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A Comparative Overview of Venture Capital in Europe and the United States

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Abstract. This paper gives a comparative overview of venture capital in Europe and in the United States. A comparison of aggregated data, which is afflicted with several difficulties, and a comparison of studies using micro data shows a couple of interesting differences and similarities between the European private equity market and the US venture capital market. The two markets are different with respect to the level and specialization of investments. The United States invested more venture capital per capita than Europe. Of each unit invested, Europe spent a larger part in firms' early stages than the United States. The two markets are similar with respect to control mechanisms used, such as incentive-enhancing compensation of fund managers, syndication of investments, and the use of convertible securities albeit the intensities of using these mechanisms differ between the United States and Europe. This paper does not only identify differences and similarities between the two markets but it also discusses several explanations for the existing differences and similarities.

Keywords: venture capital, private equity, market structure, Europe, United States**.**

1. Introduction

During the 1990s, venture capital activity in Europe experienced an extraordinary increase. In 1993, the investments in young firms amounted to 0.2 billion euros, while in 1999 more than 2.5 billion euros were invested in such firms. This boost raises the question whether the European venture capital market developed along the same lines as the US venture capital market, which is the prototype of venture capital finance. This paper offers a comprehensive description and comparison of the developments in the European and US venture capital markets that is the first step in determining whether the European market is similar to the US market in terms of its efficiency of providing funding for high-technology firms.

Venture capital is often referred to as a prerequisite for productivity and employment growth. In line with the American tradition, venture capital is understood as offering financial means to young high-technology firms in combination with management support for these firms by an experienced intermediary, the venture capitalist. The role of venture capital in facilitating

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employment and productivity growth has made venture capital a major target of financial market policies by European governments. European governments have made a variety of attempts to ease the access to equity capital for young high-technology firms by improving the regulatory conditions venture capitalists face and by granting rather generous subsidies.

In order to identify differences and similarities between the US and the European venture capital markets, this paper discusses all parts of the venture capital cycle: fundraising, investment, and divestment. Focusing solely on venture capitalists' investment behaviour would be misleading since the investment behaviour depends in turn on fundraising and divestment opportunities. In particular, venture capitalists may have higher incentives to invest in high-technology firms when they can use liquid stock markets for divestment or when they can use government money for new fundraising. In addition, capital providers, such as banks and pension funds, can substantially affect venture capitalists' investment and divestment behaviour.

A comparison of aggregated data on fundraising, investment, and divestment activities will indicate that the US venture capital market and the European market differ with respect to several characteristics. With respect to fundraising, pension funds were the main capital provider to venture capital funds in the United States, but not in Europe. Only in the middle of the 1990s, did the importance of pension funds as capital provider for venture capital in Europe rise. With respect to investment, US venture capital per capita was much higher than in Europe. But European investments were more specialized in firms' early stages of development than US investments. With respect to divestment, US venture capitalists exit from their participation via stock markets in comparison to trade sales more often than their European counterparts. Differences identified on the basis of aggregated data must be handled with care since statistics are not standardized. In particular, for Europe, only data on general private equity activity are available which covers equity investments in all kinds of firms and not only data on venture capital more narrowly defined. As an approximation of aggregated venture capital activity, private equity investments without buy-outs and private equity investments in firms' earliest development stages can be utilized. However, statements about European fundraising activity are always based on private equity in general.

In order to gain deeper insights into the differences and similarities between the US and the European venture capital markets, I will survey recent studies that analyse the US, the British, the German, and the French markets. While the number of studies analysing the different aspects of the venture capital cycle is large for the United States, it is very small for the European countries. Nevertheless some studies exist that can be used to identify differences and similarities between the US and the European market. These studies indicate that for example US venture capitalists differ from their

European counterparts with respect to the intensity of syndication. US venture capitalists more often syndicate their deals and they have more partners when syndicating their investments than their European counterparts. However, US venture capitalists and European private equity investors have several similarities with respect to their age, and the number of firms in their portfolios for example.

The remainder of this paper is divided into five sections. Section two is concerned with venture capitalists' fundraising. In this section, I will not only present aggregated data on fundraising activity in the United States and Europe, but also information on the organizational forms of venture capital companies and compensation systems of venture capitalists, i.e., managers of venture capital companies. Section three deals with venture capitalists' investment behaviour. In this section, I will present aggregated US and European investment figures, I will offer information on the control mechanisms used in the relationship between venture capitalists and the portfolio firms such as convertible securities and the staging of capital infusion, and I will discuss portfolio strategies such as specialization and syndication. Section four discusses venture capital divestment. In this section, I will discuss divestment channels such as trade sales and initial public offerings, and I will offer information on venture capitalists' divestment behaviour and the returns for capital providers. Section five summarizes the main results.

2. Fundraising: the Relationship between Venture Capitalists and Capital Providers

2.1. Aggregated Fundraising Figures

In the United States, venture capital activity has experienced a considerable boom in recent years. In 1990, only 375 venture capital companies were in existence, which managed 734 funds, employed 3,794 professional managers, and financed 1,317 firms. By contrast, in 2000, 693 venture capital companies were in existence, which managed 1,443 funds, employed 8,313 professional managers, and financed 5,412 firms (NVCA 2001). Thus, the average number of firms per professional manager increased from 0.35 in 1990 to 0.65 in 2000.

In Europe, the number of private equity investors has increased in some countries, while in others it has remained constant. In France, 575 venture capital executives that financed 1,654 firms were in existence in 1994. By contrast, in 2001, only 501 private equity executives financed 1,926 firms. In the United Kingdom, the number of private equity executives increased from 693 in 1994 to about 1,722 in 2000. At the same time, the number of private-

equity-backed firms increased slightly from 1,954 in 1994 to 2,054 in 2000. In Germany, the number of private equity executives was 340, and the number of private-equity-backed firms was 740 in 1994. In 2001, 1,364 private equity executives financed 1,969 firms. In 2001, German private equity executives had much more time to monitor the progress of the firms in their portfolios than seven years ago. In terms of private equity executives, the German private equity market grew at a higher rate than the British and the French market.

The volume of new funds raised for venture capital and private equity investments increased substantially in the observation period in the United States and in Europe. In the United States, new funds raised for venture capital increased from about three billion euros at the beginning of the 1900s to about 45 billion euros in 2001 (Table 1 opposite). In Europe, new funds raised for private equity increased from about four billion euros at the beginning of the 1990s to about 38 billion euros in 2001. During the 1990s, venture capital markets in the United States and in Europe were affected substantially by the over-valuation of high-technology shares. In the United States, new funds raised for venture capital accounted for more than 55 billion euros in 1999 and even more than 113 billion euros in 2000. In Europe, new funds raised accounted for about 25 billion euros in 1999 and 47 billion euros in 2000. Thus, the increase during the bubble time was stronger in the United States than in Europe.

In order to give an impression of the relative size of the two markets, Table 1 opposite shows US new funds raised for private equity per capita in addition to new funds raised for venture capital per capita. Comparing new funds raised for private equity per capita in the United States with the respective figures in Europe shows that the US market is much larger than the European market for private equity. In particular, in the United States, new funds raised for private equity per capita increased from about 25 euros in 1991 to about 446 euros in 2001, while in Europe new funds raised per capita increased from only 11 euros in 1991 to about 97 euros in 2001.

Table 1: Source of New Funds

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
					United States						
					Billion euros						
					Euros per capita						
Venture capital	1.5	3.9	3.2	6.6	7.6	9.8	15.5	27.4	55.2	113.6	45.0
	6	*16*	*13*	*25*	*29*	*37*	*58*	*101*	*202*	*412*	*162*
Private equity	6.3	14.4	19.4	28.4	33.4	44.2	67.2	101.5	132.5	229.1	123.8
	25	*57*	*75*	*109*	*127*	*167*	*251*	*375*	*485*	*832*	*446*
					Per cent of new funds raised for venture capital						
Corporations	4.8	3.7	8.2	9.3	4.6	19.9	25.2	11.9	14.2	3.7	2.6
Endowments and foundations	27.4	21.2	11.9	21.9	20.3	11.9	16.6	6.3	17.2	21.1	21.8
Individuals and families	13.4	12.1	7.4	12.2	16.7	6.8	12.5	11.3	9.6	11.8	9.4
Financial and insurance	5.9	17.3	11.6	9.7	20.0	3.1	6.3	10.3	15.5	23.3	24.5
Pension funds	48.4	45.6	60.8	46.9	38.4	58.3	39.5	60.1	43.5	40.1	41.7
					Europe						
					Billion euros						
					Euros per capita						
Private equity	4.2	4.2	3.4	6.7	4.4	8.0	20.0	20.3	25.4	47.2	38.0
	11	*11*	*9*	*18*	*11*	*21*	*52*	*52*	*65*	*121*	*97*
					Per cent of new funds raised for private equity						
Corporate investors	5.1	5.1	5.3	10.2	4.9	3.5	11.3	9.8	9.5	10.1	5.5
Private individuals	4.7	4.7	3.1	2.7	3.4	7.4	4.0	7.6	6.2	6.7	6.3
Government agencies	1.6	1.6	6.5	2.7	3.1	2.3	2.2	5.1	4.7	5.1	5.7
Banks	36.2	36.2	30.0	28.4	25.6	29.8	25.8	27.8	29.1	19.4	22.8
Pension funds	14.6	14.6	15.7	19.7	27.3	22.7	25.0	24.0	18.7	22.4	25.8
Insurance companies	11.3	11.3	10.0	12.2	10.8	11.3	16.4	8.9	13.2	11.9	12.2

Note: Europe includes Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

Source: European new funds raised and exchange rates are from EVCA 1991-2001, US new funds raised are from NVCA (2002).

The difference in the amounts of new funds raised for private equity between the United States and Europe and the difference in the amounts of venture capital, can be caused by several factors that affect the venture capital demand and/or the venture capital supply. Factors affecting the venture capital demand are discussed in Section 3. Factors affecting the venture capital supply are those that affect the risk-return relationship of venture capital investments in comparison to alternative investments. The risk-return relationship is decisive for capital providers' portfolio decisions. The tax system is expected to have a significant impact on the capital providers' portfolio decisions since it can favour particular forms of investments. For example, outside investors have lower incentives to invest in venture capital funds and higher incentives to invest in bonds when losses made with venture capital investments are not tax deductible. In addition, the risk-return relationship of venture capital investments depends on several pieces of legislation and regulations especially regarding shareholder rights. For example, better anti-director rights, are expected to have a positive effect on returns on equity investments and, thus, on venture capital investments, and a negative effect on risks of these investments since they protect shareholders. Accounting standards are expected to have similar effects than anti-director rights since they reduce transaction costs arising when investors gather information. The better accounting standards are, the easier and cheaper it is to get information about a particular firm.

Differences in venture capital activity may be the result of differences in the financial architecture of the economies. In many European countries, banks are the major players, while, in the United States, shareholders play an important role. Banks seem to have many disadvantages with respect to financing young high-technology firms especially because the control mechanisms of banks do not work well in the case of these firms. High-technology firms that invest a large part of their capital into research and development activities cannot offer collateral. Thus, collateral is not at bank's disposal as a selection mechanism. Additionally, bank managers are less likely to have enough experience to select the most promising high-technology firms.

