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ABSTRACT

It is well documented that the venture capital industry is highly volatile and that much of this volatility is associated with shifting valuations and activity in public equity markets. This paper examines how changes in public market signals affected venture capital investing between 1975 and 1998. We find that venture capitalists with the most industry experience increase their investments the most when public market signals become more favorable. Their reaction to an increase is greater than the reaction of venture capital organizations with relatively little industry experience and those with considerable experience but in other industries. The increase in investment rates does not affect the success of these transactions adversely to a significant extent. These findings are consistent with the view that venture capitalists rationally respond to attractive investment opportunities signaled by public market shifts.

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1. Introduction

The high volatility of the venture capital industry is well documented. This volatility manifests itself in a number of ways: the funds flowing to venture capital firms, the investments firms make in portfolio companies, and the financial performance of portfolio companies and venture capital firms. (Gompers and Lerner, 2004). Much of this volatility appears to be tied to valuations in public equity markets. An increase in IPO valuations leads venture capital firms to raise more funds (Gompers and Lerner, 1998; Jeng and Wells, 2000), an effect that is particularly strong among younger venture capital firms (Kaplan and Schoar, 2005). Moreover, returns of venture capital funds appear to be highly correlated with the returns on the market as a whole (Cochrane, 2005; Kaplan and Schoar, 2005; Ljundqvist and Richardson, 2003).

Many industry observers (see, for instance, Gupta, 2000) argue that the volatility of the venture capital industry is a symptom of overreaction by venture capitalists and entrepreneurs to perceived investment opportunities. These swings result in periods in which too many competing companies are funded, followed by ones in which not enough companies have access to capital. The boom of 1998-2000 provides an extreme illustration of these problems. Funding during these years grew dramatically—in real terms, the financing level in 2000 was more than 30 times the level in 1991—and was concentrated in two areas: Internet and telecommunication investments, which accounted for 39% and 17% of all venture disbursements in 1999. Considerable sums were devoted to supporting very similar firms—e.g., the nine dueling Internet pet food suppliers and the many companies that undertook the extremely capital-intensive process of building second cable networks in residential communities. Meanwhile, many apparently

promising areas such as advanced materials, energy technologies, and micro manufacturing languished unfunded as venture capitalists raced to focus on the most visible and popular investment areas.

This alleged overreaction may have its roots in the behavioral biases of venture capitalists who irrationally associate past investment successes with future investment opportunities. Or it may stem from venture capitalists who feel compelled to follow the herd out of concern for the reputation consequences of being contrarians (Scharfstein and Stein, 1990) Indeed, in 1999, even private equity firms with investment mandates to invest in leveraged buyouts felt compelled to back Internet startups.

A contrasting view is that the volatility of the venture capital industry stems not from overreaction, but from the inherent volatility of fundamentals. In this view, fluctuation in venture capital investment activity is simply a response to changes in investment opportunities. There may be shocks to the investment opportunities of existing entrepreneurial firms, or entry by new entrepreneurs, both of which increase the demand for capital.

This paper takes a step towards distinguishing between the "overreaction view" and the "fundamentals view" by examining the responses of different classes of venture investors. We start with the observation (and empirically document) that the most experienced venture capital firms generally have the best performance (Sorensen, 2004). We then examine how these most successful investors respond to public market signals of investment opportunities. Are they more prone to increase their investments when the market heats ups? And, how well do they do on these investments relative to less experienced venture capitalists? If we find that the most experienced investors are more

prone to increase their investment levels when the market heats up, this suggests that shifts in fundamentals are likely an important component of venture capital investing. This interpretation is further supported if there is also little degradation in their performance. On the other hand, if we observe that the least experienced venture capitalists are most likely to increase their investment activity during hot markets, this lends more credibility to the view that overreaction is a more important cause of volatility in the venture capital industry.

Our empirical results indicate that investment by the most experienced venture capital firms—notably those with the most *industry* experience—are most responsive to public market signals of investment opportunities. We start by showing that venture capital investment activity at the industry level is very sensitive to public market signals of industry attractiveness such as Tobin's Q and IPO activity; a shift from the bottom to the top quartile in these measures increases the number of investments by more than 20%. This effect is driven largely by venture capital firms with the most experience doing deals in the industry. General experience (across all industries) has no effect on investment sensitivity to industry Q and IPO activity, once we control for industry experience. Moreover, although the success rate for deals done in a hot market is lower than it is for deals done in a cold market, the difference is small. This difference between hot and cold market performance is even smaller for experienced venture capital firms than it is for less experienced venture capital firms. These findings suggest that an important component of volatility in venture capital investment activity is driven by volatility of fundamentals.

Of independent interest is our finding of the importance of industry-specific rather than general experience. It points to the importance of industry-specific human capital and suggests that a critical part of venture capital investing is the network of industry contacts to identify good investment opportunities as well as the know-how to manage these investments. These contacts and know-how come only from long-standing experience doing deals in an industry.

This rest of the paper is organized as follows. The next section describes the construction of the data and provides some basic summary statistics. Section 3 examines the impact of shifts in valuations and IPO activity and the determinants of venture capital organization investment activity. In that section, we also look at the determinants of successful investments both in terms of the investment cycle and the characteristics of the venture capital organizations. Section 4 concludes the paper.

2. The Data

A. Constructing the Sample

Our data on venture investments come from Thomson Venture Economics (Venture Economics). This database provides information about both venture capital investors and the portfolio companies in which they invest. We consider an observation to be the first record of a venture capital organization and portfolio company pair, i.e., the first time a venture capitalist invests in a particular company. This approach results in a dataset with multiple observations for most portfolio companies since several venture capital firms typically invest in a company. We exclude follow-on investments by a

venture capital organization in the same portfolio company since these investments may result from different considerations than do initial investments.

Our analysis focuses on data covering investments from 1975 to 1998, dropping information prior to 1975 due to data quality concerns.[1] In keeping with industry estimates of a maturation period of three to five years for venture companies, we drop information after 1998 so that the outcome data can be meaningfully interpreted. As a result, we are not studying investments made at the height of the Internet boom (1999 and 2000) and the crash that followed.

From 1975 to 1998, Venture Economics provides information on 2,179 venture capital firms investing in 16,354 companies. This results in a sample of 42,559 observations of unique venture capital firm – portfolio company pairs.

B. Critical Measures and Summary Statistics

Before we turn to an analysis of investment cycles, there are three data construction issues we need to address.

The first issue is how to classify venture capital industries. Our approach is to assign all investments into nine broad industry classes based on Venture Economics' classification of the industry. The original sample of investments was classified into 69 separate industry segments. However, these 69 industries are too narrowly defined for our purposes, as they do not correspond to lines of specialization within or across venture capital firms. These 69 industries were thus combined to arrive at nine broader industries. The industries we construct from the narrower definitions are: Internet and

[1]Gompers and Lerner (2004) discuss the coverage and selection issues in Venture Economics data prior to 1975.

Computers, Communications and Electronics, Business and Industrial, Consumer, Energy, Biotech and Healthcare, Financial Services, Business Services, and all other. While any industry classification is somewhat arbitrary, we believe that our classification scheme captures businesses that have similarities in technology and management expertise that would make specialization in such industries meaningful. In addition, this scheme minimizes the subjectivity associated with classifying firms into narrower industry groupings.

Panel A of Table 1 shows the distribution across the nine broad industries. The first column is the number of companies in each industry. It is no surprise that Internet and Computers is the largest industry with 4,679 companies. Biotech and Healthcare, Communications and Electronics, and Consumer are the next largest industries with between 2,285 and 2,745 companies. The other industries are considerably smaller. The table also reports the number of observations for each industry in our sample; there are more observations than companies because there are multiple venture capital investors in most of the companies in our sample. On average, there are 2.6 venture capital investors in each company. The overall industry distribution provides some comfort that our industry classification is meaningful. While there is variation in the number of observations across industries, there are enough observations in each industry to make our analysis feasible.

