP per capita. The results, presented in Tables B and C in the Appendix, suggest that our main findings are robust to the use of this alternative measure of economic activity.

R&D expenditures

VC investments are high-risk, high-reward projects, which makes them comparable to R&D investments. Thus, an increase in domestic expenditures on R&D would imply a greater supply of resources raised that are available for VC, as well as demand for similar high-tech, high-risk companies. When R&D is better funded, the chances of technological and other advanced scientific opportunities should increase and may dually lead to more VC ventures.

In expectation, times during which investments in R&D are higher may indicate more technological or innovative opportunities. Besides the idea that R&D spending can capture demand effects over time, it may also capture demand effects across countries. Therefore, countries with higher levels of R&D spending may contain higher numbers of entrepreneurs with potentially fruitful ideas. This effect is described by Gompers and Lerner (1998), who show that, within the US, states with higher levels of both academic and corporate R&D spending also have higher levels of VC financing activity.

Our analysis therefore controls for aggregate *R&D per capita*, also for both sub-periods (1985–1999 and 2000–2009) and all countries in our sample. All other things being equal, a larger amount of funds devoted to R&D would be associated with higher technological or innovative opportunities, and therefore a higher likelihood of the success of VC-financed projects.

Regulatory environment and legal variables

Previous literature has shown that for all countries that want to increase successful VC investments, it is vital to remove obstacles that hamper the growth of their financial markets, particularly their VC market. For instance, Gompers and Lerner (1998) examine the determinants of VC fundraising in the US. They study industry aggregate, state-level, and firm-specific fundraising to determine if macroeconomic, regulatory, or performance factors affect VC activity and conclude that the regulatory environment and indicators of the legal system play a crucial role. Cumming and MacIntosh (2003) also highlight the impact of legal and institutional factors on exit strategies when comparing US and Canadian venture financing. In sum, most previous papers conclude that countries with a weak tradition of equity culture and limited asset mobility should ensure that administrative and regulatory obstacles are minimized to enable innovative companies to obtain the VC financing and exit opportunities they need (Myers, 1999; Jaffee and Levonian, 2001; Ferreira and Ferreira, 2006; Kaplan, Martel and Stromberg, 2007). The regulatory environment and legal variables employed in our analysis are *rule of law* and *creditor rights*, from La Porta et al. (1997), and *anti-director rights*, from Spamann (2010).

Entrepreneurial activity

The GEM measures the participation of individuals in *entrepreneurship activity* at the national level. Its variable *TEA* is defined as that percentage of the adult population between 18 and 64 years either actively involved in starting a new venture or the owner/manager of a business that is less than three and a half years (42 months) old.

While the GEM was in its formative years during 1998–2001, its operational design was continuously improved. After 2001 the main indicators have remained unchanged. This allows us

to observe trends in early stage entrepreneurial activity from 2002 to 2009. We find that most countries in our sample have fairly stable *TEA* rates over time (being as well reported by GEM, 2007, p. 17), and thus the relative rankings between countries remained quite set as well. This indicates that *entrepreneurship activity* may be seen as a *structural* characteristic of an economy. As such and because *TEA* values are only available since 2002, we specify *entrepreneurship activity* in our regression model as a country-specific effect and use the 2005 *TEA* value for all countries, except for Portugal, where we use the 2004 value since the 2005 assessment is not available.

Prior research has analyzed the supply side of entrepreneurship as well and suggests that variations in entrepreneurial activity across countries may be a major source of the different efficiencies in knowledge spillovers that ultimately lead to economic growth. For instance, Acs and Varga (2005) find that after controlling for stock of knowledge and R&D expenditures, *TEA* has a positive and statistically significant effect on technological change in the EU countries. The authors also show that it is very unlikely for a country to develop a strong technological sector without increasing its entrepreneurial activity.

Industry-specific variables

Our baseline specification for the regression analyses is to model our alternative measures of success as a linear function of *average investment per firm* (in millions of euros), *GDP per capita*, and *R&D per capita* (both measured in thousands of euros) and three legal variables as controls (*Rule of Law*, *Anti-Director Rights*, and *Creditor Rights*). We proceed with our sample of 13 European countries and across the six industries of interest. Given the documented differences in performance of VC-funded firms in the US and Europe, we run the regressions with and without the US to verify if the main results at the industry level still apply.

We also add industry-specific dummy variables to test whether there are significant differences between industries in regard to the probability of success. Specifically, we use the non–high-tech sector as the benchmark for comparison. This broad sector comprises firms of the following industries: business services, agriculture, forestry, financial services, utilities, manufacturing, transportation, construction, chemicals and materials, pollution and recycling, industrial equipment, oil and gas exploration, consumer products, entertainment and leisure, and food and beverage; it represents 34 percent and 52 percent of all firms receiving VC funding in the US and the EU-13, respectively.

Estimation procedure

For our multivariate specification, the nature of the data set would a priori be suitable for a panel data analysis. Nonetheless, this may prove counterproductive, given that, for some countries and industries, there are only very few observations of VC-funded firms and exits, which may very well provide some unusually high weights for these observations and rather awkward results for years in which no exits were recorded. An example of this is the biotech industry for Portugal, Italy, and Austria: Between 1985 and 2005, only four, six, and nine biotech firms received VC funds, respectively, which would leave several years with missing information or just one data point.