In addition, only few European countries have large pension funds which seek investment opportunities with a promising risk-return relationship as carried out by US pension funds. Using panel data technique, Jeng and Wells (2000) identify pension funds as a driving factor of new funds raised over time. However, in their analysis, pension fund activity does not explain the differences in new funds raised across countries.

The difference in the importance of large financial players between the United States and Europe is reflected in the structure of capital providers that offered new funds for venture capital and private equity (Table 1). In the United States, pension funds have been the most important capital provider to venture capital funds organized as limited partnerships, while corporations and

financial and insurance companies have played a minor role. Pension funds contributed between 38 and 60 per cent of the new funds raised for venture capital between 1991 and 2001. All other types of limited partners, such as financial and insurance corporations, did not contribute more than 20 per cent of the total new funds raised in most years.

The European private equity market differs from the US venture capital market with respect to importance of capital providers. In Europe, banks have contributed large amounts of capital for private equity investments. But, in recent years, the role of pension funds, measured as a percentage of the new funds raised for private equity investments, has increased significantly, while the role of banks has decreased considerably. The significance of other investor groups, such as individuals, corporate investors, and insurance companies varied little during the observation period.

The importance of banks and pension funds as capital providers for private equity differs considerably between the European countries. In Germany, for example, banks contributed as much as 50 per cent of the new funds raised for private equity at the beginning of the 1990s. Only at the end of the 1990s did the share of new funds provided by banks decrease, while the share provided by pension funds increased considerably. The French private equity market is also dominated by banks like the German market. By contrast, the British private equity market is the only European market in which pension funds have continuously provided large amounts of capital.

2.2. Organizational Form

The US and the European market differs with respect to the legal status of venture capital and private equity investors. While the data on the US venture capital market presented in Table 1 mostly cover independent venture capitalists, the data on the European private equity markets also cover dependent equity investors. Independent equity investors have to raise capital in financial markets, while dependent equity investors are legally connected to their capital providers. European independent equity investors comprise investors that invest money without supporting the firms' management teams, and venture capitalists that offer management support in addition to financial means. Dependent equity investors comprise public equity investors, subsidiaries of private banks or savings banks, and corporate equity investors. Public equity investors are controlled mainly by public authorities and are often non-profit oriented. Subsidiaries of private banks rely on funds provided by private banks. Subsidiaries of savings banks can be funded either by savings banks and/or cooperative banks. These private equity investors are distinguished from private banks because they promote firms in the region in

which they operate (Kulicke 2001). Corporate equity investors receive their funds from large corporations.

European countries do not show a clear pattern with respect to the importance of dependent and independent private equity investors. Independent private equity investors have dominated the British market: independent private equity investors raised about 77 per cent of new funds in 2000. By contrast, dependent private equity investors have dominated the French market. The share of new funds raised by independent private equity investors was as low as 24 per cent in 1997. However, the share has increased substantially in recent years and reached almost 70 per cent in 2001. For Germany, data on new funds raised by types of private equity investors are only available for the years after 1998. In 1999, independent private equity investors raised about 60 per cent of the new funds. Since German independent private equity investors are comparatively young compared to subsidiaries of banks and subsidiaries of savings banks (Schertler 2001), one can argue that the importance of independent equity investors has not only increased in France but also in Germany.

In Germany, the predominant organizational form of private equity funds has changed from unlimited open funds (so-called evergreens) to limited closed funds in the last years. At the beginning of the 1990s, private equity funds were often organized as funds without specified time frames or volumes, while at the end of the 1990s, more than 60 per cent of the new funds raised were raised by closed funds (BVK 2000). The cause of this is not a change in the behaviour of the private equity investors already acting in the market at the beginning of the 1990s, but a large number of young and independent equity investors that entered the market at the end of the 1990s and refinanced themselves with closed funds (Bascha and Walz 2001b).

In the United States and the United Kingdom, organizations infusing venture capital are typically organized as limited partnerships (Lerner 1995, Barnes and McCarthy 2002). In a limited partnership, the general partner (the venture capitalist) is independent of his limited partners (his capital providers). Institutional investors find these limited partnerships attractive, since taxes are paid only by the (taxable) investors but not by the limited partnership (Gompers and Lerner 1998b). Thus, the organizational form of the relationship between venture capitalists and their capital providers is affected significantly by legal and tax rules. Limited partnerships have to fulfil several legal constraints. They must have a pre-determined, finite lifetime (usually ten years). Participation of limited partners in the active management is forbidden, and the transfer of limited partnerships' shares is restricted (Sahlman 1990). At the end of the lifetime, the general partner (the venture capitalist) typically distributes the shares to his limited partners (his capital providers).

The limited partnerships seem to have some advantages over other organizational forms. One advantage might be the independence of the general

partners (venture capitalists) from the limited partners (capital providers). Capital providers of independent venture capitalists do not impose restrictions regarding venture capitalists' investment strategies as their dependent counterparts do. This independence seems to be important to make sure that the market conditions and the profit expectations of venture capitalists are the only driving force for venture capitalists' specialization of investments at particular stages and/or in particular technologies which change when market conditions change. Another advantage might be the limited and pre-specified lifetime of the funds, since it can protect the limited partners from the possibility that the general partner could decide against their interests (Sahlman 1990). In addition, as Brouwer and Hendrix (1998) argue, the limited and pre-specified lifetime of funds seems to make it easier for venture capitalists to invest in start-up firms and to exit from their investments in time.

However, the limited and pre-specified lifetime of the funds may also give venture capitalists incentives to abandon projects too early and to select only firms from which they can exit in time. Furthermore, it must be kept in mind that venture capitalists, when organized in a limited partnership, are not only interested in the performance of the firms in their portfolios but also in raising new funds. Gifford (1997) shows in a theoretical model that venture capitalists spend less time on management support in the firm than would be optimal from the entrepreneurs' point of view, as well as from the capital providers' point of view, since venture capitalists need time to raise new funds. By contrast, dependent venture capitalists can concentrate exclusively on supporting the management of the firms in their portfolios.

The evidence found by Gompers and Lerner (1996) indicates that US limited partnerships are affected by changes in the intensity of competition for funds: the general partners have more negotiation power when the supply of venture capital by limited partners increases. In their regression analysis, the growth rate in the venture pool in the year in which the fund is closed to new limited partners (as an approximation of the change in the venture capital supply) negatively affects the number of covenant classes in the contracts between limited and general partners, since the availability of experienced venture capitalists is fixed in the short-term.

2.3. Compensation System

The compensation system of venture capitalists who are general partners in a limited partnership has two components. Venture capitalists participate in profits of the venture capital funds and they receive a fixed management fee. This compensation system can be interpreted as a mechanism that capital providers utilize to offer venture capitalists strong incentives to carefully monitor and support the portfolio firms after the contract between venture

capitalists and the capital providers has been signed. This is necessary because capital providers cannot monitor whether venture capitalists fulfil their management support and monitoring function in the portfolio firms or whether they waste their time.

Venture capitalists who are general partners in a limited partnership receive an annual management fee of usually around 2.5 per cent of the capital committed (Sahlman 1990). Moreover, they receive a part of any realized gains of the fund, the so-called carried interest. 90 per cent of the European private equity funds analysed by Feinendegen et al. (2002) receive 20 per cent of the realized gains of the funds. In the United States, about 80 per cent of the venture capitalists receive 20 per cent of the realized gains, 15 per cent receive 25 per cent of the realized gains, and 5 per cent receive even 30 per cent of the realized gains.

In Germany, professional managers of subsidiaries of private banks often do not receive profit participation in addition to their basic salary. As a consequence, these managers have different incentives to support the management teams and to monitor the development of the firms in which they invest than their independent counterparts (Zemke 1995).

Some evidence exists indicating a learning process in the US venture capital market. This learning process can also be at work in European countries. In particular, the study by Gompers and Lerner (1999) shows that young venture capitalists' compensation depends less strongly on the performance of the funds than the compensation of older venture capitalists. The compensation of young venture capitalists, who have managed few funds and funds with small capital amounts, contains a higher basic fee than the compensation of older venture capitalists. Since Gompers and Lerner (1999) do not find a significant relation between performance and incentive compensation, they argue that the relationship between venture capitalists and capital providers can be explained by a learning model. Young venture capitalists do not need incentive-enhancing compensation because they have sufficient incentives to perform well since they have to build a reputation. The study by Gompers and Lerner (1998b) shows that the age of the venture capital company has a significantly positive impact on the volume of funds raised. Thus, those venture capitalists who have just started their career as active financial intermediaries have comparatively low volumes of funds.

Two explanations for young venture capitalists' low volumes of funds are possible. First, young venture capitalists raise only small volumes even if they can raise more funds at the same price because they find themselves not capable of managing larger funds (one reason for this might be that they do not have experienced staff). In this case, they think they lack or they actually do lack the experience important to finance high-technology firms successfully. Second, they raise only small volumes because they do not receive more funds from capital providers or they receive additional funds only at a much higher

price. In this case, young venture capitalists do not lack experience but they lack reputation important to raise new funds from uninformed capital providers at favourable conditions. After some success stories of firms backed by the respective young venture capitalist, capital providers start to believe in the capabilities of the venture capitalist and offer capital at more favourable conditions.

3. Investment: the Relationship between Venture Capitalists and Entrepreneurs

3.1. Aggregated Investment Figures

3.1.1. Investment Levels

In the United States, the recent upswing in venture capital investments started in 1995. As Table 2 below indicates, the venture capital investments accounted for about three billion euros in 1994, while they accounted for more than five billion euros in 1995. However, this increase was rather moderate compared to the increase at the end of the 1990s. In 1998, venture capital investments accounted for more than 19 billion euros, in 1999 venture capital investments exceeded 51 billion euros, and in 2000 they reached about 115 billion euros. This upswing changed the US venture capital model. At the end of the 1990s, there were not only venture capitalists who offered management support in addition to financial means but also 'venture capitalists' who had a get-rich-quick mentality (Evans 2001). As the fundraising activity, venture capital investments dropped sharply after the bursting of the stock market bubble in 2000. In 2001, venture capital investments accounted for 45 billion euros, which is low compared to the investment level of the year 2000 but high compared to the investment levels of the beginning of the 1990s.

The upswing on the European private equity markets took place in a temporally retarded manner when compared to the US venture capital market. As Table 2 indicates, the private equity investments accounted for about five billion euros at the beginning of the 1990s. The European market started to grow between 1996 and 1997, in which the private equity investments increased by more than 40 per cent to about 10 billion euros. After that, investments increased substantially until 2000. However, the growth rate of private equity investments between 1998 and 2000 was lower than the respective rate of US venture capital investments. While European private equity investments grew at a rate of 1.4, US venture capital investments grew at a rate of 5.0. European private equity investments in 2001 are rather low in

comparison to the investments in 2000. But they are as high as the private equity investments in 1999.