The second challenge has to do with the measurement of perceived investment opportunities. We use two measures of perceived investment opportunities in our analysis, industry Q and IPO activity. Because we do not know whether these measures

overstate or understate true investment opportunities, we will refer to industry Q and IPO activity simply as "public market signals."

The measurement of Q follows the standard approach in the investment literature. We calculate Q as the ratio of market value of the firm to the book value of assets, where the market value of the firm is measured as the book value of assets plus the market value of equity less the book value of equity. Since we cannot observe the Q of private firms that constitute the pool of potential venture capital investments, we use an estimate of Q for public companies as a proxy. However, in order to do so, we need to link the SIC codes of public companies to Venture Economics industries on which our data is based. Our procedure is to identify the SIC codes of all Venture Economics firms that went public. Because there are multiple SIC codes associated with each of our nine industries, we construct Q as a weighted average of the industry Q of the public companies in those SIC codes, where the weights are the relative fractions of firms that went public within our nine industries. Within the SIC code, Q is calculated by equally weighting all public companies.

Our second, less standard measure is the level of venture capital-backed IPO activity in an industry. We use this measure for both theoretical and practical reasons. The theoretical rationale is based on the observation that IPOs are by far the most important (and profitable) means for venture capitalists to exit an investment (Gompers and Lerner, 2004). Thus, an increase in the number of IPOs in a particular sector may make investing in that sector more attractive. In addition, an increase in IPO activity may also attract more potential entrepreneurs into a sector, thereby increasing the pool of potential investments and the likelihood that a venture capitalist will find an attractive

one. The practical rationale for using IPO activity is that our Q measure may not accurately reflect the shifts in public investors' appetite for venture capital-backed firms both because it uses data on mature public companies and relies on an inexact match between SIC codes and Venture Economics codes. Given the strong link between IPO activity and market valuations (Pagano, Panetta, and Zingales, 1998 and Ritter and Welch, 2002), the IPO measure may actually be a better proxy for the public market's perception of the types of investments in our sample.

Figure 1 shows the relationship between industry venture capital investment activity and the two measures of public market signals for four of the industries in the sample. In Internet and Computers, the correlation between IPOs and investment activity appears to be very high throughout the period. This high correlation can also be seen in Q in Figure 2. In other industries, the relationship is less pronounced. For instance, in both Biotechnology and Healthcare and Energy, the number of investments declined during the last half of the 1990s, even as the number of IPOs in the industry climbed.

The final challenge is to measure the experience of the venture capital groups in the sample. The second panel of Table 1 presents data on three characteristics of venture capital firms that we use throughout the paper. The first such characteristic, "General Experience," is the total number of investments made by a venture capital firm prior to the time of the investment in question. The second characteristic, "Industry Experience," is constructed similarly, but includes only investments in the same industry as the investment in question. The third characteristic, "Specialization" is the fraction of all previous investments that the venture capital organization made in a particular industry, i.e., this specialization measure is the ratio of industry to general experience. The

specialization measure is not computed for the first investment by each venture organization.

Panel B of Table 1 presents the distribution of general experience, industry experience, and specialization measures across all venture organization-industry pairs in the sample. Since many of these observations include cases where the venture capital firm did not invest in an industry in a particular year, we report the sub-sample that includes only investors in the industry in a given year. In addition, we provide summary data for 1985, 1990, and 1995.

Overall, venture capital firms made an average of 36.3 previous investments, of which 4.1 were in the same industry. The numbers are higher if one conditions the observation on the venture capital firm making an investment in the industry during the year. The medians of these experience measures are considerably lower, reflecting the skewness of the distribution. Not surprisingly, there is an increase in experience over time. On average, investments are made by venture capital firms with 19.75% of their investments in the industry of the company in which they are investing. This suggests that most venture capital firms spread out their investments across industries.

Table 2 breaks out venture capital firm characteristics by quartile, and examines the relationships among them. Industry experience and specialization quartiles were calculated by industry, by year, so that industries with fewer investments would not be disproportionately sampled in lower quartiles, and that the highest experience quartiles would not disproportionately reflect later investments. The first quartile represents the least experienced or specialized firms, while the fourth quartile measures the highest. Not surprisingly, venture capital firms in the higher quartiles of industry experience have

made more investments overall than firms in lower quartiles of industry experience. This shows up as well as a high correlation between industry experience and general experience. Specialization, on the other hand, is not highly correlated with the experience measures; in fact, it is negatively correlated with general experience. This low correlation is driven by the firms in the highest specialization quartile who make fewer investments than those firms who specialize less. The pattern is probably due to the fact that extreme specialization limits the pool of investments from which a venture capital firm can choose.

3. Analysis

A. The Determinants of Investments

We first focus on understanding how public market signals affect the investment decisions of venture capitalists. In Section 3.B, we turn to understanding the determinants of investment success.

Table 3 presents a regression-based analysis of the relationship between the number of investments and our public market signals. The first column shows the results of regressing the logarithm of the annual number of investments in an industry on the lagged logarithm of the number of IPOs in the industry, including industry and year fixed effects. The coefficient estimate implies that an increase in IPO activity from the bottom to the top quartile increases the number of investments by 22%. Likewise, the second column indicates that there is a strong positive relationship between industry investment activity and Q. An increase from the bottom Q quartile to the top Q quartile increases industry investment by 22%. The third and fourth columns of Table 3 report the results

of using detrended variables in the regression. For each industry, we detrend both industry investments and the public market measures. We then use the residuals in the regression. Again the magnitude of the effects is large and similar across regressions, although the explanatory power of the IPO measure appears to be significantly greater than that of Q. These regressions would appear to validate the use of Q and IPO activity as measures of public market signals that affect venture capital investments.

Table 4 begins to look at the relationship between venture capital firm characteristics and investment behavior. In this table, we use as observations each venture capitalist-industry pair in each year the venture organization is active, i.e., all years following the first observation of an organization and ceasing in the year in which the organization's final investment is observed. We first present results using IPO activity and then check for robustness using the Q measure. The results are essentially the same using either measure.

The first column of Table 4 repeats the industry level regression at the venture organization-industry level. We include both industry and year fixed effects. Not surprisingly, the regression indicates that venture capital firms tend to increase their investments in years and industries in which IPO activity increases. The coefficient, which is statistically significant, implies that an increase in IPO activity from the 25th percentile to the 75th percentile boosts the venture organization's investment activity in the industry by 4.9%.

As the second column of Table 4 indicates, there is also a strong positive relationship between general experience and investment activity. The third column decomposes experience into industry experience and non-industry experience. The

regression indicates that what drives the relationship is industry experience; prior investment activity outside the industry has no appreciable relationship to investment activity within the industry. The average venture capital firm in the highest quartile of industry experience invests 24% more in the industry than a firm in the lowest quartile of industry experience.

Columns 4 and 5 of Table 4 add industry specialization to the regressions. In both regressions, it is clear that prior focus on a particular industry increases future investment in the industry. The results in column 5 indicate that an organization in the top industry specialization quartile makes 8% more investments in that the industry than one in the bottom quartile. Finally, the last two columns of Table 4 replicate the results in columns 3 and 5 using Q rather than IPO activity as the measure of the public market. The basic patterns continue to hold in these regressions, and the magnitude of the effects is similar.

The next two tables present our main results on how venture capital firms with different characteristics respond to changes in public valuations and activity. In this table, we add to the specifications in Table 4 variables that interact our public market measures with our measures of firm characteristics, i.e., general experience, industry experience, and industry specialization. Throughout our discussion of the results, when we refer to periods with high IPO activity we are referring to those in the top quartile of IPO activity; low IPO activity refers to those periods in the bottom quartile. Likewise, high general experience, industry experience, and specialization refers to venture capital firms in the top quartile, while those with low general experience, industry experience, and specialization refers to those in the bottom quartile.

