LIQUIDITY OF EXIT MARKETS AND VENTURE CAPITAL FINANCE *

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This Version: June 2003

* We are grateful to the HEC School of Management in Paris for its hospitality. We also benefited from discussions with Ulrich Hege and Mark Seasholes.

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Abstract

This paper provides evidence that venture capitalists adjust their investment decisions according to liquidity conditions on exit markets (mainly stock markets and corporate M&A markets). When exit markets become less liquid, venture capitalists tend to invest proportionately more in new early-stage projects in order to postpone exit requirements and thus invest in riskier projects; venture capitalists therefore trade-off liquidity risk with technological risk. On the other hand, when liquidity is high, they rush to exit by investing more in new later-stage projects. By doing so, venture capitalists also adjust their demand for liquidity based on supply. We also document a positive impact of liquidity on the overall number of new investments, as well as a negative effect of liquidity on syndicate size.

Key Words: venture capital, liquidity risk, exit, investment behavior, financing strategy, corporate finance.

JEL Classification: G24, G3.

I. Introduction

(A) Motivation and Objectives

Venture capital investments are typically highly illiquid right after the investment is made. When investing in a new start-up company, the venture capitalist (*VC*) knows that he will have to hold the shares he gets from the investment for the next few years until a "liquidity event" occurs. Exit opportunities are essentially determined by the possibility to put the venture public at some later-stage (thus, doing an IPO) and by the possibility to sell the shares on the corporate (M&A) market (leading to a so-called *trade sale* or *acquisition*). Other exit routes (typically not for the most promising ventures) include management buy-out (MBO) and secondary sale. Besides general market risk and technological risk, this liquidity risk is an important reason for why venture capitalists require high returns for their investments. ([1]) In what follows, we will alternatively use the term *exit risk*, since for venture capital investments this liquidity risk is directly related to exit (divestment). It represents the risk of not being able to sell the shares after few years and thus being forced either to remain much longer in the venture or to sell the shares at a high discount. ([2]) Existing papers have rather focused on technological risk (i.e. the fact that innovation is an uncertain outcome) of the venture, assuming that venture capitalists are able to find buyers for their shares or to list the company with certainty, and thus assuming no liquidity risk. In this paper, we specifically look at venture capital investments in terms of exit risk and how it affects the strategic investment behavior of venture capitalists. Exit markets are crucial for venture capital investments; good exit opportunities typically occur when the economy goes well. This provides venture capitalists with the incentive to adjust their new investments according to exit expectations and thus it should affect their decision whether to hold long term positions in times where liquidity risk for private equity becomes even more important.

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[1] A general discussion for why venture capitalists want to exit is provided in a separate paper (Schwienbacher (2002a)).

[2] Market microstructure models refer to the latter as the *cost of immediacy*, which represents the price discount that the holder of the asset has to incur if he wants to sell it now instead of waiting to get the market price. More generally, Harris (2003) distinguishes between four different dimensions of liquidity: (*i*) width (difference between the buy price and the sell price); (*ii*) immediacy (how fast large volumes of shares can be traded); (*iii*) depth (amount of shares that can be exchanged without affecting prices); and (*iv*) resiliency (how quick prices go back to "normal price level").

In this paper, we aim at achieving two inter-related objectives. The first one is to examine how investment decisions evolved over time by looking at the period from 1985 to 2001. The idea is to have a look at the time dimension of industry focus by venture capitalists. For instance, we show that venture capital investments were highly linked to technological cycles, like the internet and biotech cycles. The second objective is to analyze the effect of expected exit opportunities (liquidity risk) on the investment decisions of venture capitalists. In particular, we argue that when liquidity of exit markets is low and thus exit risk high, they trade-off liquidity risk with technological risk by investing more in early-stage projects. By adjusting their portfolio of investments for long term positions, venture capitalists reduce their exposure to liquidity risk. This is important in explaining the choice of projects according to their stage of development (early-stage versus expansion-stage), and on the decision whether to invest in completely new projects or to limit investments to ongoing projects. In contrast, when liquidity of exit markets is high venture capitalists tend to invest proportionately more in later-stage projects in order to *rush for exit* and thus to hold short term positions and technologically less risky projects. We therefore test the conjecture of a negative relationship between liquidity of exit markets and the likelihood of investing in new early-stage projects. We further test the effect of liquidity on the amount of capital invested and on the syndicate size.

There are various ways how entrepreneurs can finance their early-stage investments without seeking venture capital, although not all of these sources are available to all entrepreneurs. Often, entrepreneurs rely on "friends and family (and fools)" to finance the starting of the company. Others may also obtain governmental subsidies or even being first able to do R&D in universities before they are spun-off so that substantial parts of their early-stage development is done without any additional capital injection from venture capitalists. Many other entrepreneurs prefer to work with *Business Angels* before approaching venture capitalists. This allows the latter to choose projects that are already in their expansion-stage. Empirical evidence show that *Business Angels* invest by far in more projects than venture capitalists do but in a much smaller amount (cf. Prowse (1998), Freear, Sohl and Wetzel

(1996), and Wong (2002)). ([3]) Therefore, venture capitalists do not always have to enter into start-up companies in the early-stage but may choose to join in later rounds for the first time.

(B) Empirical Results

We use investment data from the VentureXpert database to test our research hypotheses. We document the existence of a negative relationship between liquidity of exit markets and the likelihood of investing in new early-stage projects. The data further supports the conjecture developed in this paper between the effect of liquidity on the syndicate size for new projects, but not on the amount of capital invested; for new projects, the syndicate size is smaller when liquidity of exit markets is high but the effect on the investment size remains unclear.

As for the results on new early-stage investments, the result provides a possible explanation for why venture capitalists funded an impressive number of later-stage projects during the internet bubble of 1998-2000 where exit was not a problem, while today they are more selective (*pro-active*) and again prefer ventures with break-through technology. During the bubble period, a lot of ventures with low innovation were funded and for which *time-to-market* is shorter; today, these ventures would not get any funding anymore. This paper claims that conditions on the exit markets (e.g., their cyclicality) is partly responsible for this change in investment behavior, besides more general macroeconomic conditions.

Finally, the rationale behind the negative link between liquidity and syndicate size documented in this paper may be explained by risk issues. When liquidity is high, the investment is less risky and thus there is less need for syndication of deals. Similarly, when liquidity is low, venture capitalists may prefer to syndicate more in order to increase the screening of projects by investing only if other *VC*s also join after having done their own screening of the proposal.

[3] Freear, Sohl and Wetzel (1996) estimated that about 250,000 angels invested USD 10-20 billion in around 250,000 companies each year, which is by far more than the venture capital market. In Europe, the number of active business angels was estimated by the European Business Angels Network (EBAN) with 125,000.

Notice that the ultimate source of the liquidity risk analyzed in this paper is the difference in time preferences between venture capitalist and management, since there is a greater incentive for *VC* to cash out earlier than management. The time horizon of *VC* is typically shorter because of his exit requirements. If venture capitalists were long term investors and would not wish to exit already after a few years, liquidity risk would not matter and incentives between venture capitalists and management would probably be better aligned (provided managers are capable and wish to remain in place). Time horizon is even more important for the venture capital business than for other corporate businesses given the liquidity risk for private equity (as held by venture capitalists).

With respect to early-stage investments, there are therefore two opposite effects documented in this paper. On the one hand, more liquidity increases the likelihood of investing in *new* ventures; but on the other hand, it reduces the likelihood that these new ventures are in the early-stage. In other words, liquidity increases the absolute number of new investments but reduces the proportion of ventures that get early-stage finance. The study seem to indicate that overall the effect of liquidity on early-stage investments is still positive. Moreover, by doing this, venture capitalists also adjust their expected demand for liquidity based on expected supply. If they expected low liquidity in the future, they reduce today their future demand for liquidity by reducing the absolute number of new ventures *and* by postponing the demand for liquidity for a portion of the new investments by financing ventures in their early-stages.

The rest of the paper is structured as follows. The next Section discusses related literature. Section III discussed the concept of liquidity for private equity. Section IV develops the tested research hypotheses. In Section V, we present and describe the data, while Section VI presents results of the tests. We then conclude.

II. Related Literature

The presentation of the relevant literature is structured in several topics.

Active Involvement in the Portfolio Companies: A fairly large literature already exists that provides evidence on the active involvement of venture capitalists in their portfolio companies. Among other things, they document the use and usefulness of stage financing (Bergemann and Hege (1998, 2001, 2002), and Gompers (1995)), the active participation in the ventures (Lerner (1995), Casamatta (2003)), reporting requirements, use of convertible securities and contractual arrangements to allocate control rights (Kaplan and Strömberg (2001), Gompers (1997), Cumming (2002), Schwienbacher (2002a)). Other papers have documented the active role of venture capitalists in screening of business plans and ultimate project selection through extensive due diligence processes (e.g., Inderst and Müller (2002) study these issues in relation with market structure), without taking into account the effect of exit market liquidity. Finally, Keuschnigg and Kanniainen (2002) analyze the trade-off between number of portfolio companies to invest and services provided to each company.

Syndication of Venture Capital Deals (Co-Financing): At the initial investment stage, venture capitalists sometimes prefer to syndicate deals for the purpose of asking for a "second opinion". This should increase the efficiency of the screening process, since in this case venture capitalists only invest if others are also optimistic about the project's prospects. For follow-up investments, syndication may take place either for the purpose of risk diversification when capital requirements increase substantially over time, to obtain the pre-commitment of large corporations (Hellmann (2002), Riyanto and Schwienbacher (2002)), or also for certification and reputation effects through syndication with more experienced venture capitalists (Barry et al. (1990), and Megginson and Weiss (1991)). Other rationales for venture capital syndication are provided by Admati and Pfleiderer (1994) based on the optimality of fixed-fraction contracts in the presence of asymmetric information with outside investors, and Lakonishok, Shleifer and Vishny (1991) for "window-dressing" purposes. Brander et al. (2002) provide evidence that syndication of venture capital deals creates value-adding. Lerner (1994) also compares different rationales and provides support several of these rationales.