Table 2: Investment Disbursement by Stages and Technologies

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
United States											
Billion euros											
Euros per capita											
Venture capital	1.8	2.6	3.8	3.3	5.6	9.4	14.2	19.1	51.1	114.7	45.4
	7	*10*	*15*	*13*	*21*	*35*	*53*	*71*	*187*	*417*	*163*
Per cent of venture capital											
Early	35.9	32.2	49.5	41.1	43.1	42.9	30.2	34.0	28.3	27.4	24.9
Expansion	46.8	50.4	38.3	34.8	41.7	42.8	50.9	50.5	55.6	57.6	56.7
Later	17.3	17.4	12.2	24.1	15.2	14.3	18.9	15.5	16.0	15.0	18.5
Information and communication	40.2	36.7	50.6	40.7	40.2	42.1	44.0	47.0	49.0	57.4	59.3
Biotechnology and medical	25.9	34.2	22.7	28.5	25.3	23.3	26.9	16.7	8.0	6.9	14.1
Europe											
Billion euros											
Euros per capita											
Private equity	4.6	4.7	4.1	5.4	5.5	6.8	9.7	14.5	25.1	34.6	24.0
	12	*12*	*11*	*14*	*14*	*18*	*25*	*37*	*65*	*89*	*61*
Private equity without buy-outs	3.0	3.1	2.4	3.0	3.0	3.6	4.8	7.1	11.8	20.2	12.2
	8	*8*	*6*	*8*	*8*	*9*	*12*	*18*	*30*	*52*	*31*
Per cent of private equity											
Per cent of private equity without buy-out											
Early	6.9	6.9	4.9	5.7	5.8	6.5	7.4	11.4	12.9	19.1	17.2
	10.6	*10.5*	*8.4*	*10.3*	*10.6*	*12.3*	*15.0*	*23.3*	*27.4*	*32.7*	*33.8*
Expansion	52.6	52.6	45.9	42.2	41.4	40.0	35.0	30.0	29.6	36.7	32.9
	80.7	*79.7*	*78.4*	*76.0*	*75.9*	*75.6*	*70.7*	*61.3*	*63.0*	*62.9*	*64.7*
Replacement	5.9	5.9	8.4	8.0	6.4	7.1	7.6	7.5	4.7	2.6	4.8
	9.0	*9.0*	*14.4*	*14.4*	*11.7*	*13.4*	*15.4*	*15.3*	*10.0*	*4.5*	*9.4*
Buy-out	34.6	34.6	40.8	44.1	46.4	46.4	50.1	51.2	52.8	41.6	45.1
	-	-	-	-	-	-	-	-	-	-	-
Information and communication	10.5	10.7	10.8	10.4	16.2	13.6	16.9	20.8	24.5	30.6	28.3
	16.1	*16.2*	*18.5*	*18.7*	*29.7*	*25.7*	*34.2*	*42.5*	*52.1*	*52.4*	*55.7*
Biotechnology and medical	5.7	5.3	5.9	5.0	7.6	6.3	6.9	7.1	6.6	10.9	10.3
	8.7	*8.0*	*10.1*	*9.0*	*13.9*	*11.9*	*13.9*	*14.5*	*14.0*	*18.7*	*20.3*

Note: Europe includes Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom. Early stages contains the seed and start-up stage. Later stage contains investments in the later stage, bridge financing, and open market activities (NVCA 2002). European *Information and communication* contains investments in communications, computer-related, other electronics-related. US *Information and communication* contains communications, computer software, computer hardware and services.

Source: Investment volumes are from EVCA (various issues), exchange rates are from EVCA (various issues), and US investment volumes are from NVCA (2001).

In order to give an impression of the relative size of the two markets, Table 2 reports European private equity investments without buy-outs per capita as a rough measure comparable to US venture capital investments per capita. Comparing these figures indicates that the US venture capital investments per capita were higher than the European private equity investments without buy-outs per capita except in 1991. While the differences between US venture capital investments per capita and European private equity investments without buy-outs per capita were only moderate at the beginning of the 1990s, they were substantial at the end of the 1990s. In particular, per capita, the United States invested only twice as much as Europe in 1993, while the United States invested about 8 times as much than Europe in 2000.

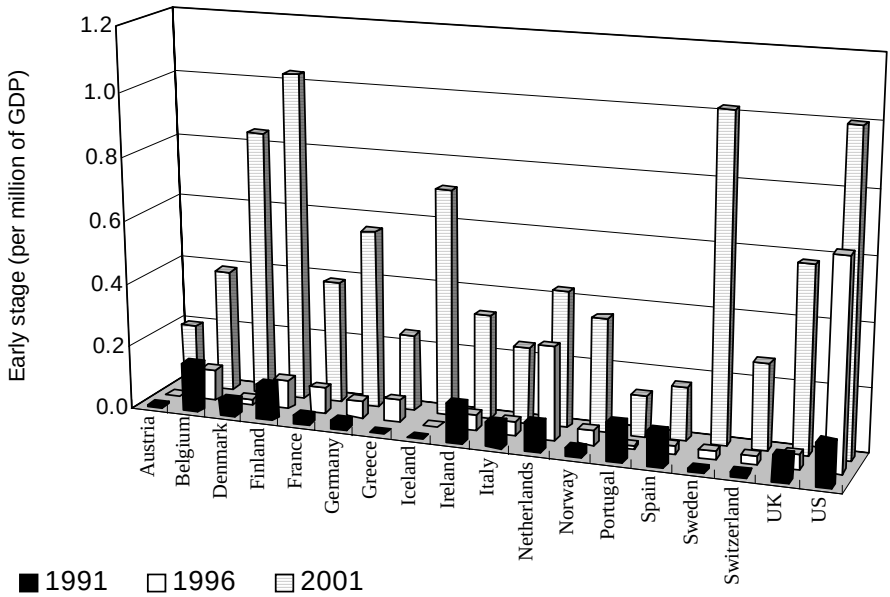
US venture capital has been used traditionally to finance firms' early[2] and expansion stages of development. At the beginning of the 1990s, US venture capitalists invested about one billion euros in firms' early stages, and another billion in firms' expansion stage. In 2001, by contrast, they invested more than 10 billion euros in firms' early stages, and more than 25 billion euros in firms' expansion stage. These stages of firms' development are of special interest because young high-technology firms are believed to be a prerequisite for productivity and employment growth. In their early stages, firms have not yet established their product markets. Firms in the expansion stage require large amounts of external funding because the cash flow often does not yet generate enough liquidity to finance the firm's growth internally.

Between 1991 and 2001, the absolute amounts of European private equity invested in firms' early stages were lower than US amounts, while the absolute amounts of European private equity invested in firms' expansion stage was sometimes higher. With respect to the early stages, European private equity investors invested about 0.3 billion euros in firms' early stages at the beginning of the 1990s. This amount increased up to 6.6 billion euros in 2000. Thus, in absolute terms, US venture capitalists invested three times as much in firms' early stages at the beginning of the 1990s, and even almost five times as much in 2000. With respect to the expansion stage, European private equity investors invested about 2 billion euros at the beginning of the 1990s. This amount increased up to 12.7 billion euros in 2000. Thus, in absolute terms, European private equity investors invested double as much as US venture capitalists in firms' expansion stage at the beginning of the 1990s, while US venture capitalists invested five times as much as the European private equity investors in this stage in 2000.

2. The early stages are the seed and start-up stage. In the seed stage, the initial business concept is formed and prototypes of new products are developed and compared with competing products in the market. In the start-up stage, production is set up and an initial marketing campaign is launched, the market reaction to which is carefully analysed.

What about the relative size of early-stage investments in the United States and in Europe? Figure 1 below depicts the early-stage investments for selected European markets and for the US market as per million of GDP for the years 1991, 1996, and 2001. Figure 1 shows that early-stage investments increased in all European countries. However, the differences between the European markets and the US market in terms of relative investments in firms' early stages are still substantial. In 2001, only Sweden and Finland realized a level of early-stage investments as per million of GDP that is comparable with the level of the United States. While the United States invested about one per million of its GDP as early-stage venture capital, the United Kingdom and Germany invested less then 0.6 and France less than 0.4 million of their GDPs as early-stage venture capital in 2001.

Figure 1: Early-Stage Investments in the United States and Europe (per million of GDP)



Source: NVCA (2002), EVCA (various issues), and OECD (2002).

3.1.2. Explaining Differences in Investment Levels

How can the difference in venture capital investments be explained? As argued in the last section, differences in private equity and venture capital activity can be caused by factors that affect the venture capital supply, such as individual

and corporate taxes and shareholder rights. The difference can also be caused by factors that affect venture capital demand. Venture capital demand by high-technology firms is also affected by individual and corporate taxes, and shareholder rights since they determine individual incentives for entrepreneurship. These incentives also depend on the design of labour markets. The incentives for entrepreneurship are expected to be lower in continental Europe's rigid labour markets than in flexible labour markets. In addition, venture capital demand may depend on human capital endowments of the economies, which determine the number of innovative ideas and, thus, the number of firms that try to realize innovative ideas. Moreover, it may depend on the institutional environment determining the way in which innovative ideas are financed in order to realize them. Unfortunately, no empirical study analyses the impact of the human capital endowments or the innovation system on private equity activity in a cross-country sample. However, one study analyses the impact of the human capital endowments on early-stage investments.

As the study by Schertler (2003) shows, differences in early-stage investments can be explained by the human capital endowments and the availability of liquid stock markets. Using dynamic panel data techniques, she finds evidence that the level of early-stage investments used as a narrow definition of venture capital depends positively on the stock market capitalisation and on the number of research and development employees used as an approximation for the human capital endowments of 14 Western European countries.

The positive impact of the number of research and development employees on early-stage investments can be explained by the specific nature of venture capital. The monitoring and supporting services make venture capital finance expensive compared to other sources of finance. Therefore, demand for venture capital comes only from peculiar firms, such as young high-technology firms, since control mechanisms that can be embedded in standard contracts are not necessarily applicable to these firms. For the development of business ideas in high-technology fields human capital is necessary.

The positive impact of stock markets on venture capital does not only exist for early-stage investments but also for expansion-stage investments as the study by Jeng and Wells (2000) shows. There are three reasons for the positive relationship. First, one can argue that when venture capitalists are exiting from their participations the share price of the respective firm can be determined more efficiently in a stock market sale than in a trade sale to an informed capital provider, such as an established firm in the industry. This is because of the large number of buyers in the case of a stock market sale. Second, as Black and Gilson (1998) argue, stock markets can increase the entrepreneur's incentives since they offer the possibility for venture capitalists and

entrepreneurs to enter into an implicit contract over control. Third, stock markets lower the costs for reputation building of venture capitalists and private equity investors. This reputation determines the selling conditions, e.g. the underpricing, of venture-capital-backed firms going public in the future. Reputation in order to determine selling conditions is likewise important for dependent and independent equity investors, while reputation in order to raise new funds at better conditions is mostly important for independent equity investors. In the presence of liquid stock markets, independent equity investors can signal their capabilities and experiences in financing high-technology firms to capital providers at lower costs.

Differences in early-stage investments can also be explained by alternative investment vehicles available. Early-stage investments may differ because of differences in informal venture capital markets, in which the so-called business angels, i.e. wealthy individuals, invest their own financial resources in firms' early stages of development. However, the relationship between formal and informal venture capital markets is not clear from a theoretical point of view. On the one hand, informal venture capital can be a close substitute for formal venture capital investments in firms' early stages. In this case, low levels of early-stage investments may result from high levels of business angel activity. On the other hand, several types of complementarities may exist between informal (business angels) and formal venture capital markets, such as sequential investing and co-investments (Harrison and Mason 2000). In this case, low levels of early-stage investments may result from low levels of business angel activity.