The first column of Table 5 indicates that the industry investment activity of more experienced venture capital firms is more sensitive to IPO activity than it is for less experienced venture capital firms. This effect is statistically significant. It is also much larger in magnitude than the effect from the average firm in the sample. At the mean of the other variables, highly experienced venture capital organizations invest 9.2% more when IPO activity is high than when it is low. By contrast, relatively inexperienced venture capital firms actually invest 1.2% less at times when IPO activity is high rather than low. The results also indicate that industry experience increases the level of investment, not just the sensitivity of investment to IPO activity. More industry-experienced venture capital firms invest 11.9% more than industry-inexperienced firms when IPO activity is low and 22.4% more when IPO activity is high.

While both industry and non-industry experience is positively associated with greater investment sensitivity to IPO activity (columns 2 and 3 of Table 5), only industry experience retains its positive effect when both interaction terms are included in the same regression (column 4 of Table 5). In fact, the non-industry experience interaction with industry IPO activity is negative in this regression. When IPO activity is high, industry-experienced venture capital firms invest 7.4% more than when it is low, while venture capital firms with experience out of the industry invest 2.0% less when IPO activity is high.

The fifth and sixth columns of Table 5 look at the effect of industry specialization on investment behavior. Consistent with our findings on industry experience, we find that more specialized venture capital firms tend to increase their industry investments by more than less specialized firms when IPO activity increases. The effect, however, is

small, implying an increase in investment by 5.7% for specialized firms and 3.9% for less specialized firms.

Finally, Table 5 in the last two columns, reports the results using Q as an alternative public market measure. Those columns replicate the basic findings in columns 4 and 6 of the table. The magnitude of the effects is similar to those estimated using IPO activity.

In Table 6 we check whether our results are driven by venture capital firms that choose not to invest in a given industry. Thus, we eliminate from the regressions all observations in which the venture capital firm made no investments in the industry in a given year. All of the findings in Table 5 continue to hold although the magnitude of the effects is somewhat smaller.

Collectively, these results suggest that industry-specific human capital is an important channel through which experience influences the reactions of venture capital firms to shifts in public market signals. Contrary to popular wisdom, it does not appear that the booms and busts are being driven by the investment behavior of inexperienced or new venture capital firms. In fact, these results suggest that the cyclicality seen in the venture capital industry is driven mostly by the more successful venture firms, that is, those with the most experience. Section 3.B considers the question of whether the sensitivity of more experienced firms to public market signals is a rational reaction to fundamentals or an overreaction.

B. The Determinants of Investment Success

In this section we explore whether the greater responsiveness of more experienced venture capital firms to public market signals is efficient. If these experienced firms are able to ramp up the number of investments they make in response to public market signals, but suffer a significant degradation of performance, the investment response to public market signals may, in fact, be an overreaction. In addition to the practitioner accounts alluded to above, there are at least two reasons to believe this might be the case. First, Baker, Wurgler, and Stein (2003) show that industrial firms whose investment is most sensitive to Q have the lowest subsequent stock returns following periods of heavy investment. A similar effect might be observed among experienced venture capital firms whose investment is most sensitive to Q and IPO activity. Second, at the same time that venture capital firms are buying equity in portfolio companies, these companies are, of course, issuing equity. We know from numerous studies, including Loughran and Ritter (1995), that when firms issue equity, their subsequent stock returns are abnormally low.

To assess this question, we examine the performance of the companies in which the venture capital firms invest. Ideally, one would have data on the actual returns on the firm's investment. Unfortunately, the best we can do is to determine whether the investment resulted in what would appear to be a profitable exit for the venture capital firm. This is most likely the case if the company went public, registered for an IPO (as of the date we collected the data from Venture Economics), or was acquired or merged. Venture Economics does not collect valuation information for all of the companies that were merged or acquired and it is possible that these outcomes are not as lucrative as those where the company exited with a public offering. However, investments in the category we characterize as successes are likely to have generated higher returns that the

investments those that have not yet exited or have been characterized as bankrupt or defunct.

The final column of Table 2 provides some initial indications of the patterns of success by venture capital firm characteristics. The tabulations suggest that investments made by venture capital firms with more general—and especially more industry-specific—experience are more successful. The patterns with specialization are non-linear, but the least specialized organizations appear to be the poorest performers. One consideration in the definition of specialization is that young venture capital firms are more likely to be in the first or fourth quartile, since the specialization measure is always 100% if its second deal is in the same industry as its first, or 0% if its second investment is in a different industry. We later consider the results looking only at organizations at the point in time where they made more than 10 investments and achieve consistent results. Our interpretation of these tabulations must be cautious, of course, because of the lack of controls for industry and time period.

Table 7 examines the determinants of success in a regression framework. The dependent variable here is a dummy variable, which takes on the value one if the company was successful before the end of 2003.[2] Each initial investment by a venture capital firm in a portfolio company is used as an observation.[3] In addition to the industry and year controls used earlier, we also control for the stage of the company and the financing round at the time of the investment, since these are likely to be associated with

[2]It should be noted that while the dependent variable is binary, we continue to use an ordinary least squares specification. This reflects the fact that with non-linear specifications, the sample size drops dramatically due to the large number of dummy variables, some of which perfectly predict certain outcomes.

[3]In the first regression, since no venture organization-specific independent variables are used, each portfolio company is used as an observation. (In this case, the round control refers to the first financing round where there was professional venture financing.) In all other regressions, standard errors are clustered by portfolio company.

the outcome. As in our previous regressions, we exclude observations occurring after 1998 in order for the outcomes of the investments to be meaningful.

The first two columns of the table suggest there is a negative, but statistically insignificant, relationship between IPO activity and success in the sample as a whole. The third column of Table 7 indicates that more experienced venture capital firms are more likely to make successful investments. However, the fifth column shows that the effect of experience is limited to venture capital firms with industry experience. Investments made by venture capitalists with the most industry experience are 4.3% more likely to succeed than those made by the least experienced venture capitalists. Given a baseline success rate of 54%, this amounts to a significant increase in the probability of success. The regressions with industry specialization in columns 6 and 7 support this basic finding on the role of industry specialization. The last two columns replicate the results using Q as our measure of the public market signal.

Table 7 makes it clear that experienced venture capital firms do not perform worse on average, as a result of being more sensitive to shifts in public market activities. Table 8 digs deeper by investigating whether experienced venture capital firms perform worse on the investments they make when IPO activity and Q are high. The results indicate that just the opposite is true. Overall, venture capital firms do somewhat worse on the investments they take when there is a lot of IPO activity and Q is high, although the estimated effect is statistically insignificant. However, the more experienced venture capitalists exhibit less degradation in their performance than do the less experienced venture capitalists. Based on the results in Table 7 and Table 8, it would be hard to argue

that the greater responsiveness of experienced venture capital firms to IPO activity and Q comes at the expense of performance.

C. Robustness Analyses

This section summarizes further analyses we undertook to determine whether our basic findings are robust.

Alternative Proxies for Public Market Signals. Our analysis used Q and the IPO activity of venture capital-backed firms as proxies for public market signals. We expanded our IPO activity measure to include all IPOs, not just those that were venture capital backed. The two measures are highly correlated (0.81) since both measures include venture-backed IPOs. Not surprisingly, the results were not appreciably altered. We also considered several other market based measures, including the earnings to price ratio, market to book ratio and historical industry returns. All of these measures led to similar results to those presented.