Importance of IPO Markets for Venture Capital: Black and Gilson (1998) document that the existence of an active stock market is an important factor for a well-performing venture capital market. This provides private equity investors with an important exit market for their most successful portfolio companies, and allows to enter into "implicit contracting" with entrepreneurs about future control over the firm (cf. Schwienbacher (2002b) for a theoretical

analysis). Michelacci and Suarez (2002) examines an additional rationale for the importance of IPOs for the venture capital market; it provides a way to recycle invested funds by buying out the venture capitalist so that the latter can invest it in new ventures. Furthermore, Lerner (1994) shows with a sample of 350 venture-backed biotech firms that venture capitalists successfully time their IPO when equity valuations are high. This evidences the strong impact of IPO markets on venture capital exits. Moreover, since this is most likely when demand of new stocks is great, his result also implies a positive relationship between the number of IPOs and stock market liquidity. Gompers and Lerner (1999) provide further evidence that the supply of new funds to the venture capital market is strongly correlated with general economic conditions. The most recent survey of IPO activities in the US is provided by Ritter and Welch (2002). They show that the number of IPOs per year has changed significantly over time, and that it is highly cyclical. For Europe, Bottazzi and DaRin (2002a, 2002b), Giudici and Roosenboom (2002) as well as Rindermann (2003) provide an extensive analysis of venture-backed IPOs on European "New Stock Markets".

Investment Behavior of Venture Capitalists: A number of papers document the extensive screening and due diligence tasks undertaken by venture capitalists prior to the investment (e.g., Wright et al. (1996), Manigart et al. (1997), Manigart et al. (1999), England and Tourani Rad (2002)). Jeng and Wells (2001) analyze the investment behavior of venture capitalists using macro-economic data, and show that early-stage investments are negatively affected by labor market rigidities, while the number of IPOs affected later-stage investments but not early-stage investments. They therefore conclude that later-stage investing is well understood but not early-stage investing. Darby and Zucker (2002) show that in the biotech industry venture capital fosters innovation and increases the success likelihood of the companies it finances. Several other papers (Cochrane (2001), Cumming and MacIntosh (2000), Gompers (1995), Darby and Zucker (2002)) reported a positive relationship between firm valuation and the likelihood of going public for venture-backed companies. Cumming and MacIntosh (2003) examine the role of partial exits as a result of the lack of exit markets liquidity. Finally, using the same database as ours Das et al. (2002) analyze more extensively the likelihood of achieving a successful exit.

Choice between Venture Capital and Alternative Sources of Financing: Investments by business angels have been documented by a few empirical papers (Prowse (1998), Fenn, Liang and Prowse (1998), and Wong (2002)). Theoretical analysis of angel investing is

provided, e.g., by Chemmanur (2002) and Leshchinskii (2002). Ueda (2000) analyzes for entrepreneurs the choice between bank and venture capital finance. Berger and Udell (1998) provide empirical evidence on the use of these alternative sources of funding by many small businesses and start-ups in the U.S.

III. Liquidity Concept for Private Equity

For financial assets like publicly listed equity, there seem to be consensus about the concept of liquidity. Four different dimensions have been suggested to define the concept for traded assets (Harris (2003), Kyle (1985)): width, immediacy, depth, and resiliency. Loosely speaking, liquidity refers to the ability to trade at low (explicit and implicit) transaction costs. Kyle (1985) further stresses the importance of continuous trading and frictionless markets to achieve perfect liquidity of assets.

As for real estate or art objects, private equity is infrequently traded and thus the standard concept of liquidity hardly applies. ([4]) Private equity is not a continuous trading, since by definition they are private prior to the IPO. An important element that distinguish private from public equity is that IPO markets are characterized by "hot" and "cold" issue phases and through clustering waves. In this paper, liquidity is related to the possibility of exiting by either listing the company on a stock market or finding a strategic buyer. The notion of liquidity used here is closest to the dimension of immediacy, since liquidity here represents the likelihood of being able to divest (*cost of immediacy*). Das et al. (2002) show that this illiquidity may induce a substantial non-tradability discount.

Throughout this paper, we use the number of IPOs per year on the Nasdaq, NYSE and AMEX as proxy for liquidity of exit markets. ([5]) Although this proxy only considers the IPO markets, it also gives a good idea of what happens on corporate M&A markets. There are strong links between stock markets and corporate M&A markets. In particular, stock market conditions are also crucial for acquisitions ("trade sales") for different reasons: (1) an IPO may represent an outside option for highly profitable ventures that have the potential to go

[4] Recently, new approaches have been suggested to value illiquid assets and build a venture capital index (e.g., Peng (2001a, 2001b)).
[5] Jenkinson and Ljungqvist (2001) denote this same proxy as the annual "IPO volume".

public (in this case it directly affects the price in an acquisition); (2) capital inflow into venture capital is strongly correlated with stock market conditions (this affects total investments and therefore also the absolute number of trade sales); (3) stock market conditions determine the cost of capital for acquisitions when the buyer is listed; and (4) stock markets also mirror general economic conditions. Therefore, we should expect M&A markets to closely follow the IPO cycle. Also, an IPO is very often (but not only) what venture capitalists aim at when investing in a new venture.

IV. Research Hypotheses

In this paper, we empirically test different predictions related to the effect of liquidity risk on investment decisions of venture capitalists. The primary investment decision we focus in this paper is the likelihood of investing in new early-stage projects. We conjecture that venture capitalists trade-off liquidity risk with technological risk by investing more in early-stage projects when the exit markets become less liquid. On the other hand, when liquidity is high, they *rush to exit* by investing more in expansion-stage and later-stage projects. Such a strategic behavior yields a negative relationship between liquidity of exit markets and investment in new early-stage projects. Thus, we formulate the following prediction:

HYPOTHESIS 1 (EFFECT ON NEW EARLY-STAGE INVESTMENTS): *For new investments, the likelihood of investing in early-stage projects decreases with the liquidity of exit markets.*

An alternative explanation that may potentially lead to an opposite prediction than HYPOTHESIS 1, can be derived from observations made by Gompers and Lerner (2000), namely that the supply of funds to the venture capital market is positively correlated with stock market returns. This would drive down the required returns of new projects for venture capital, and thus they now become worthwhile to be funded. New early-stage projects may very well be the ones that would benefit most, since projects in other stages of development are more likely to be funded in bull as well as in bear stock markets. This would also be in line with the often-cited private equity puzzle that implies a lack of early-stage investments due to too low returns for these projects. In this case, these projects should benefit from important capital inflows into the venture capital market. Thus, since more liquid exit

markets increase the supply of funds to the venture capital market and makes the market more competitive, early-stage investments may again potentially benefit most.

Consistent with the conjecture stated in HYPOTHESIS 1, we also derive other testable research hypotheses in this paper. For instance, we should expect this change in investment behavior to be more likely in industries for which projects require lower investment levels. If venture capitalists only start getting involved in a project at the expansion-stage, then the entrepreneur needs to have sufficient other resources to fund his early-stage rounds. This is easier when the project requires low investment amounts, while for projects that involve huge sums, like for biotech and medical sectors, the possibilities to postpone the involvement of venture capital funds is significantly reduced. Also, projects with low capital requirements are most likely early-stage projects, since capital needs increase with the advancement of the project. In both cases, this leads to a negative link between new early-stage investments and capital requirements. This is summarized in HYPOTHESIS 2.

HYPOTHESIS 2 (EFFECT OF CAPITAL REQUIREMENTS): *For a given level of exit markets liquidity, the likelihood of investing in new early-stage projects is lower for projects with high capital requirements.*

HYPOTHESIS 3 involves the decision whether to invest in new projects at all, irrespective their stage of development:

HYPOTHESIS 3 (EFFECT ON NEW INVESTMENTS): *The likelihood of investing in new projects (irrespective of their development stage) increases with the liquidity of exit markets.*

In words, when liquidity of exit markets is increased, venture capitalists face less risk, which at the same time, may indicate that expected return from exiting may also be positively affected (and thus also a lower market risk). After all, conditions on exit markets are highly affected by growth expectations of the overall economy. Therefore, the likelihood of funding new companies (irrespective of stages of development) is also increased, and thus is positively affected by liquidity of exit markets.

Regarding the relative importance of early-stage investment, notice that if HYPOTHESES 1 and 3 hold we should expect an ambiguous effect on the overall portfolio of the venture

capitalist, since from HYPOTHESIS 1 we should expect a decrease in the fraction of *new* early-stage projects when liquidity of exit markets is high but HYPOTHESIS 3 would imply more early-stage projects in absolute value. This means that there are two opposite effects when liquidity goes down. First, we expect proportionately more new early-stage projects (cf. HYPOTHESIS 1). And secondly, since venture capitalists invest in less new projects (cf. HYPOTHESIS 3), there will be more follow-up projects in the venture capitalists' portfolio. The weight of follow-up investments in the overall portfolio will therefore be greater when liquidity is low, since less new investments are made while follow-up investments are often continued, and are most likely already at the expansion-stage and later-stage of development. Thus, the effect of liquidity risk on the overall portfolio composition of venture capitalists is ambiguous.

For instance, denote by α_i the fraction of new projects in the early-stage, where i refers to the state of liquidity of exit markets. Thus, $i = h$ when liquidity is high (*hot issue* market) and $i = c$ if liquidity is low (*cold issue* market). Denote also by N_i the absolute number of new projects financed and by F the number of current follow-up investments. Then, HYPOTHESIS 1 says that $\alpha_h > \alpha_c$, while HYPOTHESIS 3 says that $N_h > N_c$. The proportion of new early-stage investments as a fraction of all the projects in the venture capitalist's portfolio is then equal to $\alpha_i N_i / [F + N_i]$, where obviously this ratio depends on the state i. Comparing this ratio for both states h and c shows no clear-cut and largely depends on the current number of follow-up investments in the overall portfolio of the venture capitalist. Since $N_h > N_c$, the minimum threshold level for α_h decreases with F: ([6])

$$\frac{\alpha_h N_h}{F + N_h} \leq \frac{\alpha_c N_c}{F + N_c} \quad \text{iff} \quad \alpha_h \leq \alpha_c \cdot \frac{1 + F / N_h}{1 + F / N_c}$$

The next hypothesis is related to the effect of liquidity on investment size and holds for new as well as for follow-up investments.