Some of the informal venture capital markets have been analysed in the recent literature. However, estimates can only approximate the volumes of informal venture capital, since official statistics are not available. In the United States, the invested informal venture capital is estimated to be about USD 60 billion annually (Van Osnabrugge and Robinson 2000). In the United Kingdom, the invested informal venture capital is estimated to be of a volume ten times as high as the early-stage investments by formal private equity investors (EBAN 1998). In Germany, 27,000 business angels are thought to be active, with an annual investment volume of about 1.4 billion German marks (Just 2000). Thus, the informal venture capital market in the United States measured in terms of GDP is four times as large as the one in the United Kingdom, which is in turn three times as large as the one in Germany. This is in line with the existence of complementarities between informal and formal venture capital markets so that low levels of business angel activity are associated with low levels of early-stage investments.

Differences in early-stage investments can also be explained by government subsidies. Early-stage investments may differ because national policies in form of subsidies reduce the costs of investments in young high-technology firms. Almost all European governments utilize public policies to

improve the capital supply for young, high-technology firms (OECD 1997). European governments try to boost private equity investments in young high-technology firms by utilizing tax incentives for capital providers, by establishing state-owned funds that invest capital in young high-technology firms, and by offering capital at favourable conditions to independent and dependent private equity investors and venture capitalists. When the government refinances private equity investors' participations in high-technology start-ups with loans at favourable interest rates, high-technology start-ups become more attractive for investors compared to other investment possibilities. Therefore, a considerable volume of early-stage investments can be the result of government intervention.

What kinds of public policies have been used in particular countries? The United Kingdom has established tax incentives for private equity investments and has started to offer government equity for small deals (Baygan 2003). In France and Germany, investments are supported using loan and equity guarantees (Dubocage and Rivaud-Danset 2002). Under guarantee schemes, the government covers a share of private equity investors' realized losses. In addition, the French government offers tax incentives for private equity investors who invest a certain percentage of their funds in high-technology start-ups (Dubocage and Rivaud-Danset 2002).

Although European governments have subsidized private equity investments in young high-technology firms, early-stage investments as per million of GDP are lower in European countries than in the United States. This does however not indicate that European subsidies are not successful in promoting early-stage venture capital. In fact, one does not know the US or European equilibrium level of early-stage venture capital given a particular architecture of financial markets, entrepreneurial incentives, individual and corporate taxes, human capital endowments, characteristics of the innovation system and so on. The only thing which can be said is that Europe's subsidies have not been sufficient to catch up with the United States in terms of early-stage investments.

3.1.3. Specialization of Investments

Apart from comparing investment levels, it is interesting to compare the specialization of investments on particular types of firms since this offers information on investments opportunities in venture capital markets. In the United States, investments in firms' expansion stages to total investments increased stronger than the investments in firms' early stages to total investments between 1998 and 2000 (Table 2). The reason for this may be the significant increase in the total capital committed. Greater commitments of capital are in favour of the expansion or later development stages, because

firms in these stages are capable of using larger amounts of money than firms in the early stages (Gompers 1998). A boost in the committed capital leads to investments of larger size and not to a larger number of investments. There are two reasons for this. First, individual time constraints lead to a particular number of firms that each venture capitalist can select, monitor and support so that venture capitalists have few incentives to increase the number of firms in their portfolios. Second, the supply of experienced venture capitalists is not very flexible in the short-term (Gompers 1998).

With respect to the share of private equity invested in firms' early stages and expansion stage to total private equity, Europe experienced a different development than the United States. In Europe, the share of private equity invested in firms' early stages increased substantially during the 1990s, while in the United States the share decreased in the second half of the 1990s. In Europe, the share of private equity invested in firms' expansion stage declined between 1991 and 1999, while in the United States the share increased in the second half of the 1990s. To some extent, the decline in Europe's share of expansion-stage investments mirrors the substantial increase of the early-stage investments.

The European and the US shares of early stage investments differed substantially during the 1990s. In 1993, only about 8 per cent of the European private equity without buy-outs was invested in firms' early stages, while the respective number was about 33 (34) per cent in 2000 (2001). By contrast, at the beginning of the 1990s, more than 30 per cent of the US venture capital was invested in firms' early stages, while the respective number was about 27 (25) per cent in 2000 (2001). Thus, at the end of the 1990s, of each unit invested, Europe spent a larger part in firms' early stages than the United States when arguing on the basis of private equity without buy-out activity.

The low European shares of private equity invested in firms' early stages at the beginning of the 1990s are not astonishing because banks were dominant in Europe and banks have several disadvantages with respect to financing young high-technology firms as argued above. But what drove the significant increase in the shares of private equity invested in firms' early stages during the 1990s? The substantial increase in the share can be explained by two developments. First, European governments have started to subsidize early-stage investments more intensively. Thus, early-stage investments have become more profitable in comparison to expansion-stage investments. Second, pension funds as capital providers increased their importance during the 1990s. This may have affected the share of private equity invested in firms' early stages since pension funds provide capital to independent private equity investors who have a higher propensity to invest in firms' early stages than private equity investors who are bank subsidiaries. This explanation holds, however, only if the European private equity market is not a mature market because one expect that higher capital commitments by outside investors in

mature markets lead to decreasing early-stage investments and increasing later-stage investments.

Investments are not only specialized in particular stages of development but also in particular technologies. US venture capital investments have been highly specialized in a small number of high-technology industries (Table 2). The share of venture capital invested in firms operating in the information and communication business was always about 40 per cent in the 1990s. After 1996, this share increased significantly and reached about 59 per cent in 2001. Thus, venture capital invested in firms operating in the information and communication business increased in absolute as well as in relative terms. Venture capital investments in biotechnology and medical-related firms, however, increased only in absolute terms but not in relative terms. This investment share decreased from about 27 per cent of the venture capital investments in 1997 to less than seven per cent in 2000.

European private equity investments were not specialized as much in financing information and communication firms as the US venture capital investments were when arguing on the basis of total private equity (Table 2). While the share of venture capital invested in information and communication firms was always at least about 40 per cent in the United States, a share of private equity invested in information and communication firms lower than twenty per cent was not uncommon in Europe. Even at the end of the 1990s, only about 30 per cent of the private equity were invested in information and communication firms.

However, when arguing on the basis of private equity without buy-outs and assuming implicitly that most buy-out investments are not in high-technology industries, then Europe's private equity without buy-outs was as much specialized in financing information and communication firms than US venture capital (Table 2). During the 1990s, the European share of private equity invested in information and communication firms increased from about 16 per cent in 1991 to more than 52 per cent in 1999 and even more than 55 per cent in 2001. Thus, at the beginning of the 1990s, European private equity investments were not specialized as much in particular high-technology industries as the US venture capital investments, while at the end of the 1990s they were when arguing on the basis of private equity without buy-outs.

With respect to the investments in biotechnology and medical-related firms, Europe experienced a different development from the United States at the end of the 1990s. In the United States, venture capital investments in biotechnology and medical-related firms increased only in absolute terms, while the share of investments in these firms to the total investments decreased. In Europe, however, both the absolute volume as well as the share of investments in biotechnology and medical-related firms increased at the end of the 1990s. The increase was so significant that the share of private equity

invested in biotechnology and medical-related firms was even larger than the respective share in the United States in 2000.

3.2. Venture Capitalists and Their Portfolio Firms

The relationship between venture capitalists and their portfolio firms has been the focus of many studies. One group of studies examines the value added by venture capitalists, while another group discusses control mechanisms used in the relationship. The question of whether venture capitalists add value to high-technology firms is of particular interest since the answer relates the efficiency of venture capital finance. Discussing control mechanisms, such as soft and contractually specified control mechanisms, is sensible to understand and to explain the differences in venture capital finance across countries.

Although the body of literature addressing soft and contractually specified control mechanisms and the value added by venture capitalists has grown significantly in recent years, studies analysing the European market are still few in number compared to the number of studies for the United States. This is a result of a lack of data availability for European venture capital activity. Because of this, many studies describe only the European market without using large data sets and adequate econometric methods. Table 3 opposite offers some information on these studies using large European or US data sets.

Comparing studies of the US venture capital market and the European private equity market in order to identify similarities and differences is difficult for at least three reasons. First, the number of observations in European data sets is quite often very small and this raises concerns about the robustness of regression results. Second, studies of European markets most often use data from the end of the 1990s, while studies on the US market use different observation periods. This might be a problem because shares of high-technology firms were overvaluated at the end of the 1990s and this over-valuation is expected to have changed the behaviour of US venture capitalists. Third, studies of the European market do not always distinguish between the different types of private equity investors active in Europe. This might lead to non-interpretable results. Let me give an example. Let us assume that control mechanisms such as the staging of capital infusion or entrepreneurs' incentive compensation are not used intensively by private equity investors in a particular country. This observation may be driven by a high proportion of dependent private equity investors in the market. Dependent private equity investors have no incentive to use these control mechanisms if using these mechanisms is costly for them and if they do not participate in the profits of the private equity fund. Thus, observations based on all types of private equity investors are not at all informative and cannot be compared with observations based on particular types of private equity investors.

Table 3: Studies Analysing Soft Control Mechanisms, Contractually Specified Control Mechanisms, and the Value Added by Venture Capitalists

Study	Data Sample	Main Results
Baker and Gompers (1999b)	1,076 IPOs of US firms	♦Insiders' representation on the board of directors decreases with venture-capital-backing and with venture capitalists' reputation. Experienced venture capitalists are more capable of reducing the fraction of insiders on the board of directors than their inexperienced counterparts. ♦The probability of a founder remaining as CEO increases with venture-capital-backing and decreases with venture capitalists' reputation.
Hellmann and Puri (2002)	170 venture-capital- and non-venture-capital-backed Silicon Valley start-ups	♦Venture-capital-backed firms use more often professional contracts to recruit sales and marketing personal and administrative and managerial personnel than their non-venture-capital-backed counterparts. ♦Venture-capital-backing increases the likelihood of adopting stock option plans.
Lerner (1995)	271 venture-capital-backed biotechnology US firms	♦Venture capitalists increase their representation on the board of directors if the CEO is replaced, while other outside investors do not. ♦Venture capitalists' board membership depends on the distance to the firm suggesting significant transaction costs.
Manigart et al. (2002)	73 US, 66 UK, 32 French, 24 Dutch, 14 Belgian venture capital and private equity companies	♦Independent venture capitalists and private equity investors demand significantly higher returns than their dependent counterparts for investments in firms' early and expansion stages. ♦Higher returns are correlated with a higher intensity of venture capitalists' and private equity investors' involvement.
Baker and Gompers (1999a)	1,036 IPOs of US firms	♦CEOs' equity stake and salaries of venture-capital-backed firms are significantly lower than those of their non-venture-capital-backed counterparts. ♦The percentage change in CEOs' wealth for a percentage change in firm value is higher for venture-capital-backed firms than for their non-venture-capital-backed counterparts.
Kaplan and Strömberg (2000)	200 venture capital investments in 118 entrepreneurial firms by 14 venture capital companies	♦Contracts allow venture capitalists to allocate cash-flow rights, voting rights, board rights, liquidation rights separately. ♦Convertible securities are used most frequently. ♦Control rights are often contingent on observable performance measures.