Alternative Success Measures. Our primary outcome measure codes all mergers and acquisitions as successes. To validate this choice, we further researched the 3,650 outcomes that Venture Economics recorded as mergers or acquisitions using the Factiva database and the SDC mergers and acquisitions database, finding values for 1,263 companies. Of the 508 merged or acquired companies for which Venture Economics had information on the total amount invested in the company and for which we found valuation information, 431 companies (94%) had merger or acquisition values greater than the total amount invested in the company, with a median sale price of seven times the amount of money invested. This supports our thesis that merged or acquired

companies are likely to have been high-return investments for venture capital firms. However, one must be cautious in this interpretation since we were unable to find information on the majority of the mergers and acquisitions, either because they were purchased by other private entities or purchased by public companies in deals that were not accompanied by a press release (perhaps because of their small size). Making the highly conservative assumption that all companies whose value we could not determine were not successful, we then redefined a successful investment as one in which the company went public, or was in registration for a public offering, or was in a merger or acquisition for which we were able to find a value. The results were similar to those presented.

One Observation per Company. Since the dataset includes multiple observations on the same portfolio companies, each outcome reflects not only a given venture capital firm's characteristics, but those of the other venture capitalists invested in the company. As an additional robustness check to the relationship between experience, industry experience, specialization, and success, we used a sample with one observation for each portfolio company and the average levels of each variable of the venture capitalists investing in the company. In these specifications, both industry and non-industry experience are positively associated with success, as is specialization, although the coefficient on specialization is not significantly different than zero. In the absence of more information about the specific roles that each venture capital organization plays in the selection and development of the company, it is difficult to draw any conclusions from the interaction of the different venture capitalists which invested in the company. This is a rich topic for future research.

4. Conclusions

The venture capital industry is a highly volatile one, as dramatic fluctuations in fundraising and investment activity over the past few years demonstrate. These fluctuations seem to be related to changes in the public market valuations and activity. Practitioner accounts and the academic literature suggest that it would be valuable to understand the impact of this volatility on the success of venture capital investments: do public market shifts lead venture capitalists to make poor investment choices, or rather do they provide valuable information to investors? We address this question by examining the determinants and success of investments by the venture industry as a whole, as well as by subclasses of firms with different levels of experience and specialization.

We analyze over forty thousand venture capital investment decisions over the past two decades. We find that the greatest response to shifts in the public markets is not by new or inexperienced groups, but rather by specialized organizations with considerable industry experience. Not only do the investments of these organizations tend to be more successful in general, but there is no appreciable degradation in their performance with the changing conditions.

Our results suggest that shifts in public markets provide information, whether directly to the venture investors or else to individuals who then seek venture financing. Not all venture groups, however, are able to take advantage of this information: the critical factor appears to be human capital.[4]

[4]One might have thought that overall experience would also have been an important explanation for two reasons. First, the most experienced venture capital firms tend to have the greatest access to financial capital. They may already have raised large funds or they may have established reputations and networks that enable them to raise easily additional capital. Second, firms with the most overall experience may have

The greater investment sensitivity is associated with industry, but not non-industry, investment experience. Whether that effect is from greater knowledge of the industry or better networks that allow for recruitment of senior management, customers, and strategic partners needs further exploration.

A variety of open issues remain for future research. First, as we acknowledge above, the precise mechanisms behind the relative performance of more specialized organizations remain unclear. For instance, is it possible to disentangle the relative importance of superior investment selection and ability to add value from the ability to persuade entrepreneurs to accept ones' capital? (While Kaplan and Stromberg (2004) present an intriguing initial look at the venture capital decision-making process, many open questions remain. Sorensen (2004) represents another important step in untangling these issues.) Second, because we sought to examine investment outcomes, our analysis only extends through 1998: we do not analyze the events of 1999 and 2000. While the venture capital market has seen many cycles in the past, the magnitude of the boom and bust during this period was second to none. Understanding whether the patterns delineated above continued to hold during that most dramatic of cycles is an important question for future researchers to examine.

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access to a large pool of human capital that they can redeploy across sectors. That is, one might think of venture capital firms as having an internal labor market to complement an internal capital market. However, our finding that industry experience is the key driver of investment activity suggests that it is not easy to redeploy venture capitalists across sectors. This would be the case if human capital in other sectors—in the case of venture capitalists within an organization that specialize in a given industry, say biotechnology—were unable or unwilling to shift focus to a different industry, e.g., the Internet. This prediction is in line with the view that diversified firms have a difficult time redeploying capital into sectors with more investment opportunities: see Scharfstein and Stein (2000), Scharfstein (1998), and Rajan, Servaes, and Zingales (2000). Fulghieri and Sevilir (2004) model some of these issues in a venture capital context.

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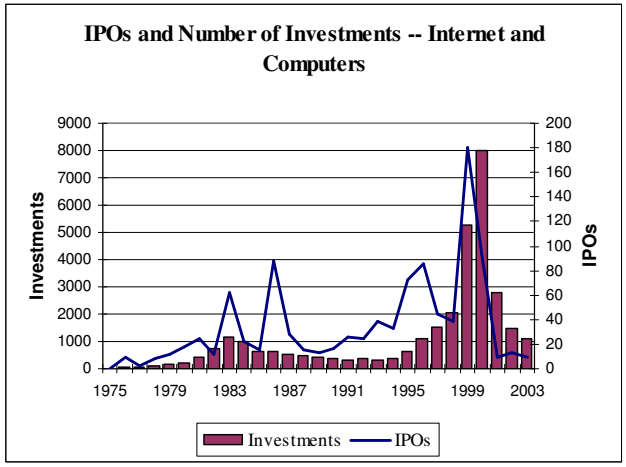
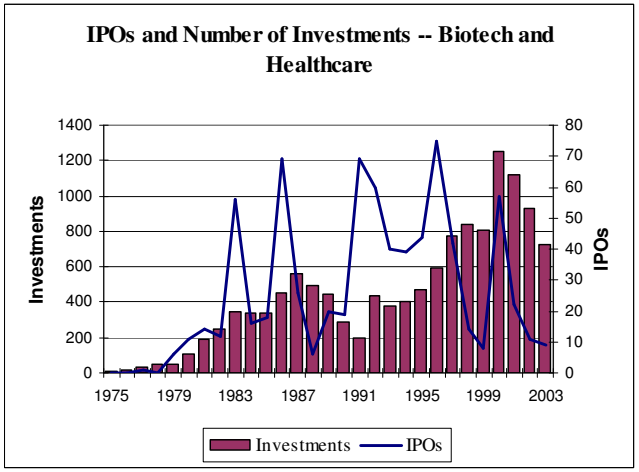
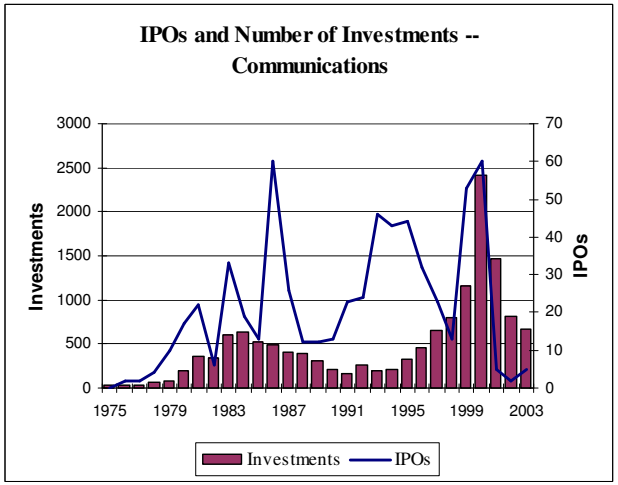
Figure 1: IPOs and Number of Investments for Selected Industries

The graphs show years on the x-axis, the number of venture investments in the industry as a line calibrated on the left y-axis and the number of IPOs as bars calibrated on the right y-axis.