HYPOTHESIS 4 (EFFECT ON INVESTMENT SIZE): *The size of investments (in amounts of USD) is positively affected by the liquidity of exit markets.*

[6] For instance, assume that α_h = 0.20, α_c = 0.5, N_h = 10, N_c = 2, and F is either 5 or 10 (assume also for simplicity that no follow-up investments are in the early-stage anymore). Then, the condition mentioned above is satisfied for F = 5 but not F = 10.

The prediction of HYPOTHESIS 4 may be due to two different effects. The first is directly related to HYPOTHESIS 1 as more liquidity on the exit markets involves proportionately more investments in the expansion-stage and later-stage, which in turn require greater amounts of capital than early-stage investments. The second possible channel may be through the possible desire of venture capitalists to *rush for exit*, since market conditions are propitious for exiting now. This means that venture capitalists may be ready to inject greater amounts of funds in their portfolio companies in order to accelerate their development and reduce their time to exit. ([7]) ([8])

The last two hypotheses concern the likelihood for deal syndication.

HYPOTHESIS 5A (SYNDICATION FOR DIVERSIFICATION PURPOSES): *The syndicate size increases with the liquidity of exit markets as a way to better diversify the portfolio.*

HYPOTHESIS 5B (SYNDICATION FOR SCREENING PURPOSES): *The syndicate size decreases with the liquidity of exit markets in order to improve the screening process.*

HYPOTHESES 5A and 5B provide opposite predictions regarding the effect of exit markets liquidity on the syndicate size. The effect can be positive for risk diversification purposes, or can be negative to improve the screening process of business plans. In HYPOTHESIS 5A, an increase in liquidity requires greater portfolio diversification if HYPOTHESIS 4 holds, since more liquid exit markets then imply greater amounts of funds. ([9]) This is also what is required whenever venture capitalists are limited in the amount of capital they can invest in any single portfolio company. On the other hand, HYPOTHESIS 5B conjectures a negative relationship through screening effects. More liquid exit markets represent lower risk for the investment, which weakens the requirements for good screening and thus the need for

[7] An example illustrating this is the rush for different online services, like for online grocery stores (Webvan) or online pet stores (pets.com). Cassidy (2002) points out that in both cases a race took place to be the first in the market and (especially) do an IPO before your competitors. Furthermore, Hellmann and Puri (2000) observed a shorter *time-to-market* in venture-backed start-ups.

[8] An alternative way to test for the *rush to exit* argument is to see whether the length of time between two investment rounds is shortened prior to reductions in liquidity of exit markets. This may be tested by regressing round duration on exit liquidity.

[9] An alternative rationale for a positive relationship stems from the often-heard preference of some venture capitalists in bad times to retain the remaining of their available funds for their own projects. This is well possible as raising new funds gets difficult in cold issue markets.

syndicating with other venture capitalist as a way to improve screening of projects (cf. the "second opinion" rationale mentioned by Brander et al. (2002)).

V. Data Analysis

(A) Description of Data Source

In this Section, we present the data we use in this paper for testing our research hypotheses. We also analyze here how the investment behavior of venture capitalists evolved over time. Finally, we present summary statistics of the data used throughout this paper.

The data source is the VentureXpert dataset of Venture Economics. Given the large size of the database, we randomly selected 100 venture capitalists out of the total sample of independent *VC*s in the U.S. and collected information about all their investments between the date they have been established (but not investments done earlier than January 1, 1985) until December 31, 2001. We also limited the total sample from which the 100 *VC*s were drawn by taking only those that already had at least 20 investments done. Information available for each portfolio company and each round include date of investment round, its amount, its stage, the industry sector of the portfolio company and the number of investors involved in financing the given round. Notice that although only 100 *VC*s have been considered, these investments involve a much greater number of venture capitalists as virtually all investment rounds were syndicated. The random sample of 100 *VC*s was drawn purely for the purpose of selecting the venture-backed companies.

The unit of observations considered in this paper (and in most other papers of this kind) is an investment round. We use the definition for investment stages provided by VentureXpert, which distinguishes between four broad classes of stages:

i. *Early-Stage*: this includes seed, start-up early, R&D early, other early, first stage, R&D equity and other R&D stages.
ii. *Expansion-Stage*: this includes expansion, R&D expansion and second stages.
iii. *Later-Stage*: this includes third stage, bridge, bridge loan, other later-stage, open market purchase, private investment in public company and other expansion-stages.

iv. *Other Stages (including Buyout/Acquisition)*: this includes acquisition, acquisition for expansion, leverage buy-out (LBO), turnaround, special situation, secondary purchase, venture capital partnership and unknown stages.

In what follows, we will focus the analysis on the first two classes, since these are the ones that really deal with technological risk. Later-stage investments already include stages like bridge loans where both technological risk and exit risk are largely resolved. We use this third class occasionally for robustness checks; in that sense, we alternatively use an extended definition of alternative investments to the early-stage. This also holds for the last class, the so-called "other stages", which even include all observations for which no information is available about the investment stage. Also, for investments like "special situation" or "venture capital partnership", it is not clear from the available information for which class of stages it is intended. In fact, this forth class of stages represents not more than 5% of all the investment rounds in our sample. In other words, when analyzing the investment decision of venture capitalists, we will only concentrate on the two first classes (early-stage versus expansion-stage) and in some cases (for robustness purposes) include the third class (so that we look at early-stage versus either expansion-stage or later-stage). Overall, for the first three classes of stages we have a total of 17130 investment rounds in 3804 companies.

(B) Definition of Variables

Herewith we define the variables used in the regression analysis: EARLY_STAGE is a dummy variable equal to one if the considered investment round is in the early-stage (otherwise, equal to zero); EXPANSION_STAGE is a dummy variable equal to one if the investment round is in the expansion-stage (otherwise, equal to zero); LATER_STAGE is a dummy variable equal to one if the investment round is in the later-stage (otherwise, equal to zero); AMOUNTS is the total amount of funds invested in the given round (in million USD); NBR_INVESTORS gives the number of venture capitalists involved in raising AMOUNTS (it gives the size of the syndicate in a given round); NBR_IPO represents the number of IPOs in the US during the year in which the investment round was done (data provided by Ritter and Welch (2002)); NEW_INVESTMENT is a dummy variable equal to one if the investment is a first-round investment (otherwise, equal to zero); FOLLOW_UP (:= 1 – NEW_INVESTMENT) is a dummy variable equal to one if the considered investment round

is a follow-up investment (otherwise, equal to zero); and GDP represents the real annual growth rate of the U.S. economy during the year in which the considered investment is done. Finally, we also include industry dummies in all the regressions to control for industry-specific (technological) risk: INTERNET (internet communication, e-commerce, internet services, internet software and programming), COMPUTER (hardware and software), BIOTECH (biotechnology), and MEDICAL (medical and health-related).

(C) Graphical Analysis of the Data

Figure 1 shows the number of observations available in each year for the sample of all early-stage, expansion-stage and later-stage investment rounds (i.e., excluding the "other stages"), as well as the sample of all new investments in these same three stages. The third line (dashed line) provides the ratio of new investments over all data available. Not so surprisingly, the correlation on an annual basis between the first two data series is very strong, namely +93%, while the correlation between the first and the third series is +51%. When overall investment increases, so do investments in new companies. More generally, Figure 1 shows the great increase in venture capital investments during the second half of the 1990s, and that it is strongest for new projects as compared to investments in follow-up rounds; about 30% of all the investment rounds are first-round investments during the second half of the 1990s. Finally, we also observe the sharp decrease after 2000 for both, the number of investments overall and the proportion of new investments (third series).

Figure 2 presents the total number of IPOs that took place in the US during the period of 1985 to 2001 as reported in the paper by Ritter and Welch (2002). These include IPOs on the Nasdaq, NYSE and AMEX. In what follows in this study, we use these data as *liquidity measure* of exit markets for venture capital investments. Notice that using yearly aggregate values of liquidity leads to consider the more general liquidity condition of markets. As mentioned in Section III, NBR_IPO is therefore used in this paper as a proxy for liquidity of exit markets. The time series exhibits a strong positive autocorrelation from one year to the other.

Figure 3 highlights the relative importance of early-stage investments as compared to expansion-stage investments. For each year, it shows the ratio of new early-stage investment

rounds over new expansion-stage investment rounds (= early-stage investments in year t ÷ expansion-stage investments in year t). In other words, it represents the average number of new early-stage investments for every new expansion-stage investment, and evidences that it has been changing considerably over time. For instance, in 1987 *VC*s invested 9 times more often in new early-stage projects than in new expansion-stage projects, while in 1997 it was roughly 3 times only. Notice that on an annual basis the empirical correlation of this series with the number of IPOs per year as reported in Figure 2 is –31%, which already provides preliminary support for HYPOTHESIS 1.

Figure 4 reports similar information as in Figure 3 but in terms of amounts invested instead of number of investment rounds. For instance, we can see that in 2001 venture capitalists invested about 91 cents in new early-stage projects for each dollar invested in new expansion-stage projects, while in 1992 it has only been 20 cents. Obviously, when expanding the sample by including also later-stage investments (dashed line), the values are lower.

Investments decisions have also changed over time according to industry focus. This is shown in Figure 5 for all new investment rounds and in Figure 6 for all new as well as follow-up investment rounds. We observe that venture capital investment was less focused during the 1980s but was then taken over by a few sectors. These figures show the huge impact of internet start-ups during the second half of the 1990s and the sharp drop after the year 2000. At some less extent, we also observe a boom of biotech investments prior to the internet boom and the computer boom at the end of the 1980s. Overall, it seems as the internet bubble took over most of the investments done during 1998 to 2000, since all other sectors lost in importance.