Study	Data Sample	Main Results
Gompers (1997)	50 US venture capital contracts with convertible preferred equity	♦Convertible securities are converted to common equity if particular milestones are achieved. This is in line with incentive compensation considerations to motivate the entrepreneur. ♦Covenants are used to allocate control rights to venture capitalists that are separated from cash-flow rights.
Gompers and Lerner (1998a)	32,364 investments in privately held venture-capital-backed US firms	♦Corporate venture capitalists tend to invest slightly less frequently in start-up firms compared to their independent counterparts. They prefer investments in the later stages of firms' development and they prefer to invest larger amounts of money per investment deal than independent venture capitalists do. ♦The group of corporate funds is not homogeneous. Venture capital investments of corporate funds with a strategic focus on a particular technology are significantly more successful than investments of other funds.
Gompers (1995)	794 venture-capital-backed US firms	♦Firms that go public receive more total financing than other firms and firms in their early stages receive less money per round than firms in their later stages. ♦An increase in the asset tangibility reduces monitoring intensity and increases financing duration.
Cumming (2002)	179 investment rounds in 132 firms backed by 17 European venture capital companies	♦Common equity is the financing instrument most often used. ♦When convertible securities are used as financing instrument, specific contingencies are more likely to be used.
Schwienbacher (2002)	67 US, 19 Dutch and Belgian, 13 French, 23 British, 29 German, and 20 Swedish venture capital companies	♦European private equity investors use convertible securities three times less often than their US counterparts. ♦European private equity investors syndicate their investments less often than their US counterparts. ♦European private equity investors finance less frequently firms' early stages of development than their US counterparts.
Bascha and Walz (2001b)	60 German private equity investor	♦Germany's private equity investors often use pure equity, and less frequently they use the sort of convertible securities. ♦57 per cent of the private equity investors do not use convertible securities at all and 67 per cent do not use debt equity mixes.
Brav and Gompers (1997)	934 US IPOs of venture-capital-backed firms, and 3,407 US IPOs without such backing	♦Venture-capital-backed firms outperform non-venture-capital-backed ones even after the IPO. Venture-capital-backed firms earned 44.6 per cent after the IPO over five years, while non-venture-capital-backed ones earned only 22.5 per cent on average.

Study	Data Sample	Main Results
Hellmann and Puri (2000)	173 venture-capital- and non-venture-capital-backed Silicon Valley start-ups	♦Innovator firms are more likely to obtain venture capital than imitator firms. ♦High-technology venture-capital-backed firms, especially innovators, bring their products to the market earlier than their non-venture-capital-backed counterparts do.
Megginson and Weiss (1991)	320 IPOs of venture-capital-backed US firms are matched with 320 IPOs without such backing	♦Venture-capital-backing results in lower underpricing and it reduces the underwriting spread charged by the investment banker. ♦Total costs of going public are lower if venture capitalists are present.
Mull (1990)	340 IPOs of venture-capital-backed US firms are matched with 340 IPOs without such backing	♦Levels of debt are lower for venture-capital-backed firms than for their non-venture-capital-backed counterparts. ♦The revenue and total assets of venture-capital-backed firms grow faster than the ones of their non-venture-capital-backed counterparts. ♦Venture capitalists invest in projects with higher research and development expenses than other investors.
Kortum and Lerner (2000)	US panel data set with industry and time dimension 530 US venture-capital and non-venture-capital-backed firms	♦Venture-capital-backed firms do patent more than comparable non-venture capital-backed firms. Results suggest that a dollar in form of venture capital stimulates patenting more than a dollar of traditional research and development expenditure. ♦In order to address measurement problems between patents and innovations, the authors use micro data and find that venture-capital-backed firms do not dilute the economic importance of their patents.
Lerner (1994b)	350 IPOs by venture-capital-backed biotechnology US firms	♦Experienced venture capitalists are more proficient in timing the IPOs of the firms in their portfolios than less experienced venture capitalists. ♦Firms backed by experienced venture capitalists are more likely to go public when their valuations are at the maximum than the firms backed by less experienced venture capitalists.
Barry et al (1990)	433 IPOs by venture-capital-backed firms and 1,123 IPOs without such backing in the United States	♦Venture capitalists' involvement in form of management support affects negatively the degree of underpricing. Proxies for venture capitalists' involvement are: number of calendar months between the IPO and starting date of the lead venture capitalists' board membership, number of calendar years between the IPO and lead venture capitalists' founding year, cumulative number of prior IPOs in which the lead venture capitalist participated.
Franzke (2001)	164 IPOs of venture-capital-backed and non-venture-capital-backed firms on the Neuer Markt	♦Firms backed by high-ranked private equity investors realized a lower underpricing of their shares than firms backed by low-ranked private equity investors and non-private-equity-backed firms. Underpricing is measured as spread between opening price on the first trading day and initial offering price.

Study	Data Sample	Main Results
Kraus (2001)	308 firms that went public on the Neuer Markt	♦When controlling for ex ante uncertainty and underwriter reputation, underpricing does not differ between venture-capital-backed and non-venture-capital-backed firms. ♦Venture-capital and non-venture capital-backed firms do not differ with respect to risk characteristics and underwriter reputation.
Barnes and McCarthy (2002)	85 British firms that went public	♦Firms backed by young private equity investors are younger at their IPO than those backed by older investors. ♦Firms backed by young private equity investors do not differ from their counterparts backed by older investors with respect to underpricing and the private equity investors' equity stakes. Young private equity investors do not raise new funds significantly earlier after the date of the IPO than their older counterparts.
Roling (2001)	European panel data with country and time dimension	♦No significant relationship between the level of private equity investments and the number of patents. ♦Significant positive relationship between the number of private-equity-backed firms and the number of patents.
Engel (2003)	ZEW panels	♦Private-equity-backed firms realize higher economic growth than their non-private-equity-backed counterparts. This is the result of the pre-investment screening procedure by private equity investors.
Engel (2002)	ZEW panels	♦Young private-equity-backed firms realize significantly higher annual growth rates in employment than their non-private-equity-backed counterparts when private-equity and non-private-equity-backed firms are matched.
Audretsch and Lehmann (2002)	341 firms formerly listed on the Neuer Markt	♦Private-equity-backed firms realized a higher employment growth than their non-private-equity-backed counterparts. ♦The likelihood and the amount of venture capital is positively related to the board of directors' human capital.

Soft control mechanisms, such as venture capitalists' management support and monitoring, are not only used during the investment process but also when high-technology firms are selected: venture capitalists carefully scrutinize the founders and their business concepts before deciding on an investment (Fried and Hisrich 1994). In order to be actively involved in the firms in their portfolios, venture capitalists need several explicit control rights, such as board and voting rights. With contractually specified control mechanisms, such as incentive compensation of the entrepreneurs, venture capitalists can mitigate several incentive problems after the contract is signed.

With respect to the soft control mechanisms, US venture capitalists provide three critical services to their portfolio firms: venture capitalists build the investor group, review and help to formulate the business strategies, and

fill the management teams (Gorman and Sahlman 1989). Lead venture capitalists, who take on the support of the portfolio firms when several venture capitalists invest money, spend on average two hours per week in firms if these firms are in their early stages of development (Gorman and Sahlman 1989). However, the time that the lead venture capitalists spend, on average, in a portfolio firm varies substantially. Elango et al. (1995) report that the most active group in their sample spends more than 35 hours per month per portfolio firm, while the least active group spends less than seven hours. Venture capitalists' active involvement, however, is principally crisis- and project-oriented. They are not involved in the day-to-day management of their portfolio firms.

Soft control mechanisms have an impact on how venture-capital-backed firms are managed. In the United States, venture capital finance results in a reduced number of insiders on the boards of directors (Baker and Gompers 1999b). Thus, the relative importance of venture capitalists on the boards increases since they are classified as outsiders. In addition, stock option plans are more often utilized in venture-capital-backed firms than in non-venture-capital-backed firms (Hellmann and Puri 2002). The view that venture capitalists' active involvement in form of management support is rather crisis-oriented is supported by the empirical study by Lerner (1995), who uses a sample of US biotechnology firms. He finds that the number of venture capitalists on the board of directors increases significantly in situations where monitoring is most important, for example, around the time when the Chief Executive Officer (CEO) leaves the firm.

What about soft control mechanisms used by European private equity investors? In Germany, for example, private equity investors differ with respect to the intensity of management support. Especially, Germany's Mittelständische Beteiligungsgesellschaften (MBGs) often do not offer consulting services that go beyond traditional arm's-length board activity (Wupperfeld 1994). The subsidiaries of the savings banks generally provide limited management support and monitoring (Kulicke 2001). Subsidiaries of financial institutions are often not capable of evaluating the quality of high-technology firms' ideas. Compared to all other groups of private equity investors, the private equity investors that are independent from capital providers offer a high intensity of support to the firms in their portfolios (Kulicke 1997). In addition, Zemke (1995) finds evidence that independent equity investors have a significantly higher intensity in supporting the management teams than their dependent counterparts when strategic decisions must be made in the firms.

Manigart et al. (2002) find evidence that independent venture capitalists and private equity investors, located in the United States, the United Kingdom, the Netherlands, France and Belgium, demand significantly higher returns than their dependent counterparts for investments in firms' early and expansion

stages. These higher returns are correlated with a higher intensity of venture capitalists' and private equity investors' involvement. Thus, the intensity of management support by venture capitalists and private equity investors is higher when they are independent from the capital providers.

With respect to the *contractually specified control mechanisms*, several mechanisms can be distinguished. In particular, US venture capitalists compensate entrepreneurs or managers of venture-capital-backed firms with a compensation system, which is usually tied to the firm performance. Second, US venture capitalists almost exclusively use convertible securities when financing high-technology firms. And, third, venture capitalists invest the required capital in stages and not all at once.

The form of entrepreneurs' compensation system with basic salaries and profit participations can be interpreted as a mechanism that offers the entrepreneurs strong incentives to add their specific technological expertise in the development of the firms after the contract has been signed. Moreover, as Weimerskirch (1998) shows, tying the entrepreneurs' compensation to firm value can be interpreted as a mechanism with which venture capitalists can select the most promising firms, since, given this form of compensation, entrepreneurs do not prefer venture capital finance when their firms have dismal growth prospects.

Entrepreneurs of venture-capital-backed firms receive modest salaries in combination with equity stakes that are typically tied to the performance of the firms (Barry 1994). In the United States, the CEOs' equity stakes and salaries of venture-capital-backed firms are significantly lower than the CEOs' stakes and salaries of non-venture-capital-backed firms (Baker and Gompers 1999a). However, the elasticity of a CEOs' wealth to shareholder wealth, which is defined as the percentage change in a CEOs' wealth for a percentage change in firm value, is higher for CEOs of venture-capital-backed firms than for their counterparts of non-venture-capital-backed firms.