Therefore, we proceed instead to separate the data into the two same sub-periods as in our descriptive analysis (before and after 2000) and estimate the model via a probit model in which we try to determine the importance of each of the explanatory variables in predicting the likelihood of success of a VC-backed firm. As a result of missing observations—mainly with respect to the available information on average investment per firm—we are forced to limit our

sample to analyzing exits for 33,358 firms (12,477 for 1985–1999 and 20,881 from 2000 onward).

The results are reported as follows: In a first step, we differentiate between the two successful exit strategies: exit via IPO and exit via M&A. In a second step, we run separate probit regressions for infant and mature firms.

4.1. Explaining success by exit strategy

Table 5 reports the results of considering exit via IPO. For the sub-period 1985–1999, the coefficient of the average investment is negative and significant if firms from both the US and European countries are considered. Thus we fail to find evidence suggesting that a higher level of VC funding to a particular industry makes firms from this industry more likely to successfully go public.

<Insert Table 5 about here>

With respect to the non–high-tech sector, VC investment in biotech, MHL, and CM has a higher likelihood of resulting in an IPO. For semiconductors and other electronics this difference is not significant, while firms in the computer sector underperform relative to their non–high-tech counterparts. In particular, the success rate for the biotech industry, controlling for all other factors, is significantly higher than for the benchmark sector (with a coefficient of 0.3). Regarding the other control variables, *GDP per capita* enters the regression with a negative and significant coefficient, contrary to our expectations, whereas higher levels of *Rule of Law* are associated with better IPO performance. Neither *R&D per capita* nor the other legal variables enter the regression with significant coefficients. Finally, we see that the national level of

entrepreneurship activity plays a substantial role for successful exit via IPO for a given VC-backed firm: The TEA coefficient is positive and significant at the 1 percent level.

Column 2 of Table 5 replicates these results, excluding the US data from the sample. The impact of the average investment on the likelihood of VC-backed firms going public becomes insignificant, while biotech, MHL, and CM remain the most successful industries. Interestingly, when considering only European VC-backed firms, *GDP per capita* becomes a positive and significant explanatory variable, while *Rule of Law* becomes negative and significant. As before, none of the other control variables have any significant impact on exit via IPO. Moreover, excluding US firms from our sample leads to a negative though insignificant coefficient of the *TEA* variable. This indicates that the difference in entrepreneurship activity between the US (high) and the European countries as a whole (low) was very relevant during 1985–1999.

Turning to our analysis of the period starting in 2000, displayed in the last two columns of Table 5, we can verify that the average investment is positively and significantly correlated with success via IPO, both with and without US data in the sample. However, once we control for all other factors, only biotech and MHL have a significantly higher success rate compared to the non–high-tech sector during this period, with all other industries performing worse. Contrary to our expectations, *GDP per capita* again enters the regression with a negative sign (although it becomes insignificant once we exclude US VC-backed firms). The coefficient of *R&D per capita* is positive and significant (with and without US data). Meanwhile, higher scores for the legal control variables *Rule of Law* and *Anti-Director Rights* are associated with lower successful exits via IPO from 2000 onward, and *Creditor Rights* enters the regression with a positive and significant sign (again, with or without US VC-backed firms in the sample). Entrepreneurship activity plays an important role in understanding successful exits via IPO once again. The

variable *TEA* has a positive and significant coefficient in our regression that contains US VC-backed firms; once we exclude the US data, *TEA* becomes negative, though insignificant.

Summarizing this first set of results, the main driving factors of VC-backed firms going public are mainly each industry's particular characteristics and, after 2000, the amount of funding these firms received. The differences between the relevance of the determinants of VC success in the US and in European countries can be mainly identified by the apparent asymmetric effects of *GDP per capita*, and for the period between 1985 and 1999, by the striking difference between the correlation of success and *Rule of Law* when one excludes US VC-backed firms from the sample. The demand side of VC also seems to be of great relevance. If our sample includes the US data, the national level of entrepreneurship activity has a positive and significant effect on VC success as measured by IPO exit. Once we exclude the US VC-backed firms from our analysis, *TEA* carries a negative though insignificant coefficient, indicating the substantial differences in both sample periods of entrepreneurial activity between the US and the European countries.

Table 6 shows cases of successful exit via M&A. For the period 1985–1999, reported in the first two columns of Table 6, *Average Investment* appears with a negative and insignificant sign, suggesting that, for this particular period, the amount of money received by VC-backed firms did not have any impact on their likelihood of being acquired by or merging with other firms, irrespective of whether US data are considered in the sample. It is interesting to note that while firms from all industries except biotech have a higher probability of success than the non–high-tech sector, none of them perform any differently from the benchmark once US VC-backed firms are excluded from the sample. The variable *GDP per capita* enters the regression with a negative sign (albeit only significant when US ventures are in the sample), and *R&D per capita* has an insignificant effect. Finally, higher scores for *Rule of Law* and *Anti-Director Rights* are associated with a higher probability of exit via M&As. Looking at entrepreneurship activity, we

observe a positive and significant coefficient when US firms are included; once we exclude them from our analysis, we no longer find a significant effect.