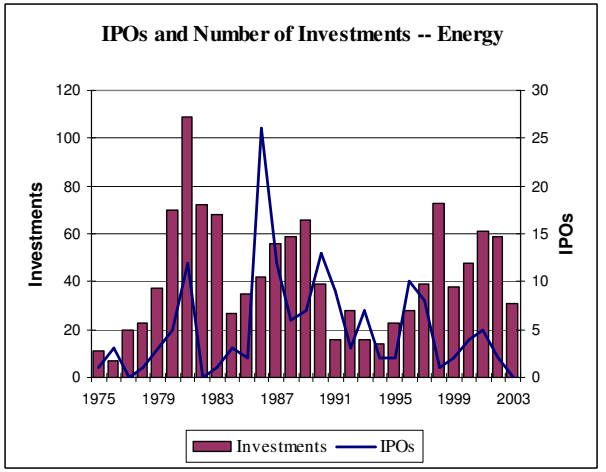
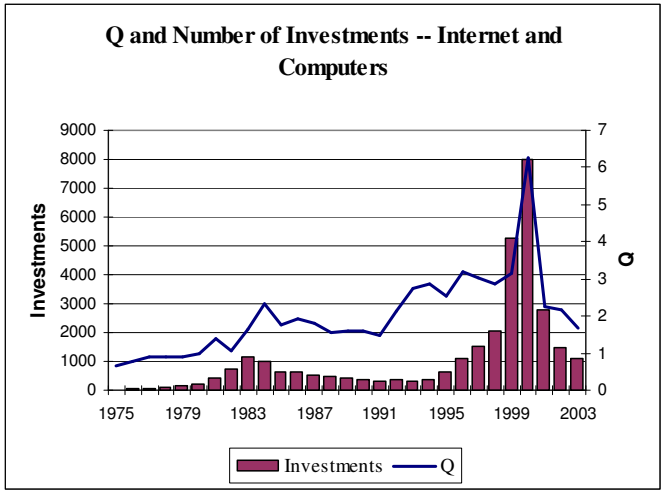
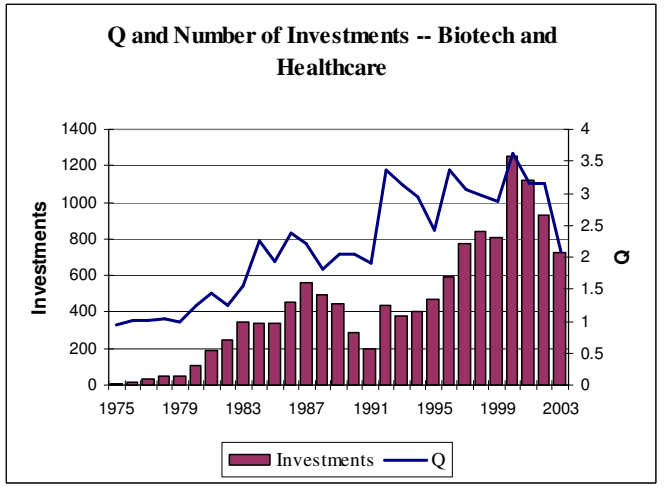
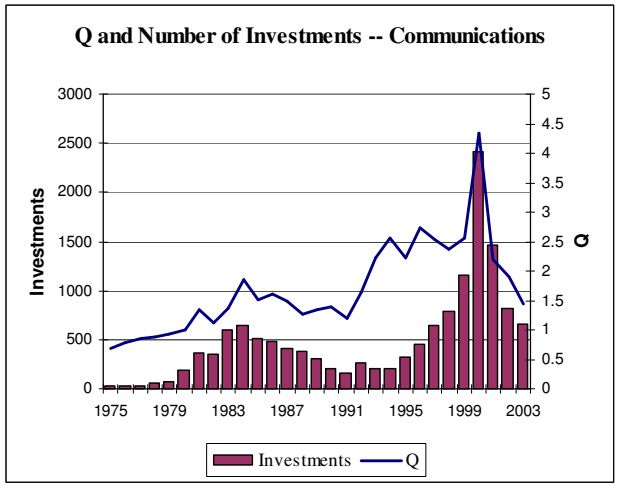


Figure 2: Q and Number of Investments for Selected Industries

The graphs show years on the x-axis, the number of venture investments in the industry as a line calibrated on the left y-axis and Q as bars calibrated on the right y-axis.







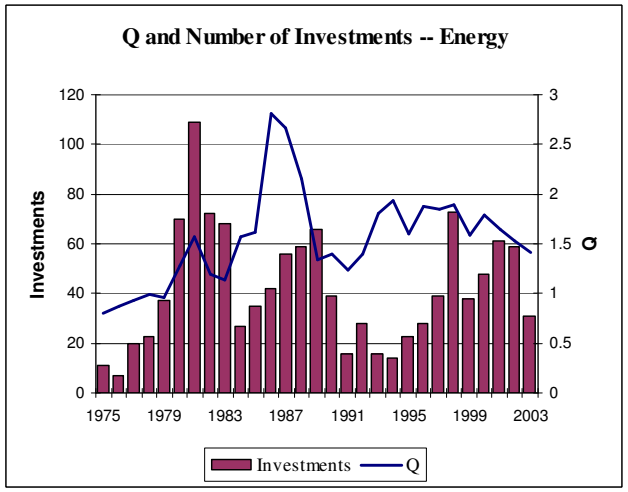


Table 1: Sample Characteristics

Panel A: Sample by Industry

Industry	Companies	Obs.
Internet and Computers	4,679	14,785
Communications and Electronics	2,555	8,525
Business / Industrial	1,364	2,256
Consumer	2,285	4,156
Energy	573	1,137
Biotech and Healthcare	2,745	8,780
Financial Services	606	952
Business Services	509	815
All other	824	1,153
Total	16,354	42,559

Panel B: Sample Characteristics

	0.25	0.50	0.75	Mean	s.d.	N
Sample						
General experience	11	20	45	36.26	44.99	71,874
Industry Experience	0	1	4	4.08	8.85	71,874
Specialization	0.00%	4.88%	16.67%	11.15%	15.56%	71,874
Investors Only						
General experience	14	31	65.5	51.90	60.64	14,768
Industry Experience	1	4	12	9.47	14.60	14,768
Specialization	4.88%	15.38%	28.57%	19.75%	19.09%	14,768
Sample						
1985						
General experience	10	18	38	30.16	33.40	347
Industry Experience	0	1	3	3.20	6.42	3,111
Specialization	0.00%	4.84%	16.67%	11.24%	15.49%	3,111
1990						
General experience	11	21.5	46	37.35	42.28	478
Industry Experience	0	1	5	4.31	8.55	4,254
Specialization	0.00%	5.56%	17.24%	11.67%	15.61%	4,254
1995						
General experience	11	23	56	44.12	53.97	498
Industry Experience	0	1	5	5.13	10.59	4,398
Specialization	0.00%	5.26%	17.65%	11.75%	16.12%	4,398

Panel A shows the distribution of the sample by industry which includes 16,354 unique companies compiled by Venture Economics, and 42,559 unique VC- company pairs.

Panel B summarizes characteristics of venture capital funds in the sample including organization–years only for years after which the organization has been observed making an investment, and ceasing in the year after which the final investment is made. It excludes observations for years before VCs has made 5 investments and excludes VCs who invest in only one year of the sample. It also shows these characteristics in three selected years. Statistics include investments from 1975 to 1998, inclusive, and exclude the industry category all other. *General experience* is the number of investments made by the venture capital fund previous to the date of its first investment in the portfolio company. *Industry Experience* is the number of investments made by the venture capital fund previous to the date of its first investment in the portfolio company in that industry. *Specialization* is *Industry Experience* divided by *General experience*.