Recent theoretical literature has explained the use of convertible securities in terms of incentive problems (Berglöf (1994), Lülfesmann (2000), Bascha and Walz (2001a), Hellmann (2001)). With convertible securities, entrepreneurs have strong incentives to use their knowledge in the development of the firms since they have all residual claims, at least temporarily, so that entrepreneurs substantially participate in increasing profits but do not benefit from increasing risks (Gompers 1997). In addition, convertible securities provide the venture capitalists with incentives to carefully monitor and support the management teams (Schmidt 2003). Thus, convertible securities can be used in such a way that both contracting parties give the opposite party sufficient incentives to add value after the contract has been signed.

US venture capitalists organized as partnerships most often use convertible securities when financing high-technology firms with the

automatic conversion of the convertibles when specific milestones are reached. In the sample analysed by Kaplan and Strömberg (2000) consisting of 200 venture capital financing rounds, convertible preferred stocks are used in 189 cases. Only seven of the 200 venture capital financing rounds are without any convertibles. The sample by Gompers (1997), which contains 50 convertible preferred equity contracts, demonstrates the role of automatic conversion. In this sample, 92 per cent of the convertible preferred equity converts automatically at the time of the initial public offering (IPO).

The available evidence suggests that venture capitalists organized as limited partnerships differ significantly from their dependent counterparts with respect to investment behaviour. US limited partnerships use relatively more preferred equity and invest proportionally more in firms' early stages than corporate venture capital funds (Norton 1994). The empirical study by Gompers and Lerner (1998a) likewise confirms that differences exist between corporate and independent venture capital partnerships. According to their study, corporate venture capitalists tend to invest slightly less frequently in start-up firms. They prefer investments in the later stages of firms' development and they prefer to invest larger amounts of money per investment deal than independent venture capitalists do.

The last contractually specified control mechanism to be discussed is the staging of the capital infusion. It can be explained as a consequence of incentive problems arising when information on the firms' characteristics is unequally distributed among venture capitalists and entrepreneurs.[3] The staging of capital offers the entrepreneur the opportunity to use other financial resources after each capital infusion (Smith 1999). Moreover, infusing capital in stages offers the venture capitalist the opportunity to abandon the project after each capital infusion if contractually specified financial or non-financial criteria, so-called milestones, are not met (Sahlman 1990). This sets strong incentives to entrepreneurs to exert high effort and to avoid high risks. On the one hand, the staging of capital mitigates the hold-up behaviour of entrepreneurs (Neher 1999). But, on the other hand, the infusion of capital in stages can also cause several disincentives as well. Cornelli and Yosha (2003) show that an entrepreneur has incentives to manipulate the short-term performance when capital is invested in stages. In the model they use convertible securities to counteract this disincentive.

The staging of the capital infusion for the US venture capital market is analysed in the empirical study by Gompers (1995). According to this study, venture-capital-backed firms differ with respect to the size of each financing round, as well as with respect to the number of financing rounds. The more

3. However, Bergemann and Hege (1998) ascribe the staging of the capital infusion to unknown time profile of future investment needs; staging of the capital infusion has an option value in their model because capital invested is ultimately sunk.

tangible the assets of the firms are, the higher the amount of money per financing round and the lower the number of financing rounds. Moreover, firms that are in their early stages of development receive less capital per financing round than firms in later stages. And the number of financing rounds is higher for firms that went public than for those which stayed private.

Little is known about the contractually specified control mechanism in Europe. There are only few studies addressing control mechanisms used by European private equity investors. In the sample of European investment rounds analysed by Cumming (2002), common equity is the most often used form of finance. Schwienbacher (2002) compares a sample of private equity funds operating in Europe with a sample of venture capital funds operating in the United States. He finds evidence that convertible securities are more often used in the United States than in Europe. Bascha and Walz (2001b) use a data set containing 60 members of the German venture capital association, that is, 49.6 per cent of all members in January 2000. They find that besides using silent partnerships, Germany's private equity investors more often use pure equity, and less frequently use the sort of convertible securities. 33 per cent of the 60 members use silent partnerships, almost 27 per cent use pure equity, while only about eleven per cent use convertible securities.

With respect to the *value created by venture capitalists*, several empirical studies of the US market indicate that venture-capital-backing indeed has a positive impact on the development of firms. Brav and Gompers (1997) find that venture-capital-backed firms outperform non-venture-capital-backed ones even after the IPO. In their sample, venture-capital-backed firms earned 44.6 per cent after the IPO over five years, while non-venture-capital-backed ones earned only 22.5 per cent on average. In the sample of Silicon Valley high-technology start-ups analysed by Hellmann and Puri (2000), high-technology venture-capital-backed firms bring their products to the market earlier than their non-venture-capital-backed counterparts do so that the former can realize first mover advantages. Moreover, evidence found by Megginson and Weiss (1991) suggests that the total costs of going public including the underwriters' fee are lower for venture-capital-backed firms than for their non-venture-capital-backed counterparts. Mull (1990) finds evidence that the revenue and total assets of venture-capital-backed firms grow faster than the ones of their non-venture-capital-backed counterparts. In addition, Kortum and Lerner (2000) show that venture-capital-backed firms take out significantly more patents than other comparable firms.

The effects of venture-capital-backing depend on venture capitalists' experience. In the United States, experienced venture capitalists are more capable of reducing the fraction of insiders on the board of directors than their inexperienced counterparts (Baker and Gompers 1999b). In addition, the empirical analysis by Lerner (1994b) suggests that experienced venture capitalists are more proficient in timing the IPOs of the firms in their portfolios

than less experienced venture capitalists. In particular, firms backed by experienced venture capitalists are more likely to go public when their valuations are at the maximum than the firms backed by less experienced venture capitalists. In addition, Barry et al. (1990) find evidence that venture capitalists' experience in supporting the management teams negatively affects the degree of underpricing.

The value created by private-equity-backing has also been analysed for some European markets. Roling (2001) analyses the relationship between patents and private equity for countries of the European Union. He does not find a significant relationship between the level of private equity investments and the number of patents, but he does find a significant impact of the number of private-equity-backed firms on the number of patents. The survey of Bürgel et al. (2000) suggests that there is no significant relationship between a private equity participation and revenue or employment growth among 600 German and British high-technology firms. However, Engel (2003) shows that Germany's private-equity-backed firms realize higher economic growth than their non-private-equity-backed counterparts. But higher economic growth is not the result of private equity investors' active involvement in their portfolio firms. Instead, private equity investors are capable of selecting firms with higher ex ante and ex post growth prospects, i.e., the pre-investment screening procedure by private equity investors is the reason for the higher growth of their portfolio firms (Engel 2003). Moreover, Engel (2002) shows that young private-equity-backed firms realize significantly higher annual growth rates in employment than their non-private-equity-backed counterparts when private-equity and non-private-equity-backed firms are matched. In addition, Audretsch and Lehmann (2002) find evidence that private-equity-backed firms listed on the Neuer Markt realized a higher employment growth than their non-private-equity-backed counterparts.

The effect of private equity investors' experience has also been analysed for two European markets. For private-equity-backed firms that went public on the London Stock Exchange, Barnes and McCarthy (2002) find no differences in the underpricing of firms backed by young and established private equity investors. For private-equity-backed and non-private-equity-backed firms that went public on the Neuer Market, Franzke (2001) finds evidence that high-ranked private equity investors reduce the underpricing of the firms' shares. However, without considering a private equity investor's rank, private-equity-backed firms are not less underpriced than their non-private-equity-backed counterparts (Kraus 2001).

3.3. Portfolio Strategies

At any point in time, venture capitalists and private equity investors have a multitude of firms in their portfolios. This raises the question of whether venture capitalists have particular portfolio strategies such as portfolio diversification over a wide range of firms in different development stages and/or industries, or portfolio specialization in firms at particular development stages and/or on particular industries. Amit et al. (1998) argue that due to specialization, venture capitalists have a comparative advantage in the selection and monitoring of high-technology firms compared to other financial intermediaries. However, this specialization strategy can be expected to lead to portfolios that are not well-diversified, i.e., not all unsystematic risk is diversified away (Norton and Tennenbaum 1993).

In the US venture capital market, two portfolio strategies can be identified: the specialization and syndication of investments. US venture capitalists tend to specialize in firms of particular industries and/or in firms that are at a particular development stage. Venture capitalists that are specialized in early stages demand lower returns for early-stage investments than venture capitalists that are not specialized (Manigart et al. 2002). Moreover, US venture capitalists syndicate their investments, i.e., several venture capitalists finance a single firm and only one of them takes on the monitoring and support of the firm.

In the United States, the degree of venture capitalists' specialization appears to depend on several factors. First, US venture capitalists who focus on the early stages of a firm's development are on average more specialized in particular industries than venture capitalists who focus on the later stages of firm's development (Norton and Tenenbaum 1993, Gupta and Sapienza 1992). Second, venture capitalists managing large funds prefer greater industry diversity than venture capitalists managing small funds (Gupta and Sapienza 1992).

In addition, capital providers can affect the degree of venture capitalists' specialization. In the United States, corporate venture capitalists have a higher degree of specialization in industries than non-corporate venture capitalists, while Small Business Investment Companies seem to have no preference regarding industry diversity (Gupta and Sapienza 1992). In Germany, independent equity investors have a considerably higher degree of specialization than the subsidiaries of private banks, savings banks and public equity investors (Schertler 2001). This holds with respect to industries and the stages of a firm's development, as well as with respect to simultaneous specialization in particular industries and stages.

The degree of syndication seems to depend on the uncertainty of the investment: the higher the uncertainty of an investment, the higher the degree of syndication. For example, US venture capitalists prefer a higher degree of

syndication when they finance firms' early stages of development although the investment amount per company is small compared to later-stage deals (Bygrave 1987). Spreading of financial risks does not seem to be the main reason for syndications in the United States (Bygrave 1987, Bygrave and Timmons 1992). Rather, syndication of investments mainly serves to share information, as the empirical study by Lerner (1994a) suggests. Experienced venture capitalists syndicate early-stage investments with venture capitalists that have similar experience. Investments in later stages are also syndicated with less experienced venture capitalists. By contrast, in the United Kingdom, syndication of investments seems to be used to spreading risks and not to sharing information (Lockett and Wright 1999).

European private equity investors and US venture capitalists syndicate their investments with different intensities. Schwienbacher (2002) compares the syndication behaviour in the United States and in Europe. He finds that 54 per cent of the deals by the European private equity investors are syndicated, on average, compared to 80 per cent of the deals by the US venture capitalists. In addition, the number of partners in a syndicate is higher in the United States than in Europe. European private equity investors have 2.7 partners, on average, while US venture capitalists have 4.5 partners on average. Moreover, in twelve per cent of the European syndication a governmental partner was included, while in only two per cent of the US syndications was this the case.