<Insert Table 6 about here>

The period starting in 2000 does not suggest that *Average Investment* per firm is important in explaining the acquisition or merger of VC-backed firms, regardless of whether or not US VC-backed firms are included. As for the sector-specific variables, only firms in the computer sector and CM industry are more likely to exit via M&A than those in the non–high-tech sector, once US data are excluded. The variable *GDP per capita* enters the regression with a negative and significant sign and *R&D per capita* has a positive significant coefficient (with or without US ventures in our sample). As for the legal environment variables, higher scores of both *Anti-Director Rights* and *Creditor Rights* are associated with a higher probability of exit via M&A. This continues to be the case when only European ventures are considered. The *TEA* coefficient carries the right sign in both samples and is statistically significant at the 1 percent level, indicating that higher national levels of entrepreneurship activity lead to higher success rates of VC-backed firms for the period 2000–2009.

4.2. Explaining success by life cycle

The following investigates whether the life cycle of the VC-backed firms plays a pivotal role in the determination of successful exits. Table 7 presents our findings of successful exits of infants firms. The first two columns report the results for 1985–1999; only when limiting the sample to European ventures do we find a positive significant effect of average VC investment in the overall success of seed/startup and early stage firms. The explanatory power of the likelihood of a

successful exit by infant firms lies mainly in industry-specific characteristics: Firms in all sectors perform better than their counterparts in the non–high-tech industry, while only biotech and CM do so when we leave out US ventures. The variable *GDP per capita* once again enters the regression with a negative and significant coefficient, and the effect disappears for European VC-backed firms. Finally, *Anti-Director Rights* and *Rule of Law* appear with positive coefficients (when all firms are considered), while *Creditor Rights* has a negative effect only when the US data are excluded from the sample. The level of participation of individuals in entrepreneurship activity has a positive and statistically significant impact on the successful exits of infant firms when we analyze the full sample; once we exclude the US VC-backed firms from our analysis, *TEA* becomes insignificant and such a demand-side effect disappears.

<Insert Table 7 about here>

Starting in 2000, infant firms do not seem to be more successful when receiving more funds. All industries exhibit, on average, better performance than the benchmark, but for firms in the semiconductor sector these results become insignificant when US VC-backed firms are excluded. For the entire sample and the one that only includes European ventures, *GDP per capita* enters the regression with a negative and significant sign and *R&D per capita* has a positive and significant coefficient. Finally, higher scores of *Anti-Director Rights* are associated with a higher probability of exit of infant firms. Entrepreneurship activity also plays a relevant role for successful exits of infant firms during 2000–2009, but once we exclude the US observations from our sample such a positive demand-side effect ceases to exist.

Summarizing, success for VC-backed infant firms in either sub-period is linked more with industry-specific elements than with funding received or any macroeconomic or legal variables,

although the high level of entrepreneurial activity in the US seems to also have a strong impact. For the period beginning in 2000, R&D plays a more important role. Excluding US ventures from our sample affects some of the findings, confirming our previous observation that, when dealing with success at the seed/startup and early stage levels, the US and the European countries have quite different characteristics.

Table 8 presents the results on linking the success of established VC-backed firms to its determinants. For the period 1985–1999, higher average investment is counter-intuitively associated with a lower likelihood of success. The industry-specific dummies point to the better performance of all industries with respect to the non–high-tech sector, with the exceptions of European ventures in the computer industry and CM. Finally, country-specific controls and legal variables only seem relevant when US VC-backed firms are included in the sample. The *TEA* coefficient indicates that the national level of entrepreneurship activity has a positive and significant effect on the successful exits of mature VC-backed firms, although once we exclude the US firms from our analysis, the effect vanishes for the earlier period.

<Insert Table 8 about here>

The period after 2000 does suggest some evidence of a positive impact of average investment on a successful exit by VC-backed mature firms when only European firms are included in the sample, while all industries perform better than the non–high-tech sector. Here, *R&D per capita* enters the regression with a positive and significant sign, while *GDP per capita* appears with a negative and significant coefficient. These latter results are robust to the exclusion of the US data. Only for the legal control variables do we see changes between the specification that includes all VC-backed firms and that which only considers European ventures. The level of

entrepreneurial activity also plays an important role in the latter sample period: The *TEA* coefficient is positive and highly significant. If we exclude the US VC-backed firms from our analysis, the coefficient becomes once again insignificant.

Our general findings are also similar when employing *GDP growth* instead of *GDP per capita* as a control variable. These additional probit results are available in the Appendix: Table B for IPO versus M&A exits and Table C for infant versus mature firms.

4.3. General discussion

In sum, we observe that higher levels of average investment are linked to better performance by VC-backed firms going public when considering the period since 2000. This does not come as a big surprise. Campbell and Kräussl (2007) conclude "size matters" for the success of the VC industry in Central and Eastern Europe. Numerous public policy research groups also confirm the crucial role of sufficient VC financing. For instance, the Conference Board of Canada (2009) frequently asserts that the investment amounts per deal for VC in Canada are too low to generate any meaningful success (see, e.g., the latest report by the Conference Board of Canada on the Western provinces). On the other hand, we also find evidence that it is not just the supply of VC financing that matters: the demand-side, as measured by the TEA plays a substantial role as well. We find that a sufficiently high level of national entrepreneurship activity leads to a better functioning of VC markets, as indicated by the higher success rates of exits via IPOs and M&As for both infant and mature VC-backed firms in the US, as compared to the European countries, where such participation of individuals in entrepreneurial activities is less developed.