(D) Summary Statistics of the Data

Finally, Tables 1 to 3 present summary statistics of the data. Table 1 disaggregates the data between new investment rounds and all investment rounds (i.e. new and follow-up). A few interesting observations are worth being mentioned. First, a large fraction of new investment rounds are in the early-stage, while this fraction goes considerably down when considering overall portfolios (new and follow-up investment rounds). Secondly, the average

syndicate size (NBR_INVESTORS) is of about one investor smaller when comparing new investment rounds with all rounds (going from 2.6 to 3.5–3.6 investors). Thirdly, 22% of all investment rounds included in the dataset are new investments. The forth remark concerns differences in industry sectors. Investments in biotech and medical sectors are less often done than for internet and computer sectors. This results is certainly largely affected by the internet boom during the end of the 1990s that accounts for a large portion of all-time venture capital investments. Lastly, when looking at the stages of development we observe that most new investment rounds are in the early-stage, indicating that most venture-backed companies get venture capital in their early stages of development, while about 20–21% only (have to) wait for the expansion-stage to obtain venture capital.

Table 2 provides summary statistics by investment stages. An observation that is worth being mentioned is the significant increase in the average amounts invested per round between early-stage (USD 4.43 million) and expansion-stage (USD 6.87 million). Interestingly also is the low proportion of later-stage investments for internet companies (11%) as compared to early-stage and expansion-stage investments (24% and 28%).

In Table 3, we focus on the data by industry sectors. In each cell, we provide the summary statistics for new investment rounds in all 3 stages of development, as well as for all rounds (new and follow-up) in brackets. An important proportion of the investment rounds are in the internet sector, and this category is also the one that involved on average the greatest amount of investment per round (USD 6.57 million). Furthermore, there seem to be no important difference in the average syndicate size across industry sectors, except for the slight difference for biotech. Also, for all sectors most of the new investments are in the early-stage, indicating again that most companies seek venture capital is their early-stage already and that there is no distinction across the industry sectors considered. The category of "other sectors" include investment projects in business and financial services, communications and media, consumer-related services and products, and semiconductors.

VI. Regression Analysis

(A) Effect of Liquidity Risk on Project Selection

Recall that for testing the shifting to early-stage investments when liquidity of exit markets goes down (HYPOTHESIS 1), we will primarily concentrate on the two first classes of investment stages (early-stage versus expansion-stage), and in a second step include the third class (so that we look at early-stage versus either expansion-stage or later-stage) for robustness purposes only. When regressing early-stage investments on the proxy for exit markets liquidity, HYPOTHESIS 1 implies that the estimated coefficient of NBR_IPO should be negative. In some regressions, we also include the number of IPOs per year occurring one and two years ahead (NBR_IPO(+1) and NBR_IPO(+2)) to capture the fact that also future liquidity should matter. By including these two variables, we implicitly assume that *VC*s have perfect foresight over future exit markets liquidity for the next two years ahead. ([10]) This is of course a very strong assumption. Furthermore, HYPOTHESIS 2 implies that the coefficient of AMOUNTS should be negative too. In all the regressions we include the logarithm of the Nasdaq Composite Index (denoted by NASDAQ) at the end of the year in which the considered investment was done. This is to control for general market effects. Finally, we also include GDP and GDP(–1) into all the regressions to control for the supply of venture capital as documented by Gompers and Lerner (1999) for the U.S. They show that general economic conditions (which they also proxied by the real GDP) impacted significantly the flow of capital into the venture capital market but mainly with one year delay. Since supply shifts may also affect the investment decisions of venture capitalists, we include GDP and GDP(–1) into all the regressions.

Table 4-A reports the results of different Logit regressions. The dependent variable is EARLY_STAGE, a dummy variable equal to one if the new investment is in the early-stage and zero otherwise. The coefficient of NBR_IPO is significantly negative in all the regressions, supporting the prediction stated in HYPOTHESIS 1. It also shows that early-stage financing through venture capital funds is more likely for projects in biotech and medical industries but less in internet and computer sectors. This is most probably due to the fact that the former sectors require substantially greater amounts of funds in early-stages than the former sectors; this makes entrepreneurs of biotech and medical projects fully dependent on

[10] An alternative method would be to estimate expected liquidity through an autoregressive model of NBR_IPO. But since our annual dataset is "only" for the period 1985-2001 this provides little precision to such an estimation. Also, it would not capture expected exogenous shocks such as the internet wave (as a technological shock) nor any other forward looking expectations.

external funding already in their early-stages (investment-intensive sectors). At the same time, it also reduces the possibility for venture capitalists investing in these sectors to trade-off liquidity risk with technological risk when liquidity of exit markets goes down, since they will hardly find biotech or medical projects that funded internally their early-stage and thus only seek venture capital in the expansion-stage. It is worthwhile mentioning that NBR_IPO(+2) is particularly significant and captures much of the liquidity effect.

Notice that similar results are obtained when analyzing the choice between early-stage and either expansion or later-stages (cf. regressions (4) to (6) in Table 4-A, which run the same regressions but with the extended sample). Furthermore, HYPOTHESIS 2 is also significant in all the regressions.

Notice that an important question remains open. Recall that we have two different stories for explaining the negative effect of liquidity on the likelihood of investing in new early-stage investments. One is the hedge strategy rationale in downturns (i.e., when liquidity is low) and the other is the rush to exit rationale in hot issue markets. In principle, we obtain this negative coefficients of NBR_IPO whenever at least one of the rationales holds. To examine whether our results are driven by a single rationale or by both, we estimate separately the coefficients of NBR_IPO and its forward-looking values for cold and hot issue markets. We define a hot issue market as one where the number of IPOs in that year is above the average number of IPOs per year. On average, 323.7 IPOs took place each year during the period 1985 to 2001. Thus, we define a dummy variable HOT equal to one if NBR_IPO $\geq$ 323.7 in a particular year, and zero otherwise. Similarly, COLD := 1 – HOT (i.e., COLD is equal to one whenever NBR_IPO < 323.7). In this way, we wish to capture whether we are in a *hot* or *cold* issue market, and see if the negative effect of liquidity on early-stage investments holds in both types of issue markets or only in one of them. The results are presented in Table 4-B. It provides evidence that the negative effect holds in both issue markets. Therefore, both rationales seem to be in play. Furthermore, there is no indication that both rationales have different time horizon effects, since in both cases the significant coefficients in regressions (3) and (6) are for NBR_IPO and NBR_IPO(+2). Again, HYPOTHESIS 2 on the negative coefficient of AMOUNTS is supported in all the regressions.

Further robustness checks are presented with respect NASDAQ and the impact of internet companies. In Table 4-C, regressions are run with NASDAQ instead of its logarithm in order

to evaluate the impact of a change in the Nasdaq Index relative to a change in the liquidity of exit markets (NBR_IPO). This is not directly possible with log(NASDAQ). The results show that in all the regressions, the coefficient of NASDAQ is smaller in absolute value than the one of NBR_IPO. ([11]) This suggests that the liquidity effect from NBR_IPO has a greater impact on the likelihood of investing in new early-stage projects than the effect of an increase in the Nasdaq Index. In Table 4-D, we show the results of testing HYPOTHESIS 1 with internet projects; we therefore only consider first-round investments with INTERNET = 0. The reason for this testing is the fact that internet projects may bias the results due to their overrepresentation during the bubble period at the end of the 1990s. There again, HYPOTHESIS 1 cannot be rejected, and the two years-ahead liquidity variable NBR_IPO(+2) is highly significant.

Table 5 provides the Logit regression results for the choice whether to invest in early-stage investment rounds using not only new investments but also including follow-up investment rounds into the sample. In other words, here we do not distinguish between new investments and follow-up investments. Overall, it confirms the intuition presented already in Section IV, namely that HYPOTHESIS 1 is specific to new investments but not for the overall portfolio of venture capitalists. Table 5 provides support for this intuition since it shows ambiguous results of the effect of NBR_IPO on the likelihood of investing in early-stage when considering all the investment rounds (new as well as follow-up rounds). On the other hand, HYPOTHESIS 2 still holds here.

Table 6 shows results of a Logit regression with NEW_INVESTMENT as dependent variable to test HYPOTHESIS 3; it conjectures a positive effect of liquidity on the propensity of investing in new investments as a result of reduced risk. Recall that this variable is a dummy variable equal to one if the investment is a first-round investment; otherwise, equal to zero. We again use the two samples as for the regressions of the previous tables but irrespective of the development stage. It provides support for HYPOTHESIS 3 ("New Investment Decision"). Notice also that the coefficient of AMOUNTS is negative. Interestingly, investment-intensive projects have lowest propensity to have new investments.

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[11] Difficulties arise for interpreting estimated coefficients of Logit models, since some corrections need to be made to compute the marginal effect of an exogenous variable on the probability change of the dependent variable. In fact, this depends on all of the exogenous variables and not only on a single coefficient (as for OLS). But it is still possible to compare coefficients of two exogenous variables.

With respect to early-stage investments, there are therefore two opposite effects documented in this paper. On the one hand, more liquidity increases the likelihood of investing in *new* ventures; but on the other hand, it reduces the likelihood that these new ventures are in the early-stage. In other words, liquidity increases the absolute number of new investments but reduces the proportion of ventures that get early-stage finance. The results here seem to indicate that overall the effect of liquidity on early-stage investments is still positive. Moreover, by doing this, venture capitalists also adjust their expected demand for liquidity based on expected supply. If they expected low liquidity in the future, they reduce today their future demand for liquidity by reducing the absolute number of new ventures *and* by postponing the demand for liquidity for a portion of the new investments by financing ventures in their early-stages.

(B) Effect of Liquidity Risk on Other Investment Decisions

In the rest of this Section, we examine other investment decisions of venture capitalists, namely the total amount of funds invested each round (Table 7) to test HYPOTHESIS 4 and the syndicate size (Table 8) to test HYPOTHESIS 5A versus HYPOTHESIS 5B. For the total amount invested, we use AMOUNTS as dependent variable, and NBR_INVESTORS for the syndicate size. Again, we do the same robustness checks as in all previous regressions. In both cases we test the hypotheses based on the two different samples; i.e., using investment rounds in early-stage and expansion-stage in regressions (1) to (3) and extending this sample with later-stage investment rounds for regressions (4) to (6).

The results for the testing of HYPOTHESIS 4 on the investment size are presented in Table 7. The coefficients of NBR_IPO is significantly positive only in regressions (1) and (4), i.e. when not controlling for anything else. Otherwise it is not significant. We therefore find no support for HYPOTHESIS 4. Surprisingly, when considering regressions (3) and (6) we observe that the coefficient of NBR_IPO(+2) is negative (but not significantly), although it is overall smaller than the cumulative effect of NBR_IPO and NBR_IPO(+1). This is in line with the idea that venture capitalists invest greater amounts in their ventures and thus try to *rush for exit* if they expect a downturn within two years. Notice also that high stock market valuations (measured by log(NASDAQ)) drives up the investment size.