Table 2: Venture Capital Firm Characteristics

Panel A: Characteristics by Quartile

		Number of Investments		Number of Industry Investments		Specialization		Success
	N	Mean	S.D	Mean	S.D	Mean	S.D	Mean
General experience Quartile								
1	4,490	0.46	0.61	0.16	0.41	35.13%	0.4655	50.9%
2	3,359	3.07	1.63	1.08	1.31	34.84%	1.6337	52.0%
3	8,728	9.76	5.08	3.24	3.45	33.00%	1.3107	52.1%
4	24,829	82.35	78.14	20.26	24.04	25.82%	0.3729	55.7%
Industry Experience Quartile								
1	8,092	6.84	15.08	0.00	0.00	0.00%	0.0000	49.9%
2	1,522	6.21	7.99	1.10	0.30	42.57%	0.3444	52.8%
3	6,088	13.53	15.59	2.27	1.43	34.85%	0.2973	54.0%
4	25,704	77.62	79.21	20.23	23.48	32.37%	0.2224	57.0%
Specialization Quartile								
1	5,397	10.27	17.51	0.00	0.02	0.00%	0.0009	49.9%
2	3,610	64.81	67.56	10.75	14.05	15.92%	0.0737	56.1%
3	14,783	83.81	87.37	21.03	27.21	25.11%	0.1315	56.7%
4	14,918	41.15	55.09	12.46	15.98	45.61%	0.2948	53.3%

Panel B: Correlations

(N=38,708)	Experience	Industry Experience
Experience	1.0000	
Industry Experience	0.7998	1.0000
Specialization	-0.1095	0.1994

Panel A shows the composition of the *General Experience*, *Industry Experience* and *Specialization* quartiles and mean values for selected characteristics of the quartiles. Data are on a VC-company pair observation level. Quartiles were composed at the beginning of each calendar year based on the values at the end of the previous year for each venture capital organization with investments in that year. Industry experience and specialization quartiles were calculated by industry, so that industries with fewer investments would not be disproportionately sampled in lower quartiles. The first quartile represents the least experienced or specialized, while the fourth is the highest.

Panel B details the simple correlations between *General Experience*, *Industry Experience* and *Specialization*.

Table 3: Impact of Public Market Signals

					Detrended			
	'(1)		'(2)		(3)		(4)	
Lagged IPOs	0.2264				0.3508			
	[4.25]	***			*[6.08]*	***		
Lagged Q			0.4797				0.3617	
			[4.07]	***			*[2.25]*	**
Industry Fixed Effects	Yes		Yes		No		No	
Year Fixed Effects	Yes		Yes		No		No	
Detrended	No		No		Yes		Yes	
Adj. R-squared	92.37%		92.30%		16.27%		2.59%	
N	192		192		192		192	

The sample consists of yearly observations with one observation per industry year for 1975 to 1998, inclusive, excluding the industry all other. The dependent variable is the is the log of the number of investments made by all venture organizations in industry *g* in year *t*. *Lagged IPOs* is the log of the number of initial public offerings (IPOs) of venture-backed companies in industry *g* in year t-*1*. *Lagged Q* is the market to book ratio of companies in SIC codes mapping to the Venture Source industry *g* weighted by the number of public venture backed IPOs in that SIC code and equal weighted by companies within that SIC code in year t-*1*. Detrended regressions are the pooled regressions of the residuals of the dependent and independent variables regressed against year, with a separate regression run for each industry.

***, **, * indicate statistical significance at the 1%, 5% and 10% level, respectively.

Table 4: Investment Patterns (No Interactions)

	(1)		(2)		(3)		(4)		(5)		(6)		(7)	
PM Measure	IPOs		IPOs		IPOs		IPOs		IPOs		Q		Q	
PM Measure	0.0389		0.0392		0.0308		0.0371		0.0373		0.0297		0.0452	
	[12.88]	***	*[12.97]*	***	*[11.09]*	***	*[12.77]*	***	*[12.86]*	***	*[3.81]*	***	*[5.57]*	***
Experience			0.1271						0.1288				0.1288	
			[16.53]	***					*[17.14]*	***			*[17.13]*	***
Industry Experience					0.2029						0.2031			
					[29.80]	***					*[29.81]*	***		
Non-Industry Experience					-0.0051						-0.0053			
					[0.97]						*[1.01]*			
Specialization							0.8661		0.8792				0.8799	
							[22.75]	***	*[23.47]*	***			*[23.44]*	***
Fixed Effects:	Industry Year		Industry Year		Industry Year		Industry Year		Industry Year		Industry Year		Industry Year	
Adj. R-squared	14.87%		20.62%		27.85%		20.23%		26.14%		27.78%		26.05%	
N	71,874		71,874		71,874		71,874		71,874		71,874		71,874	

The sample consists of aggregated investments by industry by year for 1,775 VCs in 8 industries from 1975 to 1998, inclusive, as compiled by *Venture Economics*. Observations includes VC organization–years only for years after which the organization has been observed making an investment, and cease in the year after which the final investment is made. It excludes observations for years before VCs has made 5 investments and excludes VCs who invest in only one year of the sample.

The dependent variable is the log of the number of investments made by venture organization *f* in industry *g* in year *t*. The public market measure (PM Measure) is either *Lagged IPOs,* the log of the number of initial public offerings (IPOs) of venture-backed companies in industry *g* in year t-*1* or *Lagged Q,* the market to book ratio of companies in SIC codes mapping to the Venture Source industry *g* weighted by the number of public venture backed IPOs in that SIC code and equal weighted by companies within that SIC code in year t-*1*. $Experience_t$ is the difference between the log of the number of investments made by venture capital organization *f* prior to year t and the average in year *t* of the number of investments made by all organizations prior to year t. $Industry\ Experience_t$ is the difference between the log of the number of investments made by venture capital organization *f* in industry *g* prior to year *t* and the average in year *t* of the number of investments made by all organizations in industry *g* prior to year *y*. *Non-Industry Experience* is the difference between the log of the number of investments made by venture capital organization *f* in industries other than *g (~g)* prior to year *t* and the average in year *t* of the number of investments made by all organizations in all industries other than *g (~g)* prior to year *t*. $Specialization_t$ is the difference between the number of investments made by venture capital organization *f* in industry *g* divided by the number of investments made by the venture organization in total prior to year *t* and the average of the same figure for all organizations in year *t*. Industry and year fixed effects are including. T-statistics in italics below coefficient estimates are based on robust errors allowing for data clustering by venture capital organization.

***, **, * indicate statistical significance at the 1%, 5% and 10% level, respectively.

Table 5: Investment Patterns (Includes Interactions of IPOs)

	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
PM Measure	IPOs		IPOs		IPOs		IPOs		IPOs		IPOs		Q		Q	
PM Measure	-0.0424		0.0112		-0.0062		0.0203		0.0380		-0.0433		0.0053		0.0134	
	[6.56]	***	*[4.14]*	***	*[0.88]*		*[3.87]*	***	*[12.89]*	***	*[7.07]*	***	*[0.68]*		*[1.65]*	*
Experience	-0.0275										-0.0259				-0.0001	
	[2.94]	***									*[2.93]*	***			*[0.01]*	
Industry Experience			0.0413				0.0319						0.0338			
			[3.75]	***			*[2.90]*	***					*[3.12]*	***		
Non-Industry Experience					0.0023		0.0182						0.0066			
					[0.25]		*[2.49]*	**					*[1.13]*			
Specialization									0.3784		0.3911				0.3890	
									[4.02]	***	*[4.47]*	***			*[4.50]*	***
Experience * PM Measure	0.0604										0.0603				0.0502	
	[12.18]	***									*[12.93]*	***			*[14.01]*	***
Industry Experience * PM Measure			0.0541				0.0583						0.0574			
			[12.17]	***			*[13.63]*	***					*[13.54]*	***		
Non-Industry Experience * PM Measure					0.0348		-0.0080						-0.0035			
					[6.51]	***	*[2.15]*	**					*[1.24]*			
Specialization * PM Measure									0.1529		0.1522	***			0.1526	***
									[5.10]	***	*[5.63]*				*[5.69]*	
Controls:	Industry Year		Industry Year		Industry Year		Industry Year		Industry Year		Industry Year		Industry Year		Industry Year	
Adj. R-squared	22.16%		28.74%		18.66%		28.76%		20.35%		27.77%		28.73%		27.65%	
N	71,874		71,874		71,874		71,874		71,874		71,874		71,874		71,874	