The level of average investment also is a robust variable in explaining the better performance of M&As and the overall success of mature firms, albeit again only since 2000. We also see that industry-specific characteristics tend to explain differences in success mainly over

the first period when considering success via IPO and the success of infant firms. Overall, when compared to the benchmark of non–high-tech firms, we find evidence that VC-backed firms in the MHL and biotech industry tend to have a preferred exit via IPO, while computer software and hardware as well as semiconductors and other electronics tend to be more prone to exit via an M&A. For the CM sector, both types of exits are usually more likely than for the non–high-tech sector, depending on the period analyzed (exits via IPO between 1985 and 1999, and exits via M&A after 2000).

As for the decomposition stages of VC financing, most of what we observe is that success by infant firms in the non–high-tech sector was significantly lower than for any of the other industries between 1985 and 1999, although some of these sector-specific differences have gotten much narrower since 2000. Interestingly, neither the country-specific macroeconomic variables (*GDP per capita* and *R&D per capita*) nor the legal variables (*Rule of Law*, *Anti-Director Rights*, and *Creditor Rights*) have a robust, significant effect on the likelihood of exit across both sub-periods. While this does not necessarily rule out country-specific characteristics as explanatory variables, it does reiterate the importance of the amount of funding and industry-specific characteristics in determining which paths are more conducive to successful exits of VC-backed firms.

We conclude that while we have indeed observed better performance in the US than in Europe before the end of the 1990s, most of this was a result of US infant firms performing better than their European counterparts. After 2000, the gap closed, but mostly due to a sharp reduction in the percentage of US VC-backed firms that have successfully gone public. The gap with respect to infant firms has, however, not narrowed: European countries are still experiencing a great deal of trouble in turning seed/startup and early stage firms into successful ventures, irrespective of their industry.

5. Conclusion

Previous research concludes that the success of VC-backed firms depends on a large number of factors, many of which are quite specific. This paper explains the difference in success documented in the literature between US and European VC financing. It has been suggested that, although the European VC industry has undergone substantial development and growth over the past two decades, a distinct gap in performance still exists. By examining specific factors, including a venture's industry and financing stage (which we argue can also partly determine venture capitalists' success in exiting their investments), we attempt to explain this performance gap.

Indeed, our findings show that differences in the rates of success and thus performance are only partly due to the intrinsic differences between the US and European VC experiences. We find that industry-specific characteristics play an important role; in particular, our results suggest that the relatively higher success rate found in VC-backed biotech firms, for instance, may be mostly due to the intrinsic dynamic nature of this sector, and less to firm location and the source of funds. However, we also show that differences in VC performance can be explained by demand-side effects. It seems that the substantially higher level of entrepreneurship activity in the US leads to higher successful exits via IPOs and M&As for both infant and mature VC-backed firms. The weaker participation of individuals in entrepreneurship activity seems to be an attenuating factor on VC performance in the EU.

We also analyze whether substantial differences across industries and countries arise when looking separately at the success rates of firms that received VC at the seed/startup and

early stage versus firms that received funding at later stages. We also observe—confirming the findings of previous studies—that differences in the stage at which firms receive VC funding tends to be a crucial determinant of success, although mainly for European countries.

Our results suggest that, inasmuch as some of the differences in performance can be explained by country-specific factors (particularly when considering seed/startup and early stage firms), there are also important idiosyncratic differences across industries. For instance, firms in the biotech and the MHL sectors tend to be significantly more likely to have a successful exit via IPOs, while firms in the computer industry as well as in the CM sector are more prone to exit via M&As. Important differences across industries also emerge when considering *infant* versus *mature* firms and their preferred exit type.

Finally, we recognize that this study constitutes only a first step toward explaining differences in the rates of VC success and types of exits. Other factors, such as the degree of experience of venture capitalists (Hochberg, Ljungqvist, and Lu, 2007; Gompers et al., 2008; Hartmann-Wendels, Keienburg, and Sievers, 2010), need to be controlled for to draw more definite conclusions. Moreover, the performance gap may also (partly) be explained by a potential lack of valuable projects in Europe. For instance, the most recent GEM publication (2009) indicates such a shortage rather than investors in Europe not providing as much value adding. Unfortunately, the variables required to control for this phenomenon are only available since 2004, which would render any comparison between sub-periods useless. Nonetheless, these and other extensions are in our sights for future research.

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Table 1. Distribution of firms receiving VC funding, by country and by industry.

This table summarizes the data of all firms receiving VC financing during 1985–2005. Firms are classified by country and industry and by whether they received the first round of funding as a seed/startup, early stage, or mature firm.

Country	Total	Seed and Startup	Early Stage	Mature	Computer Sector	Semi-conductors /Other	Biotech	NHT	MHL	CM
Austria	222	32	27	163	52	14	9	118	10	19
Belgium	390	73	65	252	113	17	24	184	23	29
Denmark	410	119	61	230	100	28	46	153	43	40
Finland	698	219	121	358	171	49	22	328	48	80
France	2,788	308	402	2,078	670	135	94	1,568	137	184
Germany	1,721	297	291	1,133	516	113	163	627	99	203
Ireland	310	65	74	171	120	20	13	98	18	41
Italy	527	45	44	438	69	18	6	369	17	48
Netherlands	731	74	81	576	155	24	29	424	32	67
Portugal	250	72	14	164	22	8	4	191	14	11
Spain	670	70	35	565	102	10	13	463	34	48
Sweden	831	170	129	532	197	41	44	364	80	105
United Kingdom	4,135	433	562	3,140	954	162	145	2,252	298	324
United States	27,583	5,233	8,543	13,807	8,915	1,591	1,188	9,518	2,591	3,780
EU-13	**13,683**	**1,977**	**1,906**	**9,800**	**3,241**	**639**	**612**	**7,139**	**853**	**1,199**
All countries	**41,266**	**7,210**	**10,449**	**23,607**	**12,156**	**2,230**	**1,800**	**16,657**	**3,444**	**4,979**

Table 2. US versus EU-13: VC funding and success by IPO and by M&A.