For the syndicate size (Table 8), the coefficient of the variable NBR_IPO is again statistically highly significant in all the six regressions. Thus, a greater liquidity on the exit markets reduces syndicate size. This is in line with HYPOTHESIS 5B, which conjectures syndication for better screening purposes. The coefficient of AMOUNTS remains significantly positive. Moreover, the syndicate size is greater for follow-up investment rounds and smaller for early-stage investment rounds. It is also greatest for companies in the biotech sector and smallest for companies in the internet sector. These industry effects are in line with the idea that technologically riskier sectors are financed by larger syndicate, since there development cycle until a viable product is available is longer.

Interestingly, it is worth mentioning that an increase in exit market liquidity positively affects the amount invested per round and negatively affects the likelihood that the investment is in the early-stage. Therefore, the shift from early-stage to expansion-stage induced by liquidity is even more pronounced in money amounts. The overall portfolio effect must be important to venture capitalists when liquidity of exit markets changes. This was well illustrated in Figure 4.

VII. Conclusion

Venture capitalists time their investments according to exit opportunities. When exit markets (stock markets and corporate M&A markets) become less liquid, venture capitalists invest proportionately more in new early-stage projects in order to postpone exit requirements and thus invest in riskier projects. In that way, venture capitalists trade-off liquidity risk with technological risk when exit markets lack of liquidity. In contrast, when liquidity is high venture capitalists invest more in expansion-stage and later-stage projects where time until exit (investment duration) is reduced. We therefore find strong support for HYPOTHESIS 1, which conjectures a negative relationship between liquidity of exit markets and the likelihood of investing in new early-stage projects. Furthermore, we find that liquidity of exit markets positively affects size of the syndicate, while the effect on the amount invested remains unclear. Current conditions of exit markets positively affect the amount invested but conditions two years ahead (long-term perspective) have a negative impact on this same amount.

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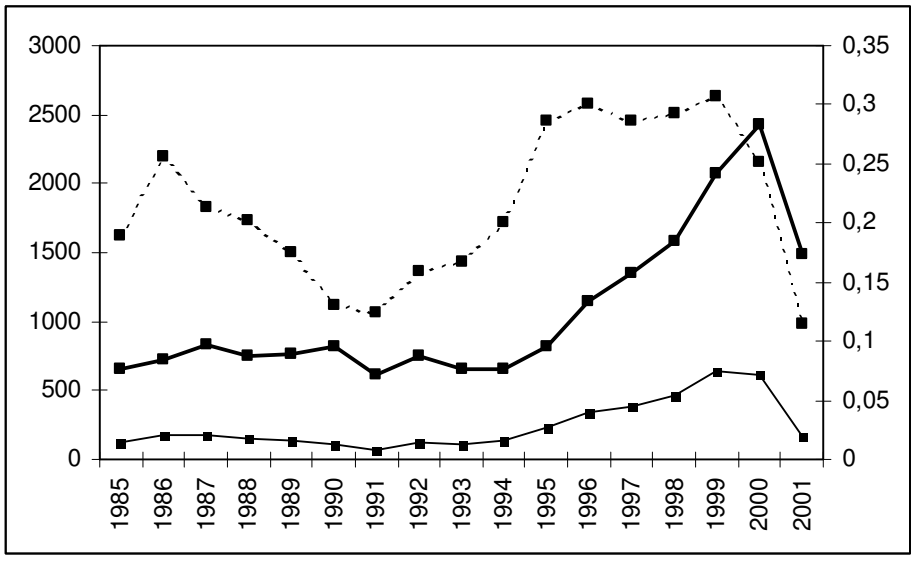

Figure 1: Number of Observations Available and the Relative Importance of New Investments in each Year from 1985-2001. The unit of observations is an investment round. The bold, full line shows the number of observations available using all the investment rounds (i.e., new and follow-up rounds in all 3 stages of development), while the thin, full line only considers new investment rounds. As for the third line (thin, dashed), the corresponding values are provided on the right-hand side y-axis and they give the proportion of new investments from the sample of all the investment rounds (i.e., "second series" divided by "first series").

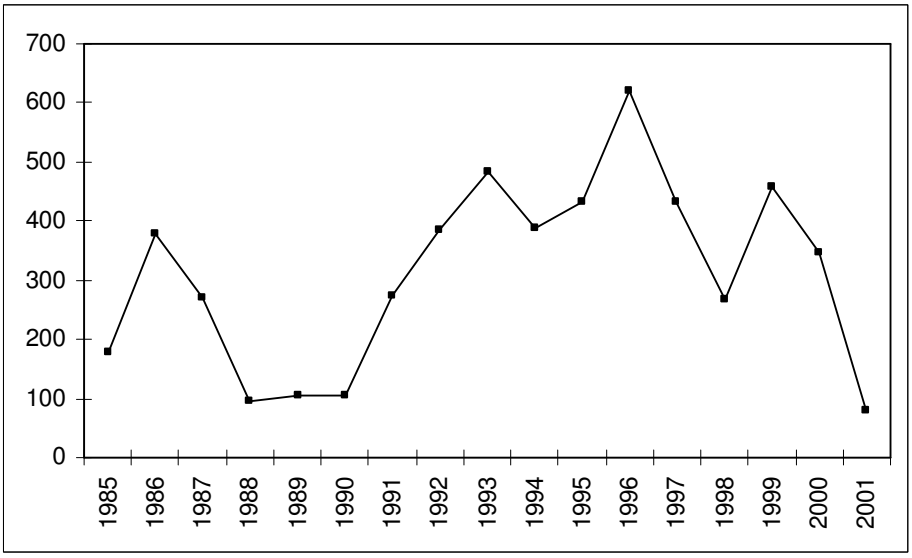

Figure 2: Number of Initial Public Offerings (IPOs) in the United States each Year from 1985 to 2001. The data are the ones reported by Ritter and Welch (2002) and refer to IPOs on the Nasdaq, NYSE and AMEX.

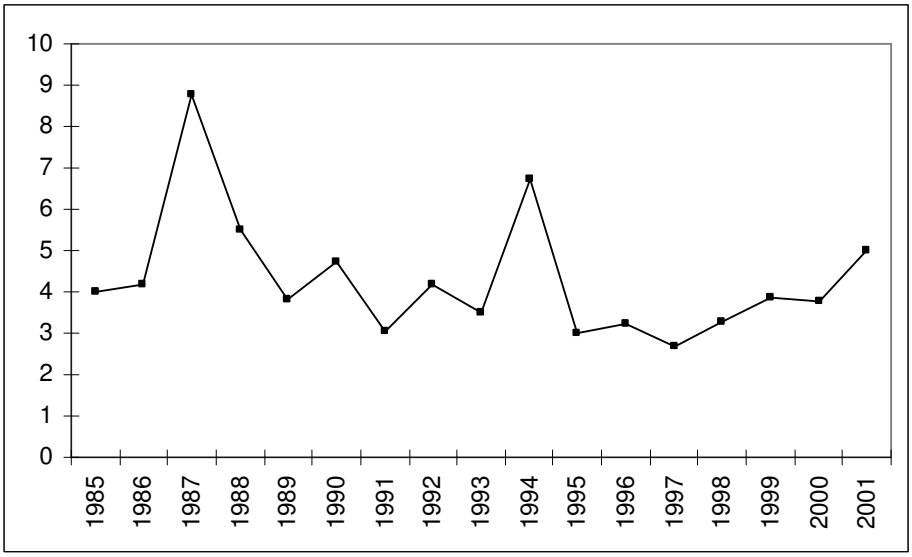

Figure 3: Importance of New Early-Stage Investments. It gives the ratio of early-stage investments over the expansion-stage investments, namely the ratio [= early-stage investments in year *t* ÷ expansion-stage investments in year *t*].

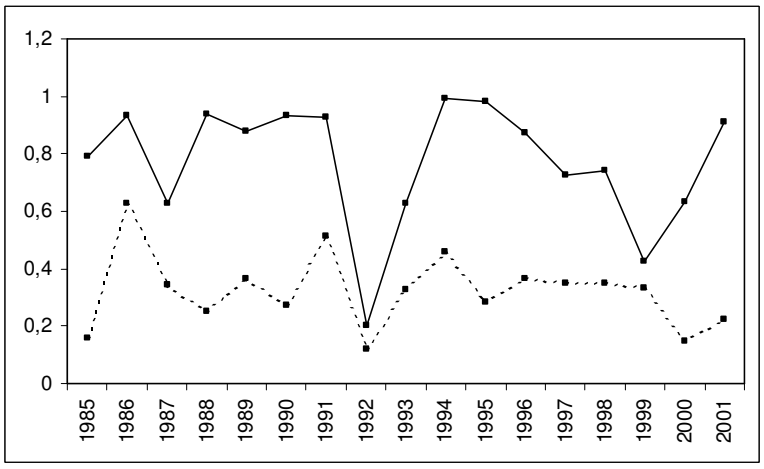

Figure 4: Average Amount of USD Invested in New Early-Stage Projects per USD in the Expansion-Stage for the Period 1985-2001. The full line gives for each year the amount of USD invested in new projects (first round investments) in the early-stage for each USD in the expansion-stage. E.g., in 2001 venture capitalists invested 91 cents in new early-stage investment rounds for each US dollar invested in new expansion-stage rounds. The dashed line gives for each year the amount of USD invested in new projects (first round investments) in the early-stage for each USD in either the expansion-stage or later-stage.