4. Divestment

4.1. Aggregated Divestment Figures

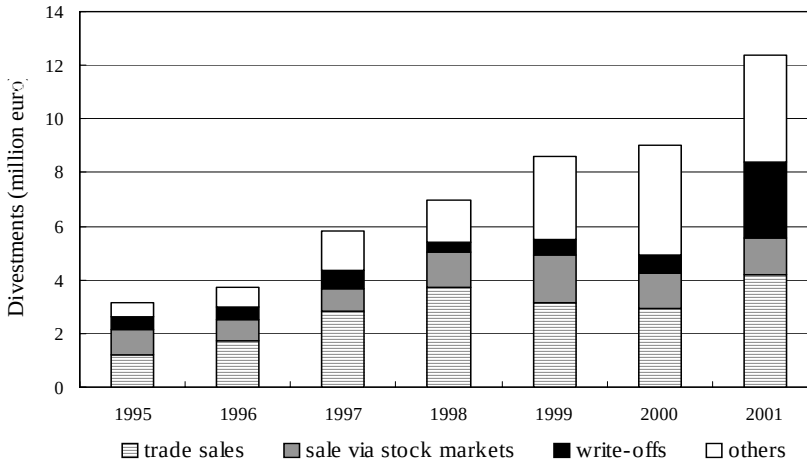
The divestment stage is the last stage in the venture capital cycle. In this stage, venture capitalists and private equity investors who are independent from their capital providers exit from their participations and pay the investment capital and returns to the capital providers. Several exit routes can be distinguished: venture capitalists can sell the shares that they hold in a firm via stock markets, due to an IPO or a sale of already quoted equity, via trade sales or, of course, via write-offs.

Figure 2 opposite depicts the importance of the three exit routes only for the European market since comparable data for the United States are not available. Trade sales were the most important exit route during the observation period. In 2000 and 2001, trade sales accounted for about 33 per cent of all divestments. In all other years, the importance of trade sales measured as a percentage of total divestments was even stronger. Sales via stock markets accounted for only 11 per cent of total divestments in 2001, while they accounted for more than 30 per cent of total divestments in 1995.

Write-offs accounted for less than 25 per cent of all divestments. This number understates the risk of venture capital investments because the data on divestment activity include investments in established firms operating in traditional firms that are less risky than investments in young high-technology firms. In 2001, write-offs accounted for more than 22 per cent of all investments, while in 2000 they accounted for less than eight per cent of all divestments. This increase in the importance of write-offs can be attributed to the bursting of the stock market bubble.

A detailed comparison of exit channels between the United States and Europe is impossible due to data limitations. The only data that might offer an impression of exit channels used in the United States and Europe are the number of IPOs and the number of acquisitions (trade sales) presented in Table 4 opposite. The statistic for European countries offers data on private equity investors' exiting, while the statistic for the United States offers data on venture capitalists' exiting. Because of this, the higher number of European trade sales does not seem astonishing. Even if trade sales and acquisitions might not measure the same thing, it seems that US venture capitalists use IPOs relatively more often to exit from their participations than European private equity investors.

Figure 2: Divestment Channels in Europe (million euro)



Source: EVCA (various issues).

Table 4: Number of IPOs and Acquisitions

	United States		Europe	
	IPOs	Acquisitions	IPOs	Trade sales
1997	136	161	Na	1,186
1998	77	201	239	965
1999	257	234	149	1,241
2000	226	299	249	1,294
2001	37	322	47	1,215

Note: Europe includes Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

Source: EVCA (various issues), and NVCA (2002).

Comparing the absolute number of IPOs suggests that more private-equity-backed firms went public in Europe than venture-capital-backed firms did in the United States. The difference in the number of IPOs of either US venture-capital-backed or European private-equity-backed firms is only moderate in 2000 and 2001. In 1999, the United States had a higher number of IPOs than Europe, while the opposite holds for 1998. Unfortunately the number of private-equity-backed IPOs for 1997 is not available.

Comparison of data on exiting via stock markets is limited for at least three reasons. First, in the second half of the 1990s a multitude of stock markets for shares of fast-growing firms was established in Europe, while a liquid stock market had already been in existence for a long time in the United States (Bottazzi and Da Rin 2002). In the United States, the Nasdaq was established in 1971, while the Nasdaq Europe, formerly Easdaq, a pan-European stock market, was only established in 1996 followed by the Nouveau Marché in Paris in 1996 (Table 5 below). Frankfurt's Neuer Markt was established in March 1997 and the TechMark in London was established in 1999. Because of this, one might argue that the number of IPOs in Europe is above the long-term average, but this might not be the case in the United States.

Table 5: Stock Markets for Fast-Growing Firms in Europe and the United States

	Nasdaq	Nouveau Marché	Neuer Markt	Nasdaq Europe	TechMark
Open since	1971	1996	1997	1996	1999
Number of IPOs	4,876	176	356	62	81
Listed companies	4,109	164	326	49	243
Funds raised	293,364	2,966	21,611	2,300	817.5
Market capitalisation	2,899,000	15,011	49,933	8,000	669,500
Market capitalisation (per cent of GDP)	24.5	1.02	2.41	na	2.61

Note: Listed companies and capitalization at end December 2001, number of IPOs and amount of funds raised from the opening of the market (from 1990 for Nasdaq) through 2001. Funds raised and capitalisation in millions of euros (millions of dollars for Nasdaq).

Source: Bottazzi and Da Rin (2002).

The Neuer Markt was the largest European stock market segment for shares of fast-growing firms in terms of the number of IPOs, listed firms and funds raised but not in terms of capitalisation (Table 5). The largest stock market in terms of capitalisation was the TechMark. While the TechMark had a high capitalisation and a high number of listed firms compared to the Easdaq and the Nouveau Marché, it had a low number of IPOs. Only 81 firms went public on the TechMark, while the respective numbers were 62 on the Easdaq, 176 on the Nouveau Marché, and 356 on the Neuer Markt. The TechMark had a comparatively high number of listed firms and a high capitalisation because it had superseded the Alternative Investment Market that had been founded in 1995.

Second, the comparison of the data is limited since the stock market bubble at the end of the 1990s may have affected the climate on these markets differently. In order to compare the number of IPOs, a longer time period seems necessary since the high number of IPOs in Europe may be mainly driven by the high share prices at the end of the 1990s. In particular, it might be the case that institutional regulations of European stock markets allowed comparatively young and small firms to go public in 1999 and 2000, while the institutional regulations of the Nasdaq did not.

Third, suggestions drawn from a comparison of the number of IPOs may be the result of obscurities in the European statistic, which is especially young with respect to the exit data. In particular, the number of European IPOs seemed to be very high in 1998. A closer look at the country data shows that this high number results from a high number of French IPOs. French private

equity investors reported 126 IPOs of private-equity-backed firms. This number is extremely high compared to the 43 firms that went public on the Nouveau Marché in 1998 (Schertler 2001). Thus, comparison of US and European divestment activity is very limited.

From a theoretical point of view, the foundation of a national stock market reduces transactions costs of IPOs compared to trade sales so that European private equity investors should more often favour the IPO of a firm they have chosen to finance. Therefore, I would expect increasing divestments via IPOs after the foundation of the European stock markets in the second half of the 1990s. However, increasing divestments via IPOs are not necessarily attributable to the foundation of stock markets but also to higher share prices at the end of the 1990s. Since the bursting of the stock market bubble increased the transaction costs of IPOs, I expect that trade sales became more favourable for private equity investors.

In Germany, the number of exits via stock markets increased substantially after the foundation of the Neuer Markt (BVK various issues). In 1996, only 18 private-equity-backed firms went public, while in 2000 67 private-equity-backed firms went public (BVK various issues). Of these 67 firms, 60 firms went public on the Neuer Markt. Therefore, the Neuer Markt offered a liquid exit channel for private equity investors until 2000. However, in 2001, the Neuer Markt got into deep trouble and some months later, the Deutsche Börse decided to re-structure this stock market segment.

The bursting of the stock market bubble has affected the German private equity market negatively through several channels. First, most of private equity investors' portfolios were inflated in the course of the stock market bubble, and the bursting of the bubble led to large negative adjustments in the portfolio values. About 70 per cent of all exits were written-off in the second and third quarters of 2001.[4] In the first quarter of 2002, the respective number was only about 50 per cent. Second, the bursting of the stock market bubble affected the solvency of private equity investors listed on a stock exchange that experienced substantial losses in their share prices.

Aggregated data on German divestments also show a substantial increase and decrease in divestments via IPOs at the end of the 1990s. The divestments via stock markets including IPOs and sale of already quoted equity as a percentage of all divestments reached their peak in 1999. Starting from about three per cent in 1997, divestments via stock markets reached 12.5 per cent of all divestments in 1998, and more than 17 per cent in 1999. In 2000, divestments via stock markets started to decline. They accounted for 12.1 per cent in 2000, and for less than eight per cent in 2001 (EVCA various issues). This decline was even stronger when looking at divestments via IPOs only.

4. http://www.mackewicz.de/venturemall/vc-panel/index.htm.

Divestments via IPOs accounted for almost 12 (9) per cent in 1999 (2000), while they accounted for less than one per cent in 2001.

In the United Kingdom, the divestments via stock markets as a percentage of all divestments also reached their peak in 1999. In comparison to the German situation, divestments via stock markets were also important in the middle of the 1990s (EVCA various issues). Divestments via stock markets accounted for about 25 per cent in 1996, and 15 per cent in 1997. They accounted for less than 19 per cent in 1998 and reached more than 26 per cent of all divestments in 1999. As German divestments via stock markets, British divestments via stock markets dropped substantially after 1999. In 2000, they accounted for only seven per cent of all divestments. Contrary to the German situation, divestments via stock markets as a percentage of all divestments were slightly higher in 2001 than in 2000. British divestments via IPOs show a similar picture for the divestments via stock markets. Divestments via IPOs accounted for almost 18 per cent of all divestments in 1999. By contrast, in 2000 and 2001 they accounted for less than three per cent.

In France, the divestments via stock markets as a percentage of all divestments reached their peak in 2000. Since the middle of the 1990s, French divestments via stock markets increased almost continuously. In 1995, divestments via stock markets accounted for about eight per cent of all divestments, in 1996 and 1997 they accounted for about 14 per cent, and in 1998 and 1999 they accounted for more than 16 per cent (EVCA various issues). In 2000, divestments via stock markets were almost 25 per cent of all divestments. In 2001, they accounted for almost 17 per cent. Thus, French divestments via stock markets as a percentage of all divestments experienced a different development than the British and German divestments via stock markets as a percentage of all divestments. The latter two experienced a substantial decline between 1999 and 2000, while the former experienced a less strong decline between 2000 and 2001.

As far as the exit channels are concerned, one can conclude that the bursting of the stock market bubble has substantially deteriorated the conditions for IPOs of private-equity-backed firms at least in Germany and the United Kingdom. But also in France the conditions for IPOs of private-equity-backed firms have been deteriorated. Looking at divestments via IPOs of private-equity-backed firms shows a substantial decline between 2000 and 2001. In 2000, divestments via IPOs accounted for more than seven per cent of all divestments, while in 2001 they accounted for less than one per cent (EVCA various issues). This decline was much stronger than the decline in the divestments via stock markets that include divestments via IPOs and sales of already quoted equity.

4.2. Venture Capitalists' Divestment Behaviour

Some aspects of venture capitalists' divestment behaviour have been analysed for some countries: these aspects include the venture capitalists' preference for the various exit channels, and the timing of IPOs of venture-capital-backed firms. The preference of US venture capitalists and European private equity investors for the various exit channels differs. Schwienbacher (2002) reports that eleven per cent of the European private equity investors consider the IPO as the most preferred exit channel compared to 29 per cent of the US venture capitalists. By contrast, 39 per cent of the European private equity investors have a strict preference for trade sales compared to 24 per cent of the US venture capitalists.