This table presents some summary statistics. The variable *Success by IPO* is computed as the number of firms venture capitalists successfully exited by IPO divided by the total number of firms receiving VC funding. The variable *Success by Merger or Acquisition* is computed as the number of firms venture capitalists successfully exited by merging with or being acquired by other firms divided by the total number of firms receiving VC. Here LBOs includes cases in which the company or a controlling interest of it was bought out by the owners through other means of funding. For all three measures, the rates were computed considering all transactions between 1985 and 1999 and between 2000 and 2009 (with companies receiving VC funding through 2005), by industry and country, and multiplied by a factor of 100.

		Number of VC-Backed Firms	Success by IPO	Success by M&A	LBOs
1985–1999	EU-13	3,605	14.67	19.53	17.15
	US	16,678	21.98	29.43	1.84
2000–2009	EU-13	10,078	6.53	10.42	16.31
	US	10,905	6.28	21.71	5.37

Table 3. US versus EU-13: VC funding and success by infant and mature firms.

This table presents additional summary statistics. The variable *Success by Infant Firms* is computed as the number of seed/startup and early stage firms' venture capitalists successfully exited through an IPO or M&A divided by the total number of seed/startup and early stage firms that received VC funding. The variable *Success by Mature Firms* is computed as the number of established or later stage firms venture capitalists successfully exited through an IPO or M&A divided by the total number of established firms that received VC. For both measures, the rates were computed considering all transactions between 1985 and 1999 and between 2000 and 2009 (with companies receiving VC funding through 2005), by industry and country, and multiplied by a factor of 100.

		Ex ante Ratio (Mature Firms to Infant Firms)	Success by Infant Firms	Success by Mature Firms	Ex post Ratio (Mature Firms to Infant Firms)
1985–1999	EU-13	3.27	38.51	33.29	2.83
	US	1.15	50.55	52.15	1.18
2000–2009	EU-13	2.32	11.68	19.22	3.81
	US	0.81	26.46	29.88	0.92

Table 4. US versus EU-13: Success by industry.

This table presents selected averages of success measures. The variables *Success by IPO* and *Success by Acquisition or Merger* are computed as the number of firms venture capitalists successfully exited via an IPO or M&A, respectively, divided by the total number of firms receiving VC funding. The variable *Success by Infant Firms* is computed as the number of seed/startup and early stage firms that experienced *overall success* divided by the total number of seed/startup and early stage firms that received VC. The variable *Success by Mature Firms* is computed as the number of established firms that experienced *overall success* divided by the total number of established firms that received VC. For all measures, the rates were computed considering all transactions between 1985 and 1999 and between 2000 and 2009 (with companies receiving VC funding through 2005), by industry and country, and multiplied by a factor of 100.

		1985–1999				2000–2009			
		Success by IPO	Success by Merger or Acquisition	Success by Infant Firms	Success by Mature Firms	Success by IPO	Success by Merger or Acquisition	Success by Infant Firms	Success by Mature Firms
Computer Hardware and Software	EU-13	16.20	20.98	36.25	38.34	5.95	11.86	12.36	22.66
	US	18.39	35.56	51.33	58.64	2.69	27.99	29.55	33.23
Semiconductors and Other Electronics	EU-13	15.82	22.78	32.65	42.20	7.07	10.40	10.83	24.07
	US	25.49	32.40	58.06	57.66	4.82	23.21	24.95	35.98
Biotechnology	EU-13	26.88	15.00	49.51	28.07	9.01	9.45	13.97	28.57
	US	39.44	23.78	60.41	74.63	11.15	15.26	22.14	39.37
Medical, Health, and Life Sciences	EU-13	26.85	19.44	43.02	48.46	8.48	10.36	11.16	23.83
	US	28.49	27.84	53.30	60.86	9.57	16.69	20.93	35.00
Communications and Media	EU-13	20.45	20.82	48.60	37.04	6.24	14.73	15.14	25.43
	US	21.14	33.16	53.41	55.36	4.44	25.38	28.01	33.98
Non–High-Technology/Other	EU-13	11.06	18.91	29.12	30.37	6.35	9.02	7.76	16.50
	US	20.98	24.08	37.97	47.05	10.46	13.93	18.92	25.77

Table 5. Success 1: Exit via IPO.