The sample consists of aggregated investments by industry by year for 1,775 VCs in 8 industries from 1975 to 1998, inclusive, as compiled by *Venture Economics*. Observations includes VC organization–years only for years after which the organization has been observed making an investment, and cease in the year after which the final investment is made. It excludes observations for years before VCs has made 5 investments and excludes VCs who invest in only one year of the sample. The dependent variable is the log of the number of investments made by venture organization *f* in industry *g* in year *t*. The public market measure (PM Measure) is either *Lagged IPOs,* the log of the number of initial public offerings (IPOs) of venture-backed companies in industry *g* in year t-*1* or *Lagged Q,* the market to book ratio of companies in SIC codes mapping to the Venture Source industry *g* weighted by the number of public venture backed IPOs in that SIC code and equal weighted by companies within that SIC code in year t-*1*. *Experience* is the difference between the log of the number of investments made by venture capital organization *f* prior to year *t* and the average in year *t* of the number of investments made by all organizations prior to year *t*. *Industry Experience* is the difference between the log of the number of investments made by venture capital organization *f* in industry *g* prior to *year t* and the average in year *t* of the number of investments made by all organizations in industry *g* prior to year *t*. *Non Industry Experience* is the difference between the log of the number of investments made by venture capital organization *f* in industries other than *g (~g)* prior to year *t* and the average in year *t* of the number of investments made by all organizations in all industries other than *g (~g)* prior to year *t*. *Specialization* is the difference between the number of investments made by venture capital organization *f* in industry *g* divided by the number of investments made by the venture organization in total prior to year *t* and the average of the same figure for all organizations in year *t*. Controls include industry and year fixed effects. T-statistics in italics below coefficient estimates are based on robust standard errors allowing for data clustering by venture capital organization.

***, **, * indicate statistical significance at the 1%, 5% and 10% level, respectively.

Table 6: Investment Patterns for Organizations That Made Investments In that Industry In that Year

	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
PM Measure	IPOs		IPOs		IPOs		IPOs		IPOs		IPOs		Q		Q	
PM Measure	0.0226		0.0446		0.0651		0.0571		0.0785		0.0062		0.1005		0.1026	
	[1.91]	*	*[6.37]*	***	*[5.42]*	***	*[5.71]*	***	*[10.85]*	***	*[0.56]*		*[8.10]*	***	*[7.66]*	***
Experience	0.0150										0.0126				0.0241	
	[0.85]										*[0.72]*				*[1.74]*	*
Industry Experience			0.0603				0.0519						0.0600			
			[3.23]	***			*[3.01]*	***					*[3.56]*	***		
Non-Industry Experience					0.0379		0.0181						-0.0053			
					[2.15]	**	*[1.24]*						*[0.43]*			
Specialization									0.4627		0.4810				0.5232	
									[3.76]	***	*[4.20]*	***			*[4.52]*	***
Experience * PM Measure	0.0357										0.0409				0.0371	
	[5.54]	***									*[6.50]*	***			*[8.08]*	***
Industry Experience * PM Measure			0.0342				0.0404						0.0374			
			[5.61]	***			*[7.17]*	***					*[6.83]*	***		
Non-Industry Experience * PM Measure					0.0138		-0.0114						-0.0035			
					[2.14]	**	*[2.33]*	**					*[0.90]*			
Specialization * PM Measure									0.0222		0.0489				0.0354	
									[0.60]		*[1.43]*				*[1.04]*	
Fixed Effects:	Industry Year		Industry Year		Industry Year		Industry Year		Industry Year		Industry Year		Industry Year		Industry Year	
Adj. R-squared	20.63%		26.57%		16.95%		26.71%		17.14%		25.75%		26.81%		26.03%	
N	14,768		14,768		14,768		14,768		14,768		14,768		14,768		14,768	

The sample consists of aggregated investments by industry by year for 1,775 VCs in 8 industries from 1975 to 1998, inclusive, as compiled by *Venture Economics*. Observations include VC organization–years only for years in which the organization has made an investment in that industry. It excludes observations for years before VCs has made 5 investments and excludes VCs who invest in only one year of the sample. The dependent variable is the log of the number of investments made by venture organization *f* in industry *g* in year *t*. The public market measure (PM Measure) is either *Lagged IPOs,* the log of the number of initial public offerings (IPOs) of venture-backed companies in industry *g* in year t-*1* or *Lagged Q,* the market to book ratio of companies in SIC codes mapping to the Venture Source industry *g* weighted by the number of public venture backed IPOs in that SIC code and equal weighted by companies within that SIC code in year t-*1*. *Experience* is the difference between the log of the number of investments made by venture capital organization *f* prior to year *t* and the average in year *t* of the number of investments made by all organizations prior to year *t*. *Industry Experience* is the difference between the log of the number of investments made by venture capital organization *f* in industry *g* prior to *year t* and the average in year *t* of the number of investments made by all organizations in industry *g* prior to year *t*. *Non Industry Experience* is the difference between the log of the number of investments made by venture capital organization *f* in industries other than *g (~g)* prior to year *t* and the average in year *t* of the number of investments made by all organizations in all industries other than *g (~g)* prior to year *t*. *Specialization* is the difference between the number of investments made by venture capital organization *f* in industry *g* divided by the number of investments made by the venture organization in total prior to year *t* and the average of the same figure for all organizations in year *t*. Controls include industry and year fixed effects. T-statistics in italics below coefficient estimates are based on robust standard errors allowing for data clustering by venture capital organization.

***, **, * indicate statistical significance at the 1%, 5% and 10% level, respectively.

Table 7: Success

	(1)	(2)	(3)		(4)		(5)		(6)		(7)		(8)		(9)	
PM Measure	IPOs	IPOs	IPOs		IPOs		IPOs		IPOs		IPOs		Q		Q	
PM Measure	-0.0054	-0.0142	-0.0143		-0.0158		-0.0159		-0.0153		-0.0160		-0.0260		-0.0239	
	[0.54]	*[1.22]*	*[1.23]*		*[1.36]*		*[1.36]*		*[1.30]*		*[1.35]*		*[1.32]*		*[1.20]*	
Experience			0.0145								0.0185				0.0186	
			[8.02]	***							*[8.62]*	***			*[8.63]*	***
Industry Experience					0.0210		0.0215						0.0215			
					[8.84]	***	*[5.73]*	***					*[5.72]*	***		
Non-Industry Experience							-0.0005									
							[0.20]									
Specialization									0.0273		0.0502				0.0500	
									[2.22]	**	*[3.92]*	***			*[3.90]*	***
Fixed Effects:	Industry Stage Round Year	Industry Stage Round Year	Industry Stage Round Year		Industry Stage Round Year		Industry Stage Round Year		Industry Stage Round Year		Industry Stage Round Year		Industry Stage Round Year		Industry Stage Round Year	
Adj. R-squared	7.47%	9.39%	9.57%		9.63%		9.63%		9.00%		9.53%		9.63%		9.53%	
N	15,518	41,406	41,406		41,406		41,406		38,708		38,708		41,406		38,708	