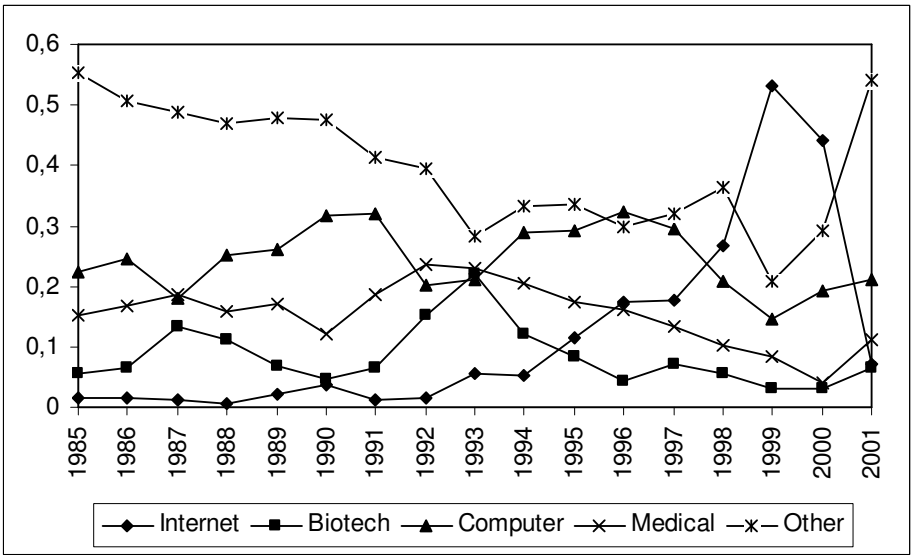

Figure 5: Proportion of all New Investments done in each Year Disaggregated by Industry Sector from 1985-2001, as Proportion of all New Investments.

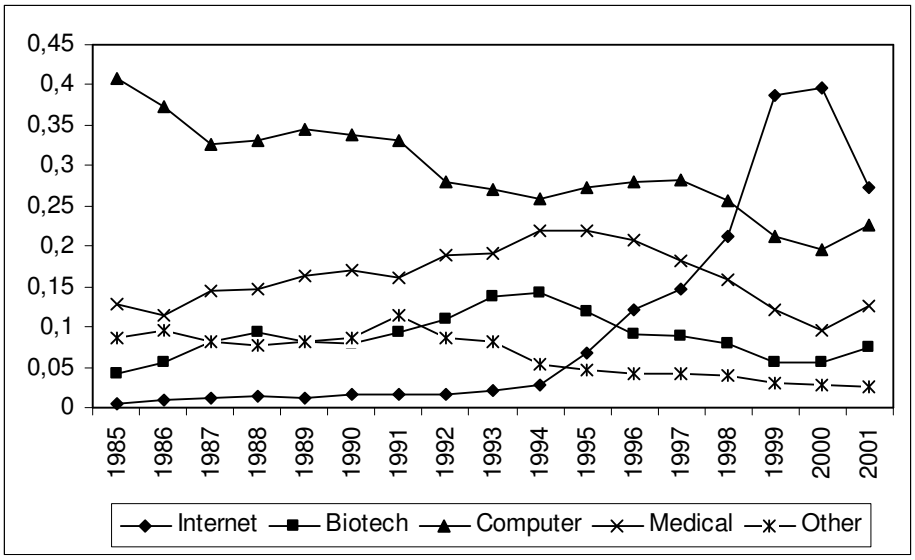

Figure 6: Proportion of all Investments done in each Year Disaggregated by Industry Sector from 1985-2001 for all New and Follow-Up Investments.

Table 1: Summary Statistics (Arithmetic Mean) of Data Sample. The unit of observation is an investment round. We distinguish between new investment rounds (first two columns) and follow-up investment rounds (last two columns). In both cases, we again distinguish between with and without investments in the later-stage. The full sample is the third column (new and follow-up investment rounds in all three stages of development).

	New Investment Rounds Only		New and Follow-Up Investment Rounds	
	for early-, expansion- and later-stages	for early - and expansion-stages only	for early-, expansion- and later-stages	for early - and expansion-stages only
Industry Sectors:				
- INTERNET	24 %	25 %	17 %	20 %
- BIOTECH	7 %	7 %	8 %	8 %
- COMPUTER	24 %	24 %	28 %	26 %
- MEDICAL	13 %	13 %	15 %	15 %
- Others	32 %	31 %	32 %	21 %
Stages of Investment:				
- EARLY_STAGE	74 %	79 %	34 %	47 %
- EXPANSION_STAGE	20 %	21 %	39 %	53 %
- LATER_STAGE	6 %	–	27 %	–
AMOUNTS (in mio USD)	5.11	4.95	6.80	6.82
NEW_INVESTMENT	–	–	22 %	28 %
NBR_INVESTORS	2.6	2.6	3.5	3.6
Number of Observations	3804	3568	17130	12547

Table 2: Summary Statistics (Arithmetic Mean) by Stages of Investment. In each cell, we provide two numbers. The first one concerns all new investment rounds only. The second one in brackets provides the same summary statistics for all investment rounds (new and follow-up rounds).

	Early-Stage	Expansion-Stage	Later-Stage
Industry Sectors:			
- INTERNET	24 % (20 %)	28 % (20 %)	11 % (10 %)
- BIOTECH	8 % (10 %)	3 % (6 %)	5 % (10 %)
- COMPUTER	24 % (24 %)	25 % (28 %)	23 % (31 %)
- MEDICAL	14 % (17 %)	8 % (14 %)	11 % (15 %)
- Others	30 % (29 %)	36 % (32 %)	50 % (34 %)
AMOUNTS (mio USD)	4.43 (4.71)	6.87 (8.65)	7.66 (6.74)
NBR_INVESTORS	2.7 (3.2)	2.4 (3.9)	2.1 (3.5)
Nbr. of Observations	2817 (5842)	751 (6705)	236 (4583)

Table 3: Summary Statistics (Arithmetic Mean) by Industry Sectors. In each cell, we provide two numbers. The first one is for new investment rounds in all the 3 stages of development (early-, expansion- and later-stage). The second one in brackets provides the same summary statistics for all investment rounds (new and follow-up rounds) in all 3 stages.

	Nbr. of Obs.	AMOUNTS (mio USD)	NBR_INVESTORS	EARLY_STAGE
INTERNET	918 (2946)	6.57 (11.40)	2.5 (3.4)	74 % (39 %)
BIOTECH	273 (1450)	4.58 (6.38)	2.9 (3.7)	87 % (41 %)
COMPUTER	919 (4751)	3.92 (4.78)	2.6 (3.6)	74 % (30 %)
MEDICAL	479 (2570)	4.05 (4.92)	2.6 (3.4)	82 % (38 %)
Others Sectors	1215 (5413)	5.46 (7.07)	2.6 (3.6)	68 % (32 %)

Table 4-A: The Effect of Exit Markets Liquidity on the Decision of Venture Capitalists to Invest in NEW Early-Stage Projects. We test HYPOTHESIS 1 on the negative relationship between liquidity of exit markets and the likelihood of investing in new early-stage projects, as well as HYPOTHESIS 2 on the negative effect of capital requirements (AMOUNTS) on the likelihood of investing in new early-stage projects. The dependent variable is EARLY_STAGE, a dummy variable equal to one if the new investment is in the early-stage and zero otherwise. The variable AMOUNTS is the total amount in million US dollars invested in this given round. NBR_IPO is the number of IPOs done in the US during the year at which the investment was made and therefore proxies the current liquidity conditions of venture capital exit markets. The variables NBR_IPO(+1) and NBR_IPO(+2) give the number of IPOs one year and two years ahead (e.g., if the new investment is done in 1995, NBR_IPO gives the number of IPOs done in 1995, NBR_IPO(+1) in 1996 and NBR_IPO(+2) in 1997). The variable GDP represents the real annual growth rate of the U.S. economy during the year in which the considered investment is done, and GDP(-1) is the real growth rate of the previous year. This variable is included to control for supply-side effects on the venture capital market. Log(NASDAQ) is the logarithm of the Nasdaq Composite index at the end of the year in which the considered investment is done. The other variables are industry dummies. To examine robustness of our results, we use two different samples. Regressions (1) to (3) are done with data on new early-stage and expansion-stage financing rounds only, while regressions (4) to (6) with data on new early-stage, expansion-stage and later-stage rounds. Thus, in the first three regressions, we test the choice between new early-stage and new expansion-stage investments; in the last three regressions, we test the choice between new early-stage investments and either new expansion-stage or new later-stage investments. In all the cases, the Logit regression technique is used to estimate the coefficients. Significance levels for the p-value of the estimated coefficients are denoted by *** for 1%, ** for 5%, and * for 10%. A constant term is included in all the regressions.

Exogenous Variables	Dependent Variable is EARLY_STAGE (LOGIT Regressions)					
	(1)	(2)	(3)	(4)	(5)	(6)
AMOUNTS	-0.0178 ***	-0.0164 ***	-0.0175 ***	-0.0170 ***	-0.0169 ***	-0.0203 ***
NBR_IPO	-0.0007 **	-0.0008 **	-0.0007 *	-0.0008 ***	-0.0010 ***	-0.0008 **
NBR_IPO(+1)			-0.00006			0.0001
NBR_IPO(+2)			-0.0011 ***			-0.0011 ***
log(NASDAQ)		0.060	-0.059		0.117 **	0.038
GDP		0.002	0.041		-0.022	-0.021
GDP(-1)		-0.011	-0.047		0.033	-0.001
INTERNET		0.066	0.197		0.270 ***	0.381 ***
COMPUTER		0.146	0.260 **		0.253 ***	0.349 ***
BIOTECH		1.189 ***	1.463 ***		1.154 ***	1.409 ***
MEDICAL		0.761 ***	0.906 ***		0.787 ***	0.907 ***
Nbr. of Observations	3568	3568	2869	3804	3804	3074
Obs. with Dep. = 1	79 %	79 %	79 %	74 %	74 %	73 %
Log Likelihood	-1821	-1794	-1437	-2159	-2123	-1716
LR Statistics	30.33 ***	84.83 ***	98.14 ***	38.25 ***	108.55 ***	126.66 ***