This table reports the initial regression results. The variable *Successful Exit via IPO* takes the value of one if a firm successfully exited by going public, and zero otherwise. The *average investment per firm* is measured in millions of euros, and *GDP per capita* and *R&D per capita* are measured in thousands of euros. All legal variables (*Rule of Law, Anti-Director Rights,* and *Creditor Rights*) originate from La Porta et al. (1997) and Spamann (2010). The latest *TEA* values are obtained from the annual GEM publications. We use the *TEA* values of 2005 for all countries, except for Portugal, for which we use those for 2004. The analysis is conducted for the two sub-periods (1985–1999 and 2000–2009, with companies receiving VC funding through 2005), controlling for results with and without data for the US. Standard errors are in parentheses and superscripts ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	1985–1999 (all countries)	1985–1999 (excl. US)	2000–2009 (all countries)	2000–2009 (excl. US)
Average Investment per Firm	-0.011***	-0.006	0.004***	0.008***
	(0.003)	(0.004)	(0.002)	(0.002)
Computer Sector	-0.135***	0.139	-0.308***	0.083
	(0.045)	(0.088)	(0.044)	(0.059)
Semiconductors and Other	0.060	0.082	-0.127*	0.160*
	(0.072)	(0.164)	(0.065)	(0.095)
Biotech	0.304***	0.350**	0.193***	0.286***
	(0.074)	(0.151)	(0.065)	(0.093)
MHL	0.099*	0.528***	0.136**	0.242***
	(0.056)	(0.134)	(0.054)	(0.080)
CM	0.077***	0.275**	-0.215***	0.082
	(0.045)	(0.117)	(0.049)	(0.076)
GDP per Capita	-0.046***	0.035**	-0.013***	0.001
	(0.012)	(0.016)	(0.003)	(0.004)
R&D per Capita	-0.056	-0.030	0.400**	0.357**
	(0.389)	(0.396)	(0.166)	(0.167)
Rule of Law	0.324***	-0.233*	-0.163***	-0.288***
	(0.083)	(0.131)	(0.061)	(0.072)
Anti-Director Rights	-0.051	-0.063	-0.064**	-0.080***
	(0.047)	(0.049)	(0.029)	(0.030)
Creditor Rights	0.018	-0.013	0.037**	0.042**
	(0.029)	(0.029)	(0.017)	(0.017)
TEA	0.053***	-0.083	0.014**	-0.067
	(0.010)	(0.059)	(0.007)	(0.034)
Likelihood Ratio	275.98***	53.37***	186.88***	41.50***
Number of Observations	12,477	2,821	20,881	9,976

Table 6. Success 2: Exit via M&A.

This table reports additional regression results. The variable *Successful Exit via Merger or Acquisition* takes the value of one if a firm successfully exited by merging with or being acquired by other firms, and zero otherwise. The variable *average investment per firm* is measured in millions of euros and *GDP per capita* and *R&D per capita* are measured in thousands of euro. All legal variables (*Rule of Law, Anti-Director Rights*, and *Creditor Rights*) originate from La Porta et al. (1997) and Spamann (2010). Here *TEA* values are from the annual GEM publications. We use the 2005 *TEA* values for all countries, except for Portugal, for which we use those for 2004. The analysis is conducted for the two sub-periods (1985–1999 and 2000–2009, with companies receiving VC funding through 2005), controlling for results with and without US data. Standard errors are in parentheses. The superscripts ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	1985–1999 (all countries)	1985–1999 (excl. US)	2000–2009 (all countries)	2000–2009 (excl. US)
Average Investment per Firm	-0.000 (0.003)	-0.005 (0.003)	0.001 (0.002)	0.002 (0.002)
Computer Sector	0.367*** (0.040)	0.025 (0.078)	0.295*** (0.036)	0.089* (0.051)
Semiconductors and Other	0.390*** (0.064)	0.206 (0.137)	0.206*** (0.050)	0.062 (0.087)
Biotech	0.065 (0.074)	-0.163 (0.154)	0.015 (0.061)	0.025 (0.091)
MHL	0.150*** (0.053)	-0.057 (0.133)	0.079 (0.049)	0.079 (0.075)
CM	0.321*** (0.040)	0.015 (0.109)	0.268*** (0.037)	0.215*** (0.062)
GDP per Capita	-0.026** (0.011)	-0.022 (0.014)	-0.043*** (0.003)	-0.031*** (0.003)
R&D per Capita	0.113 (0.333)	0.236 (0.345)	0.602*** (0.146)	0.617*** (0.146)
Rule of Law	0.188** (0.074)	0.183* (0.111)	0.084 (0.054)	0.033 (0.063)
Anti-Director Rights	0.111*** (0.043)	0.094** (0.044)	0.127*** (0.026)	0.096*** (0.026)
Creditor Rights	-0.018 (0.026)	-0.005 (0.027)	0.036** (0.015)	0.040*** (0.015)
TEA	0.040*** (0.008)	0.057 (0.050)	0.092*** (0.006)	0.086*** (0.028)
Likelihood Ratio	337.14***	17.83	1032.02***	188.46***
Number of Observations	12,477	2,821	20,881	9,976

Table 7. Successful exit of infant firms.