Whether young venture capitalists take firms public earlier than older venture capitalists do has been analysed by Gompers (1996) and Barnes and McCarthy (2002). The advantage of taking firms public earlier for young venture capitalists is that they can signal their experience in financing high-technology firms to the market so that they can raise new funds at more favourable conditions. Thus, one can expect that young venture capitalists raise new funds soon after taking firms public. What are the costs of such behaviour? Going public earlier can be associated with greater underpricing because one can expect that the younger the firm is, the larger the asymmetric information is between new and old shareholders. The larger the asymmetric information is, the higher the price reduction demanded by new shareholders.

Gompers (1996) who uses a sample of 433 IPOs in the United States, and Barnes and McCarthy (2002) who use a sample of 85 IPOs in the United Kingdom find evidence that firms backed by young venture capitalists or private equity investors are younger at IPO than those backed by older and thus more established venture capitalists or private equity investors. While young US venture capitalists raise new funds significantly earlier after the date of the IPO than their established counterparts (Gompers 1996), young British private equity investors do not differ from their established counterparts. In addition, in the sample by Gompers (1996), firms backed by young venture capitalists are more underpriced at their IPOs than firms backed by more established venture capitalists. By contrast, in the sample by Barnes and McCarthy (2002), firms backed by young private equity investors do not differ with respect to underpricing from their counterparts backed by more established private equity investors.

4.3. Returns for Capital Providers

After venture capitalists and private equity investors who are independent from the capital providers have exited from their participations, they repay the investment capital and return to capital providers. The return on venture capital determines how much capital is invested in future funds. The return on venture capital investments can be analysed for various aggregation levels with various indicators. With respect to the indicators used, the most common one is the internal rate of return (IRR) that does not offer, however, information on the risk-return profile of venture capital investments or funds.[5] The estimation of a risk-return profile of venture capital investments can be based on the capital asset pricing model. With respect to the aggregation level, the return on venture capital investments for the capital providers can be based either on single venture capital investments, or on venture capital funds including several venture capital investments, or on a venture capital index.

Peng (2001) builds a venture capital index using 12,946 rounds of venture capital investments in 5,643 venture-capital-backed US firms between 1987 and 1999, and controls for missing data, censored data, and sample selection problems. In this sample, the annual returns on the venture capital index are higher than the annual returns of the Nasdaq index between 1987 and 1990 and between 1993 and 1999 except 1997. In 1997, the annual return was lowest with 0.38 per cent, while in 1999 the annual return was extraordinarily high with 681.2 per cent. In all years of the observation period, the venture capital index has a substantially higher volatility than the Nasdaq index. These results indicate that the returns on venture capital investments are highly volatile.

Cochrane (2001) analyses the risk-return profile of a sample of single US venture capital investments from which venture capitalists have already exited. He finds that "an individual VC (venture capital) investment is not particularly attractive, despite the high average returns" (Cochrane 2001). Using maximum likelihood estimates, Cochrane (2001) calculates a mean arithmetic return of almost 57 per cent with a standard deviation of 119 per cent. This risk-return profile seems unfavourable compared with other investment opportunities.

However, if a well-diversified portfolio could be constructed, i.e. if all unsystematic risk could be diversified away, it could yield supernormal returns. But Cochrane (2001) argues that it is probably impossible to construct a portfolio free of unsystematic risks because venture capital investments may have a common component, as indicated by the high business failure rate in the Fall of 2000. Thus, it is rather hard to evaluate whether capital providers

5. The IRR is defined as the discounting rate for which the present value of all future outflows equals the present value of all future inflows that a private equity investor generates over time. Several measurement problems occur when calculating the IRR. For example, as long as the capital of the private equity funds is still being invested, future flows of capital have to be estimated in order to calculate the IRR.

receive a part of any surplus created by venture capitalists, especially because the availability of venture capital funds can create diversification gains realized by capital providers that cannot be taken into account. Diversification gains will always be realized except when venture capital investments are strictly dominated by other investment opportunities.

These studies for the United States analyse the risk-return profile of venture capital investments, while studies for European countries concentrate solely on the returns of venture capital investments. *Venture Economics*, for example, has prepared an annual *Pan-European Investment Benchmarks Study* using the IRR technique and funds data. This study provides a comparison of the performance of European private equity with other asset classes on the basis of equivalent net IRR. To calculate equivalent IRRs, the same pattern of private equity investments and divestments over time as in the private equity data set have been utilized to construct a portfolio of an alternative asset class. *Net* means that the often substantial management fees for private equity investors have already been deducted.

According to the Investment Benchmark Study of 2001, net cumulative annualised IRR of all European private equity funds in the sample outperformed alternative asset classes as Table 6 below indicates. European private equity funds had a net cumulative annualised IRR of more than 12 per cent. By contrast, the equivalent IRRs of MSCI Equity was only 8.9 per cent, the equivalent IRR of JP Morgan Bond was lower at 7.0 per cent, and the equivalent IRR of HSBC Small Cap was as low as -1.2 per cent. Only two subgroups, development and generalists, had a slightly lower net cumulative annualised IRR than MSCI Equity.

While the Investment Benchmarks Study of 2001 shows that the return of almost all private equity subgroups outperforms the return of other asset classes, the Investment Benchmark Study of 2000 shows a less clear picture (EVCA 2001a). In particular, in 2000, several subgroups of private equity funds had a lower net cumulative annualised IRR than MSCI Equity, or HSBC Small Cap. Development funds had a lower performance than both HSBC Small Cap and MSCI Equity, while early-stage and all venture capital, including all funds that invest in firms' early and expansion stages, had a lower return than MSCI Equity.

Comparing the returns on private equity reported for 2000 and 2001 shows that the return on private equity has decreased for many groups of private equity. While the Investment Benchmark Study of 2000 reports an IRR on all private equity of 15.6 per cent, the Investment Benchmark Study of 2001 reports an IRR on all private equity of only 12.7 per cent, which is comparatively high given the fall in value on European stock markets. Only Generalists and Development funds show a moderate increase in the IRR.

Table 6: Net Cummulative Annualised IRR (per cent)

	European Private Equity	MSCI Equity	HSBC Small Cap	JP Morgan Bond
Early stage	8.9	8.6	-2.1	6.4
Development	12.3	12.6	6.0	8.0
Balanced venture capital	13.6	10.4	1.3	6.3
All venture capital	12.0	10.7	2.0	6.9
Buy-outs	14.8	6.0	-4.4	7.0
Generalists	11.5	12.0	3.3	7.3
All private equity	12.7	8.9	-1.2	7.0

Note: Morgan Stanley Capital International (MSCI) is an international (originally US) investment bank. HSBC is a British bank. MSCI Equity contains larger and HSBC Small Cap contains smaller companies. When discussing these IRRs, one has to keep in mind that the end of the 1990s was characterised by higher stock prices. Increasing stock prices first have an impact on the larger companies and only thereafter on the shares of smaller companies.

Source: EVCA (2002a).

5. Concluding Remarks

This paper has compared the US venture capital market and the European private equity market in order to identify differences and similarities of these two markets. In the American tradition, venture capital comprises management support and financial means for a subset of young high-technology firms provided by experienced intermediaries, the venture capitalists. The term private equity has been used because data on the European market not only cover venture capital investments but also investments in low-technology areas and investments in already established firms. Private equity investment in firms that are in their early stages of development, or which are classified as high-technology firms, has been used as an approximation of European venture capital activity. Due to data limitations, results based on aggregated data have to be interpreted with caution.

The comparison of aggregated data has shown that Europe's private equity market differ with respect to size and investment specialization from the US venture capital market. In particular, US venture capital investments per capita were higher than European private equity investments without buy-outs during the 1990s. However, the shares of investments in firms that are information- and communication-related to private equity without buy-out activity have

suggested that Europe's private equity was as much specialized in particular industries as US venture capital at the end of the 1990s. In addition, the shares of investments in firms' early stages to private equity without buy-out activity have indicated that Europe's investments were even more specialized in firms' early stages than US investments.

The European private equity market also differs from the US venture capital market with respect to the capital providers that invest their money in funds and with respect to the relationship between capital providers and venture capitalists. In the United States, pension funds have been the most important capital provider. By contrast, in Europe, pension funds have been only an important capital provider in the United Kingdom, while banks have been important in Germany and France. However, in the second half of the 1990s, pension funds increased the amounts of capital offered to private equity funds operating in Germany and France. With respect to the relationship between capital providers and venture capitalists, US venture capitalists are most often independent from capital providers and so are private equity investors operating in the United Kingdom. By contrast, private equity investors operating in Germany or France often depend on capital providers.

I have argued that differences between the US and the European venture capital market with respect to the size and depth can be explained by several factors, three of them have been of particular interest. First, the size of the venture capital market may depend on the financial architecture of the economies. Countries in which banks play an important role compared to shareholders may have small venture capital markets because control mechanisms of banks do not work well when financing high-technology firms. Since banks play an important role in many European countries, one can expect that Europe's venture capital market is smaller than the US market. Second, the size of the venture capital market may depend on the availability of informal venture capital. If complementarities exist between informal and formal venture capital markets, the venture capital market would be larger if informal venture capital is available. In Europe, the informal venture capital market is smaller than the respective market in the United States. Thus, one can expect that Europe's formal venture capital market is smaller than the US market. Third, the size of the venture capital market may depend on the possibility of exiting via stock markets since exiting via stock markets can reduce transaction costs between venture capitalists, capital providers and entrepreneurs. Since the United States has an established stock market for shares of fast-growing firms, one can expect that Europe's venture capital market is smaller than the US market. How far the difference in the size of the venture capital markets between the United States and Europe is attributable to other factors such as differences in the human capital endowment, and the style of the innovation system is a still open question.

In addition to presenting aggregated data, the paper has also discussed a multitude of empirical studies based on micro data in order to identify differences and similarities between the US and the European market. These studies most often focus on one part of the venture capital cycle: they either focus on fundraising, or investment, or divestment. With respect to fundraising, evidence suggests that US venture capitalists and European private equity investors who are independent from their capital providers use similar compensation systems. In particular, venture capitalists participate in profits of the venture capital fund and demand a fixed fee for management activities. The levels of profit participations and management fees differ between European private equity investors and US venture capitalists.

With respect to investment, several studies indicate that US venture capitalists create value-added in the firms they finance. For European private equity investors, evidence moves in the same direction but it is much weaker than the evidence for the US market. European private equity investors also use control mechanisms, such as active monitoring and convertible securities, used by US venture capitalists. However, US venture capitalists use convertible securities more often to finance firms' investments than European private equity investors.

With respect to divestment, studies discussed analyse the grandstanding hypotheses for the US and British markets. In particular, these studies ask whether young venture capitalists take firms public earlier than older venture capitalists do. These studies find evidence that firms backed by young US venture capitalists or British private equity investors are younger at IPO than those backed by older and thus more established ones. However, these studies do also show that young US venture capitalists raise new funds significantly earlier after the date of the IPO than their established counterparts, while young British private equity investors do not differ from their established counterparts.

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