Table 4-B: The Effect of Exit Markets Liquidity on the Decision of Venture Capitalists to Invest in NEW Early-Stage Projects (Robustness Check). We test HYPOTHESIS 1 on the negative relationship between liquidity of exit markets and the likelihood of investing in new early-stage projects, but separately for hot and cold issue markets. These regressions are done for robustness check. The dependent variable is EARLY_STAGE, a dummy variable equal to one if the new investment is in the early-stage and zero otherwise. The variable AMOUNTS is the total amount in million US dollars invested in this given round. NBR_IPO is the number of IPOs done in the US during the year at which the investment was made and therefore proxies the current liquidity conditions of venture capital exit markets. The variables NBR_IPO(+1) and NBR_IPO(+2) give the number of IPOs one year and two years ahead (e.g., if the new investment is done in 1995, NBR_IPO gives the number of IPOs done in 1995, NBR_IPO(+1) in 1996 and NBR_IPO(+2) in 1997). The variable HOT is a dummy variable equal to one if NBR_IPO ≥ 323.7, and zero otherwise. The variable COLD is defined as = 1 – HOT. The variable GDP represents the real annual growth rate of the U.S. economy during the year in which the considered investment is done, and GDP(-1) is the real growth rate of the previous year. This variable is included to control for supply-side effects on the venture capital market. Log(NASDAQ) is the logarithm of the Nasdaq Composite index at the end of the year in which the considered investment is done. The other variables are industry dummies. We again use two different samples. Regressions (1) to (3) are done with data on new early-stage and expansion-stage financing rounds only, while regressions (4) to (6) with data on new early-stage, expansion-stage and later-stage rounds. Thus, in the first three regressions, we test the choice between new early-stage and new expansion-stage investments; in the last three regressions, we test the choice between new early-stage investments and either new expansion-stage or new later-stage investments. In all the cases, the Logit regression technique is used to estimate the coefficients. Significance levels for p-values are denoted by *** for 1%, ** for 5%, and * for 10%. A constant term is included in all the regressions.

Exogenous Variables	Dependent Variable is EARLY_STAGE (LOGIT Regressions)					
	(1)	(2)	(3)	(4)	(5)	(6)
AMOUNTS	-0.0183 ***	-0.0168 ***	-0.0180 ***	-0.0178 ***	-0.0176 ***	-0.0210 ***
NBR_IPO*HOT	-0.0009 **	-0.0011 ***	-0.00002	-0.0012 ***	-0.0014 ***	-0.0008
NBR_IPO(+1)*HOT(+1)			-0.0010			0.0006
NBR_IPO(+2)*HOT(+2)			-0.0009 **			-0.0011 ***
NBR_IPO*COLD	-0.0014 *	-0.0016 **	-0.0001	-0.0020 ***	-0.0022 ***	-0.0014
NBR_IPO(+1)*COLD(+1)			-0.0025 *			-0.0016
NBR_IPO(+2)*COLD(+2)			-0.0020 **			-0.0019 **
log(NASDAQ)		0.056	-0.168		0.111 **	-0.018
GDP		0.009	0.058		-0.014	-0.014
GDP(-1)		-0.009	-0.005		0.037	0.029
INTERNET		0.060	0.192		0.261 ***	0.367 ***
COMPUTER		0.144	0.270 **		0.250 ***	0.352 ***
BIOTECH		1.190 ***	1.427 ***		1.156 ***	1.382 ***
MEDICAL		0.762 ***	0.895 ***		0.788 ***	0.895 ***
Nbr. of Observations	3568	3568	2869	3804	3804	3074
Obs. with Dep. = 1	79 %	79 %	79 %	74 %	74 %	73 %
Log Likelihood	-1820	-1793	-1434	-2157	-2122	-1714
LR Statistics	31.26 ***	86.04 ***	102.66 ***	42.06 ***	112.23 ***	130.07 ***

TABLE 4-C: The Effect of Exit Markets Liquidity on the Decision of Venture Capitalists to Invest in NEW Early-Stage Projects (Robustness Check). We test HYPOTHESIS 1 on the negative relationship between liquidity of exit markets and the likelihood of investing in new early-stage projects, but with NASDAQ instead of log(NASDAQ). These regressions are done for robustness check. The dependent variable is EARLY_STAGE, a dummy variable equal to one if the new investment is in the early-stage and zero otherwise. In all the regressions, we test the hypothesis for the choice between new early-stage investments and either new expansion-stage or new later-stage investments. Significance levels for p-values are denoted by *** for 1%, ** for 5%, and * for 10%. A constant term is included in all the regressions.

Exogenous Variables	Dependent Variable is EARLY_STAGE			
	(a) OLS	(b) OLS	(c) Logit	(d) Logit
AMOUNTS	-0.003 ***	-0.004 ***	-0.018 ***	-0.021 *
NBR_IPO	-0.0002 ***	-0.0002 **	-0.001 ***	-0.001 **
NBR_IPO(+1)		-0.00002		-0.0002
NBR_IPO(+2)		-0.0002 ***		-0.001 ***
NASDAQ	0.00003 ***	0.00001	0.0001 ***	0.00006
GDP	-0.006	-0.007	-0.034	-0.033
GDP(-1)	0.001	-0.001	0.007	-0.005
INTERNET	0.045 **	0.075 ***	0.214 **	0.355 ***
COMPUTER	0.052 ***	0.073 ***	0.255 ***	0.347 ***
BIOTECH	0.192 ***	0.230 ***	1.164 ***	1.410 ***
MEDICAL	0.144 ***	0.167 ***	0.794 ***	0.907 ***
Nbr. of Obs.	3804	3074	3804	3074
Dep. = 1	74 %	73 %	74 %	73 %
Log Likelihood	-2202	-1787	-2120	-1715
F- (LR) Statistics	13.01 ***	11.57 ***	116.49 ***	127.72 ***

TABLE 4-D: The Effect of Exit Markets Liquidity on the Decision of Venture Capitalists to Invest in NEW Early-Stage Projects (Robustness Check). We test HYPOTHESIS 1 on the negative relationship between liquidity of exit markets and the likelihood of investing in new early-stage projects, but excluding internet companies (i.e., INTERNET = 0). These regressions are done for robustness check. The dependent variable is EARLY_STAGE, a dummy variable equal to one if the new investment is in the early-stage and zero otherwise. In all the regressions, we test the hypothesis for the choice between new early-stage investments and either new expansion-stage or new later-stage investments. Significance levels for p-values are denoted by *** for 1%, ** for 5%, and * for 10%. A constant term is included in all the regressions.

Exogenous Variables	Dependent Variable is EARLY_STAGE (Logit)			
	(a)	(b)	(c)	(d)
AMOUNTS	-0.017 **	-0.0212	-0.018 **	-0.022
NBR_IPO	-0.0013 ***	-0.0010 **	-0.0013 ***	-0.0011 ***
NBR_IPO(+1)		-0.00006		-0.0001
NBR_IPO(+2)		-0.0009 ***		-0.0008 **
log(NASDAQ)	0.104 *	0.029		
NASDAQ			0.0001 ***	0.00005
GDP	0.001	-0.004	-0.010	-0.016
GDP(-1)	0.019	-0.003	0.001	-0.007
INTERNET	---	---	---	---
COMPUTER	0.261 ***	0.351 ***	0.261 ***	0.349 ***
BIOTECH	1.152 ***	1.403 ***	1.161 ***	1.405 ***
MEDICAL	0.791 ***	0.907 ***	0.796 ***	0.908 ***
Nbr. of Obs.	2886	2431	2886	2431
Dep. = 1	74 %	73 %	74 %	73 %
Log Likelihood	-1600	-1354	-1598	-1354
F- (LR) Statistics	102.47 ***	110.31 ***	106.96 ***	117.01 ***

Table 5: The Effect of Exit Markets Liquidity on the Decision of Venture Capitalists to Invest in Early-Stage Projects (for All New as well as Follow-Up Investments). We test HYPOTHESIS 1 on the negative relationship between liquidity of exit markets and the likelihood of investing in early-stage projects but for investments in new projects as well as in follow-up rounds (in principle, HYPOTHESIS 1 only deals with new investments). The dependent variable is EARLY_STAGE, a dummy variable equal to one if the new investment is in the early-stage and zero otherwise. The variable AMOUNTS is the total amount in million US dollars invested in this given round. NBR_IPO is the number of IPOs done in the US during the year at which the investment was made and therefore proxies the current liquidity conditions of venture capital exit markets. The variables NBR_IPO(+1) and NBR_IPO(+2) give the number of IPOs one year and two years ahead (e.g., if the new investment is done in 1995, NBR_IPO gives the number of IPOs done in 1995, NBR_IPO(+1) in 1996 and NBR_IPO(+2) in 1997). The variable GDP represents the real annual growth rate of the U.S. economy during the year in which the considered investment is done, and GDP(-1) is the real growth rate of the previous year. This variable is included to control for supply-side effects on the venture capital market. Log(NASDAQ) is the logarithm of the Nasdaq Composite index at the end of the year in which the considered investment is done. The other variables are industry dummies. To examine robustness of our results, we use two different samples. Regressions (1) to (3) are done with data on early-stage and expansion-stage financing rounds only, while regressions (4) to (6) with data on early-stage, expansion-stage and later-stage rounds. Thus, in the first three regressions (for new and follow-up investment rounds), we test the choice between early-stage and expansion-stage investments; in the last three regressions (for new and follow-up investment rounds), we test the choice between early-stage investments and either expansion-stage or later-stage investments. In all the cases, the Logit regression technique is used to estimate the coefficients. Significance levels for the p-value of the estimated coefficients are denoted by *** for 1%, ** for 5%, and * for 10%. A constant term is included in all the regressions.