This table preports additional regression results. The variable *Successful Exit of Infant Firms* takes the value of *one* if a seed, startup, or early stage firm experienced overall success, and zero otherwise. Here *average investment per firm* is measured in millions of euros; *GDP per capita* and *R&D per capita* are measured in thousands of euros. All legal variables (*Rule of Law*, *Anti-Director Rights*, and *Creditor Rights*) are from La Porta et al. (1997) and Spamann (2010). The *TEA* values are from the annual GEM publications. We use the 2005 *TEA* values for all countries, except for Portugal, for which we use those for 2004. The analysis is conducted for the two sub-periods (1985–1999 and 2000–2009, with companies receiving VC funding through 2005), controlling for results with and without US data. Standard errors are in parentheses. The superscripts ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	1985–1999 (all countries)	1985–1999 (excl. US)	2000–2009 (all countries)	2000–2009 (excl. US)
Average Investment per Firm	-0.000 (0.006)	0.023** (0.011)	-0.001 (0.003)	0.005 (0.005)
Computer Sector	0.520*** (0.080)	0.281 (0.189)	0.236*** (0.067)	0.229** (0.103)
Semiconductors and Other	0.647*** (0.102)	0.214 (0.276)	0.159** (0.076)	0.179 (0.142)
Biotech	0.547*** (0.104)	0.689*** (0.232)	0.209** (0.084)	0.407*** (0.125)
MHL	0.340*** (0.088)	0.353 (0.245)	0.118 (0.079)	0.254* (0.134)
CM	0.567*** (0.067)	0.520** (0.206)	0.217*** (0.060)	0.324*** (0.116)
GDP per Capita	-0.115*** (0.022)	-0.029 (0.033)	-0.064*** (0.005)	-0.033*** (0.006)
R&D per Capita	0.206 (0.647)	0.687 (0.662)	0.902*** (0.257)	0.808*** (0.256)
Rule of Law	0.319** (0.135)	-0.029 (0.215)	0.027 (0.095)	-0.154 (0.115)
Anti-Director Rights	0.130* (0.072)	0.105 (0.074)	0.166*** (0.045)	0.115** (0.047)
Creditor Rights	-0.057 (0.043)	-0.108** (0.045)	-0.014 (0.026)	-0.017 (0.026)
TEA	0.084*** (0.015)	0.053 (0.089)	0.132*** (0.000)	0.033 (0.047)
Likelihood Ratio	262.14***	20.31*	525.96***	67.88***
Number of Observations	5,479	648	9,017	3,005

Table 8. Successful exit of mature firms.

This table reports additional regression results. The variable *Successful Exit by Mature Firms* takes the value of one if a mature firm experienced overall success, and zero otherwise. The *average investment per firm* is measured in millions of euros, and *GDP per capita* and *R&D per capita* are measured in thousands of euros. All legal variables (*Rule of Law*, *Anti-Director Rights*, and *Creditor Rights*) are from La Porta et al. (1997) and Spamann (2010). The *TEA* values are from the annual GEM publications. We use the 2005 *TEA* values for all countries, except for Portugal, for which we use those for 2004. The analysis is conducted for the two sub-periods (1985–1999 and 2000–2009, with companies receiving VC funding through 2005), controlling for results with and without US data. Standard errors are in parentheses. The superscripts ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	1985–1999 (all countries)	1985–1999 (excl. US)	2000–2009 (all countries)	2000–2009 (excl. US)
Average Investment per Firm	-0.006**	-0.009***	0.002	0.004**
	(0.003)	(0.003)	(0.002)	(0.002)
Computer Sector	0.243***	0.080	0.200***	0.220***
	(0.047)	(0.085)	(0.040)	(0.053)
Semiconductors and Other	0.347***	0.279*	0.309***	0.325***
	(0.086)	(0.153)	(0.068)	(0.095)
Biotech	0.377***	0.638**	0.414***	0.434***
	(0.125)	(0.267)	(0.086)	(0.120)
MHL	0.309***	0.366**	0.300***	0.291***
	(0.068)	(0.145)	(0.056)	(0.077)
CM	0.304***	-0.004	0.240***	0.299***
	(0.054)	(0.123)	(0.048)	(0.068)
GDP per Capita	-0.031***	0.004	-0.032***	-0.021***
	(0.012)	(0.014)	(0.003)	(0.003)
R&D per Capita	-0.127	0.126	0.599***	0.607***
	(0.357)	(0.368)	(0.149)	(0.149)
Rule of Law	0.284***	0.017	0.000	-0.071
	(0.081)	(0.118)	(0.054)	(0.063)
Anti-Director Rights	0.017**	0.012	0.045*	0.022
	(0.046)	(0.048)	(0.027)	(0.027)
Creditor Rights	0.018	0.025	0.055***	0.060***
	(0.028)	(0.028)	(0.015)	(0.015)
TEA	0.062***	-0.025	0.064***	0.038
	(0.009)	(0.056)	(0.006)	(0.031)
Likelihood Ratio	368.66***	40.35***	446.30***	155.13***
Number of Observations	6,998	2,173	11,864	6,971

Table A. Success by exit via IPO and M&A, by year.

This table presents additional summary statistics. The variable *Success by IPO* is computed as the number of firms venture capitalists successfully exited by IPO divided by the total number of firms receiving VC funding. The variable *Success by Merger or Acquisition* is computed as the number of firms venture capitalists successfully exited by merging with or being acquired by other firms divided by the total number of firms receiving VC. For both measures, the rates were computed considering the transactions occurring in the respective period/year and multiplied by a factor of 100.

Period/Year of Final Round of VC Funding	Number of VC-Backed Firms	Success by IPO	Success by Merger or Acquisition
1985–1994	7,735	28.55	26.15
1995	1,330	23.98	31.13
1996	1,962	22.94	29.82
1997	2,114	17.69	29.85
1998	2,997	15.35	27.19
1999	4,180	9.25	27.58
2000	6,495	6.34	22.69
2001	3,334	6.96	19.56
2002	2,116	9.07	18.52
2003	2,904	6.30	12.29
2004	3,026	6.31	10.18
2005	3,108	4.28	7.56

Table B. Success by exit via IPO and M&A, controlling by GDP growth.