The sample consists of outcomes for investments made by 2,988 VCs in 15,518 companies from 1975 to 1998, inclusive, as compiled by *Venture Economics*. The first specification includes only one observation per company. The remainder of the specifications includes one observation per unique VC-company pair. The dependent variable is *Success* a binary variable =1 if the portfolio company was acquired, merged, in registration for an IPO (as of the date we collected the Venture Economics data), or went public, and =0 otherwise. The dependent variable is the log of the number of investments made by venture organization *f* in industry *g* in year *t*. The public market measure (PM Measure) is either *Lagged IPOs,* the log of the number of initial public offerings (IPOs) of venture-backed companies in industry *g* in year t-*1* or *Lagged Q,* the market to book ratio of companies in SIC codes mapping to the Venture Source industry *g* weighted by the number of public venture backed IPOs in that SIC code and equal weighted by companies within that SIC code in year t-*1*. *Experience* is the difference between

the log of the number of investments made by venture capital organization *f* prior to year *t* and the average in year *t* of the number of investments made by all organizations prior to year *t*. *Industry Experience* is the difference between the log of the number of investments made by venture capital organization *f* in industry *g* prior to *year t* and the average in year *t* of the number of investments made by all organizations in industry *g* prior to year *t*. *Non Industry Experience* is the difference between the log of the number of investments made by venture capital organization *f* in industries other than *g (~g)* prior to year *t* and the average in year *t* of the number of investments made by all organizations in all industries other than *g (~g)* prior to year *t*. *Specialization* is the difference between the number of investments made by venture capital organization *f* in industry *g* divided by the number of investments made by the venture organization in total prior to year *t* and the average of the same figure for all organizations in year *t*. Controls include industry and year fixed effects. T-statistics in italics below coefficient estimates are based on robust standard errors allowing for data clustering by venture capital organization.
***, **, * indicate statistical significance at the 1%, 5% and 10% level, respectively.

Table 8: Success (Includes Interactions)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
PM Measure	IPOs	IPOs	IPOs	IPOs	IPOs	Q	Q
PM Measure	-0.0174	-0.0197	-0.0187	-0.0168	-0.0270 **	-0.0311	-0.0298
	[1.46]	*[1.64]*	*[1.55]*	*[1.41]*	*[2.16]*	*[1.56]*	*[1.48]*
Experience	0.0064				-0.0004		0.0062
	[1.03]				*[0.05]*		*[0.83]*
Industry Experience		0.0060	-0.0085			-0.0086	
		[0.59]	*[0.61]*			*[0.62]*	
Non-Industry Experience			0.0150 *			0.0172 **	
			[1.76]			*[2.00]*	
Specialization				-0.0352	-0.0418		-0.0244
				[0.61]	*[0.71]*		*[0.42]*
Experience * PM Measure	0.0026				0.0059 ***		0.0039 *
	[1.36]				*[2.62]*		*[1.74]*
Industry Experience * PM Measure		0.0045	0.0094 **			0.0095 **	
		[1.52]	*[2.27]*			*[2.33]*	
Non-Industry Experience * PM Measure			-0.0052 *			-0.0059 **	
			[1.95]			*[2.20]*	
Specialization * PM Measure				0.0187	0.0279 *		0.0224
				[1.14]	*[1.65]*		*[1.33]*
Controls:	Industry Stage Round Year	Industry Stage Round Year	Industry Stage Round Year	Industry Stage Round Year	Industry Stage Round Year	Industry Stage Round Year	Industry Stage Round Year
Adj. R-squared	9.58%	9.64%	9.65%	9.32%	9.56%	9.65%	9.54%
N	41,406	41,406	41,406	38,708	38,708	41,406	38,708

The sample consists of outcomes for investments made by 2,988 VCs in 15,518 companies from 1975 to 1998, inclusive, as compiled by *Venture Economics*. The first specification includes only one observation per company. The remainder of the specifications includes one observation per unique VC-company pair. The dependent variable is *Success* a binary variable =1 if the portfolio company was acquired, merged, in registration for an IPO (as of the date we collected the Venture Economics data), or went public, and =0 otherwise. The public market measure (PM Measure) is either *Lagged IPOs,* the log of the number of initial public offerings (IPOs) of venture-backed companies in industry *g* in year t-*1* or *Lagged Q,* the market to book ratio of companies in SIC codes mapping to the Venture Source industry *g* weighted by the number of public venture backed IPOs in that SIC code and equal weighted by companies within that SIC code in year t-*1*. *Experience* is the difference between the log of the number of investments made by venture capital organization *f* prior to year *t* and the average in year *t* of the number of investments made by all organizations prior to year *t*. *Industry Experience* is the difference between the log of the number of investments made by venture capital organization *f* in industry *g* prior to *year t* and the average in year *t* of the number of investments made by all organizations in industry *g* prior to year *t*. *Non Industry Experience* is the difference between the log of the number of investments made by venture capital organization *f* in industries other than *g (~g)* prior to year *t* and the average in year *t* of the number of investments made by all organizations in all industries other than *g (~g)* prior to year *t*. *Specialization* is the difference between the number of investments made by venture capital organization *f* in industry *g* divided by the number of investments made by the venture organization in total prior to year *t* and the average of the same figure for all organizations in year *t*. Controls include industry and year fixed effects. T-statistics in italics below coefficient estimates are based on robust standard errors allowing for data clustering by venture capital organization.
***, **, * indicate statistical significance at the 1%, 5% and 10% level, respectively.

Table 9: Robustness Checks

	(1)		(2)		(3)		(4)		(5)		(6)	
Ever Invested in That Industry In the Past												
N	**46,650**											
Experience * Lagged IPOs	0.0568										0.0676	
	[9.14]	***									*[11.32]*	***
Industry Experience * Lagged IPOs			0.0992				0.1110					
			[14.52]	***			*[16.92]*	***				
Non-Industry Experience * Lagged IPOs					0.0308		-0.0196					
					[4.94]	***	*[4.19]*	***				
Specialization * Lagged IPOs									0.3698		0.3652	
									[11.04]	***	*[11.07]*	***
Ever Invested in That Industry In the Sample												
N	**53,594**											
Experience * Lagged IPOs	0.0563										0.0596	
	[9.73]	***									*[10.86]*	***
Industry Experience * Lagged IPOs			0.0618				0.0653					
			[11.31]	***			*[12.49]*					
Non-Industry Experience * Lagged IPOs					0.0326		-0.0072					
					[5.49]	***	*[1.65]*	*				
Specialization * Lagged IPOs									0.2206		0.2026	
									[7.36]	***	*[7.09]*	***

The sample varies to include only venture capital firms who have ever invested in the industry in the past or have ever made an investment in that industry in the sample (past or future). It excludes observations for years before VCs has made 5 investments and excludes VCs who invest in only one year of the sample. The dependent variable is the log of the number of investments made by venture organization *f* in industry *g* in year *t*. The public market measure (PM Measure) is *Lagged IPOs,* the log of the number of initial public offerings (IPOs) of venture-backed companies in industry *g* in year t-*1*. *Experience* is the difference between the log of the number of investments made by venture capital organization *f* prior to year *t* and the average in year *t* of the number of investments made by all organizations prior to year *t*. *Industry Experience* is the difference between the log of the number of investments made by venture capital organization *f* in industry *g* prior to *year t* and the average in year *t* of the number of investments made by all organizations in industry *g* prior to year *t*. *Non Industry Experience* is the difference between the log of the number of investments made by venture capital organization *f* in industries other than *g (~g)* prior to year *t* and the average in year *t* of the number of investments made by all organizations in all industries other than *g (~g)* prior to year *t*. *Specialization* is the difference between the number of investments made by venture capital organization *f* in industry *g* divided by the number of investments made by the venture organization in total prior to year *t* and the average of the same figure for all organizations in year *t*. Controls include industry and year fixed effects. T-statistics in italics below coefficient estimates are based on robust standard errors allowing for data clustering by venture capital organization.

***, **, * indicate statistical significance at the 1%, 5% and 10% level, respectively.