Exogenous Variables	Dependent Variable is EARLY_STAGE (LOGIT Regressions)					
	(1)	(2)	(3)	(4)	(5)	(6)
AMOUNTS	-0.039 ***	-0.039 ***	-0.0435 ***	-0.025 ***	-0.030 ***	-0.032 ***
NBR_IPO	0.0011 ***	0.0009 ***	0.0004 **	0.0007 ***	0.0005 ***	-0.00004
NBR_IPO(+1)			0.0005 **			0.0004 **
NBR_IPO(+2)			0.0001			-0.0005 ***
log(NASDAQ)		-0.054 **	-0.032		-0.027	0.003
GDP		0.102 ***	0.088 ***		0.103 ***	0.039 *
GDP(-1)		0.028	0.029		0.071 ***	0.060 ***
INTERNET		0.203 ***	0.501 ***		0.398 ***	0.707 ***
COMPUTER		-0.114 **	-0.061		-0.131 ***	-0.088 *
BIOTECH		0.571 ***	0.713 ***		0.406 ***	0.538 ***
MEDICAL		0.212 ***	0.394 ***		0.233 ***	0.417 ***
Nbr. of Observations	12547	12547	9627	17130	17130	13349
Obs. with Dep. = 1	47 %	47 %	50 %	34 %	34 %	36 %
Log Likelihood	-8439	-8361	-6491	-10852	-10718	-8504
LR Statistics	455.94 ***	612.74 ***	362.25 ***	281.30 ***	550.03 ***	422.42 ***

Table 6: The Effect of Exit Markets Liquidity on the Decision of Venture Capitalists to Invest in NEW Projects (irrespective of Development Stage). We test HYPOTHESIS 3 on the positive relationship between liquidity of exit markets and the likelihood of investing in new projects. The dependent variable is NEW_INVESTMENT, a dummy variable equal to one if the investment is new (first round) and zero if the investment is a follow-up financing round. The variable AMOUNTS is the total amount in million US dollars invested in this given round. NBR_IPO is the number of IPOs done in the US during the year at which the investment was made and therefore proxies the current liquidity conditions of venture capital exit markets. The variables NBR_IPO(+1) and NBR_IPO(+2) give the number of IPOs one year and two years ahead (e.g., if the new investment is done in 1995, NBR_IPO gives the number of IPOs done in 1995, NBR_IPO(+1) in 1996 and NBR_IPO(+2) in 1997). We also include dummy variables for stages of development (EARLY_STAGE, EXPANSION_STAGE, and LATER_STAGE). The variable GDP represents the real annual growth rate of the U.S. economy during the year in which the considered investment is done, and GDP(-1) is the real growth rate of the previous year. This variable is included to control for supply-side effects on the venture capital market. Log(NASDAQ) is the logarithm of the Nasdaq Composite index at the end of the year in which the considered investment is done. The other variables are industry dummies. To examine robustness of our results, we use two different samples. Regressions (1) to (3) are done with data on early-stage and expansion-stage financing rounds only, while regressions (4) to (6) with data on early-stage, expansion-stage and later-stage rounds. In all the cases, the Logit regression technique is used to estimate the coefficients. Significance levels for p-values are denoted by *** for 1%, ** for 5%, and * for 10%. A constant term is included in all the regressions.

Exogenous Variables	Dependent Variable is NEW_INVESTMENT (LOGIT Regressions)					
	(1)	(2)	(3)	(4)	(5)	(6)
AMOUNTS	-0.027 ***	-0.038 ***	-0.042 ***	-0.016 ***	-0.026 ***	-0.031 ***
NBR_IPO	0.0022 ***	0.0015 ***	0.0013 ***	0.0020 ***	0.0013 ***	0.0011 ***
NBR_IPO(+1)			0.0003			0.0004 *
NBR_IPO(+2)			-0.0002			-0.0002
log(NASDAQ)		0.165 ***	0.132 ***		0.148 ***	0.117 ***
GDP		0.151 ***	0.167 ***		0.159 ***	0.150 ***
GDP(-1)		0.042 **	0.043 **		0.072 ***	0.064 ***
INTERNET		0.227 ***	0.521 ***		0.315 ***	0.623 ***
COMPUTER		-0.185 ***	-0.145 **		-0.246 ***	-0.211 ***
BIOTECH		-0.154 *	-0.040		-0.259 ***	-0.146 *
MEDICAL		-0.336 ***	-0.204 ***		-0.324 ***	-0.182 ***
Nbr. of Observations	12547	12547	9627	17130	17130	13349
Obs. with Dep. = 1	28 %	28 %	30 %	22 %	22 %	23 %
Log Likelihood	-7283	-7150	-5617	-8903	-8704	-6919
LR Statistics	416.92 ***	681.80 ***	495.38 ***	335.17 ***	734.04 ***	568.45 ***

Table 7: The Effect of Exit Markets Liquidity on Investment Size. We test HYPOTHESIS 4 on the positive relationship between liquidity of exit markets and the investment size for new projects. The dependent variable is AMOUNTS, the total amount in million US dollars invested in this given round. NBR_IPO is the number of IPOs done in the US during the year at which the investment was made and therefore proxies the current liquidity conditions of venture capital exit markets. NBR_INVESTORS gives the number of investors involved in the financing of the particular round. The variables NBR_IPO(+1) and NBR_IPO(+2) give the number of IPOs one year and two years ahead (e.g., if the new investment is done in 1995, NBR_IPO gives the number of IPOs done in 1995, NBR_IPO(+1) in 1996 and NBR_IPO(+2) in 1997). The variable FOLLOW_UP is a dummy variable equal to one if the investment is a follow-up investment, and zero otherwise. The variable GDP represents the real annual growth rate of the U.S. economy during the year in which the considered investment is done, and GDP(-1) is the real growth rate of the previous year. This variable is included to control for supply-side effects on the venture capital market. Log(NASDAQ) is the logarithm of the Nasdaq Composite index at the end of the year in which the considered investment is done. The other variables are industry dummies. To examine robustness of our results, we use two different samples. Regressions (1) to (3) are done with data on early-stage and expansion-stage financing rounds only, while regressions (4) to (6) with data on early-stage, expansion-stage and later-stage rounds. In all the cases, the OLS regression technique is used to estimate the coefficients, while using White heteroskedasticity-consistent standard errors and covariance. Significance levels for p-values are denoted by *** for 1%, ** for 5%, and * for 10%. A constant term is included in all the regressions.

Exogenous Variables	Dependent Variable is AMOUNTS (OLS Regressions)					
	(1)	(2)	(3)	(4)	(5)	(6)
NBR_INVESTORS	1.613 ***	1.736 ***	1.219 ***	1.674 ***	1.807 ***	1.225 ***
NBR_IPO	0.0056 ***	0.0001	0.0022	0.0056 ***	-0.0001	0.0021
NBR_IPO(+1)			0.0004			0.0013
NBR_IPO(+2)			-0.0015			-0.0017 *
log(NASDAQ)		3.097 ***	2.230 ***		3.281 ***	2.031 ***
GDP		-0.423 ***	-0.293		-0.378 ***	-0.188
GDP(-1)		-0.195 *	-0.159		-0.220 *	-0.196
INTERNET		-0.362	-0.806		-0.923	-0.899
COMPUTER		-1.299 ***	-1.105 ***		-1.647 ***	-1.182 ***
BIOTECH		-0.469	0.046		-0.933	-0.199
MEDICAL		-1.557 ***	-1.168 ***		-1.103	-1.236 ***
Nbr. of Observations	3568	3568	2869	3804	3804	3074
R^2 (Adjusted R^2)	0.07 (0.07)	0.12 (0.12)	0.07 (0.07)	0.06 (0.06)	0.09 (0.09)	0.07 (0.07)
F-Statistics	140.86 ***	54.58 ***	19.63 ***	114.97 ***	43.74 ***	20.61 ***

Table 8: The Effect of Exit Markets Liquidity on the Syndicate Size. We test HYPOTHESES 5A and 5B on the relationship between liquidity of exit markets and the syndicate size for new projects. The dependent variable is NBR_INVESTORS, which gives the number of investors involved in the financing of the particular round. The variable AMOUNTS is the total amount in million US dollars invested in this given round. NBR_IPO is the number of IPOs done in the US during the year at which the investment was made and therefore proxies the current liquidity conditions of venture capital exit markets. The variables NBR_IPO(+1) and NBR_IPO(+2) give the number of IPOs one year and two years ahead (e.g., if the new investment is done in 1995, NBR_IPO gives the number of IPOs done in 1995, NBR_IPO(+1) in 1996 and NBR_IPO(+2) in 1997). The variable FOLLOW_UP is a dummy variable equal to one if the investment is a follow-up investment, and zero otherwise. We also include dummy variables for stages of development (EARLY_STAGE and EXPANSION_STAGE, while LATER_STAGE is obviously omitted to avoid singularity). The variable GDP represents the real annual growth rate of the U.S. economy during the year in which the considered investment is done, and GDP(-1) is the real growth rate of the previous year. This variable is included to control for supply-side effects on the venture capital market. Log(NASDAQ) is the logarithm of the Nasdaq Composite index at the end of the year in which the considered investment is done. The other variables are industry dummies. To examine robustness of our results, we use two different samples. Regressions (1) to (3) are done with data on early-stage and expansion-stage financing rounds only, while regressions (4) to (6) with data on early-stage, expansion-stage and later-stage rounds. In all the cases, the Poisson Count regression technique is used to estimate the coefficients. Significance levels for p-values are denoted by *** for 1%, ** for 5%, and * for 10%. A constant term is included in all the regressions.

Exogenous Variables	Dependent Variable is NBR_INVESTORS (POISSON COUNT Regressions)					
	(1)	(2)	(3)	(4)	(5)	(6)
AMOUNTS	0.008 ***	0.009 ***	0.007 ***	0.006 ***	0.007 ***	0.007 ***
NBR_IPO	-0.0007 ***	-0.0004 ***	-0.0002	-0.0007 ***	-0.0004 ***	-0.0002 **
NBR_IPO(+1)			-0.0002			-0.0001
NBR_IPO(+2)			-0.0006 ***			-0.0005 ***
EARLY_STAGE		0.092 ***	0.091 ***		0.134 ***	0.114 ***
log(NASDAQ)		-0.120 ***	-0.153 ***		-0.123 ***	-0.148 ***
GDP		0.009	-0.010		0.007	0.004
GDP(-1)		0.023 **	0.012		0.025 ***	0.015
INTERNET		0.024	-0.029		0.047	-0.010
COMPUTER		-0.002	-0.010		0.010 **	0.007
BIOTECH		0.053	0.059		0.078 **	0.073 *
MEDICAL		0.005	0.017		-0.004	0.0248
Nbr. of Observations	3568	3568	2869	3804	3804	3074
Log Likelihood	-6556	-6512	-5185	-6973	-6917	-5522
LR Statistics	279.17 ***	366.19 ***	337.37 ***	260.12 ***	371.31 ***	370.49 ***