This table reports a robustness exercise. The variables *Success by IPO* and *Success by M&A* take the value of one if a firm successfully exited by going public or by merging with or being acquired by other firms, respectively, and zero otherwise. The variable *average investment per firm* is measured in millions of euro. The variable *Real GDP* growth takes the average growth rate over each sub-period multiplied by a factor of 100, while *R&D per capita* is measured in thousands of euros. All legal variables (*Rule of Law*, *Anti-Director Rights*, and *Creditor Rights*) are from La Porta et al. (1997) and Spamann (2010). The *TEA* values are from the annual GEM publications. We use the 2005 *TEA* values for all countries, except for Portugal, for which we use those for 2004. The analysis is conducted for the two sub-periods (1985–1999 and 2000–2009, with companies receiving VC funding through 2005). Standard errors are in parentheses. The superscripts ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	1985–1999 (IPO, all countries)	1985–1999 (M&A, all countries)	2000–2009 (IPO, all countries)	2000–2009 (M&A, all countries)
Average Investment per Firm	-0.012***	-0.002	0.004**	-0.001
	(0.003)	(0.002)	(0.002)	(0.001)
Computer Sector	-0.142***	0.341***	-0.276***	0.340***
	(0.044)	(0.039)	(0.045)	(0.036)
Semiconductors and Other	0.053	0.368***	0.119*	0.214***
	(0.071)	(0.063)	(0.065)	(0.050)
Biotech	0.292***	0.042	0.194***	0.008
	(0.074)	(0.074)	(0.065)	(0.061)
MHL	0.096*	0.134***	0.131***	0.053
	(0.056)	(0.052)	(0.053)	(0.049)
CM	0.075*	0.309**	-0.180***	0.331***
	(0.045)	(0.040)	(0.050)	(0.037)
GDP per Capita	-0.126***	0.003	-0.038***	0.001
	(0.020)	(0.017)	(0.012)	(0.009)
R&D per Capita	-1.173***	-0.487**	0.343***	0.308**
	(0.277)	(0.241)	(0.166)	(0.142)
Rule of Law	0.312***	0.239***	-0.206***	-0.022
	(0.082)	(0.073)	(0.060)	(0.051)
Anti-Director Rights	0.077*	0.136***	-0.063**	0.067**
	(0.047)	(0.043)	(0.030)	(0.026)
Creditor Rights	-0.059**	-0.030	0.035**	0.038**
	(0.029)	(0.027)	(0.017)	(0.015)
TEA	0.057***	0.038***	0.009	0.060***
	(0.010)	(0.008)	(0.006)	(0.005)
Likelihood Ratio	305.26***	331.22***	180.77***	790.40***
Number of Observations	12,477	12,477	20,881	20,881

Table C. Success by stage of funding, controlling by GDP growth.

This table reports a robustness exercise. The variables *Success by Infant Firms* and *Success by Mature Firms* take the value of one if a seed, startup, or early stage firm (mature firm, respectively) experienced overall success, and zero otherwise. The variable *average investment per firm* is measured in millions of euro. The variable *Real GDP* growth takes the average growth rate over each sub-period multiplied by a factor of 100, while *R&D per capita* is measured in thousands of euros. All legal variables (*Rule of Law*, *Anti-Director Rights*, and *Creditor Rights*) are from La Porta et al. (1997) and Spamann (2010). The *TEA* values are from the annual GEM publications. We use the 2005 *TEA* values for all countries, except for Portugal for which we use those for 2004. The analysis is conducted for the two sub-periods (1985–1999 and 2000–2009, with companies receiving VC funding through 2005). Standard errors are in parentheses. The superscripts ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	1985–1999 (Infant Firms, All Countries)	1985–1999 (Mature Firms, All Countries)	2000–2009 (Infant Firms, All Countries)	2000–2009 (Mature Firms, All Countries)
Average Investment per Firm	-0.012**	-0.007***	0.004	0.000
	(0.005)	(0.002)	(0.003)	(0.001)
Computer Sector	0.391***	0.234***	0.395***	0.217***
	(0.076)	(0.046)	(0.068)	(0.040)
Semiconductors and Other	0.540***	0.336***	0.235***	0.293***
	(0.099)	(0.085)	(0.077)	(0.068)
Biotech	0.410***	0.365***	0.260***	0.399***
	(0.100)	(0.124)	(0.084)	(0.086)
MHL	0.247***	0.301***	0.153*	0.258***
	(0.086)	(0.067)	(0.079)	(0.056)
CM	0.523***	0.298***	0.352***	0.270***
	(0.066)	(0.053)	(0.062)	(0.048)
GDP per Capita	-0.101***	-0.061***	-0.029**	-0.003
	(0.027)	(0.020)	(0.014)	(0.011)
R&D per Capita	-1.887***	-0.624**	0.429*	0.392***
	(0.440)	(0.268)	(0.243)	(0.147)
Rule of Law	0.415***	0.301***	-0.096	-0.092*
	(0.131)	(0.080)	(0.089)	(0.052)
Anti-Director Rights	0.261***	0.094**	0.071	0.005
	(0.073)	(0.046)	(0.046)	(0.027)
Creditor Rights	-0.146***	-0.027	-0.014	0.057***
	(0.045)	(0.029)	(0.026)	(0.015)
TEA	0.081***	0.063***	0.065***	0.047***
	(0.015)	(0.009)	(0.008)	(0.006)
Likelihood Ratio	246.92***	371.35***	347.34***	326.00***
Number of Observations	5,479	6,998	9,017	11,864

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