Venture Capital Investment Cycles:
The Role of Experience and Specialization

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This paper examines how organizational structure affects behavior and performance by studying different types of venture capital organizations. Our findings appear most consistent with the view that industry-specific experience and human capital enable organizations to react to investment opportunities. We find that venture capitalists with the most industry experience increase their investments the most when industry investment activity accelerates. 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 adversely affect the success of these transactions to a significant extent. These findings are consistent with the view that when firms are diversified in other sectors, it is difficult to redeploy human and financial capital from those other sectors. The evidence conflicts with the efficient internal capital market perspective as well as the view that entrants are critical to explaining the expansion of venture capital within in an industry.

1. Introduction

A central goal of organizational economics is to understand how an organization's characteristics affect behavior and performance. In this paper, we contribute to this literature by analyzing the effect of organizational experience and specialization on the investment behavior and performance of venture capital firms.[1]

The venture capital industry is a good setting to study the effects of organizational characteristics for at least three reasons. First, there is considerable heterogeneity in venture capital organizations. Some specialize by industry while others take a more diversified approach. There are also substantial differences in the experience levels of venture capital organizations, with some being relatively new entrants and others dating themselves to the beginning of the industry. Second, it is possible to get detailed information on specific investments that venture capital firms make, as well as the outcomes of these investments. Thus, investment behavior and performance can be measured at a much finer level than is typically the case in studies of organizations based on more aggregate measures of behavior and performance.[2] Finally, the industry is a highly volatile one (Gompers and Lerner, 1998), with investment activity and performance changing rapidly. How organizations respond to large external changes is likely to be an important element in determining the impact of organizational characteristics on behavior and performance.

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[1]Several other papers have examined the role of specialization and its impact on performance. The most relevant empirical work includes the analysis by Berger, et al. (2002) of the lending practices of small and large banks and Garicano and Hubbard's (2003, 2004) studies of how law firm specialization and organization structure varies with market size and the value of knowledge-sharing. Similarly, a recent theoretical paper by Fulghieri and Sevilier (2004) examines the factors that influence the choice of a venture capital firm to specialize or diversify. This work is also related the macroeconomic literature on specialization and economic growth (e.g., Romer (1987)).

[2] In this respect, the paper bears some similarity to Guedj and Scharfstein (2004) who analyze the effect of organizational structure on biopharmaceutical investments.

Our empirical analysis centers on the following basic questions: When there are increased investment opportunities within an industry, what types of venture capital firms take advantage of these opportunities and how well do these investments perform? We explore three potential hypotheses about how different types of venture capital organizations react to changes in investment opportunities and how they impact their performance.

The first hypothesis is that firms with the greatest access to capital—typically the largest and most experienced ones—will be in the best position to increase their investments when prospects improve. These organizations may already have financial capital under management that they can redeploy from other sectors. They also have reputations and established networks of limited partners that enable them to raise additional capital more easily. This view is consistent with the finding that the ability of young venture capital firms to raise new funds is more dependent on their recent track record than it is for more experienced venture capital firms (Gompers, 1996). It is also consistent with the finding that more experienced organizations are able to raise substantially larger funds than less experienced organizations (Gompers and Lerner, 1998 and Kaplan and Schoar, 2005).

A related hypothesis is that the largest organizations also have access to a large pool of human capital that they can redeploy from other sectors to make investments in industries with more opportunities for investment. This is a variant of Stein's (1997) model of the benefits of internal capital markets. Similarly, Gertner, Scharfstein, and Stein (1994) have modeled how diversified organizations might find it easier to deploy

assets across different projects in different industries. In this particular setting, a large venture capital organization with many investment professionals could move them around across sectors as different industries came into or out of favor.

The second hypothesis is that access to capital is not enough to allow organizations to take advantage of increased investment opportunities. Instead, what is important is industry-specific human capital. In this view, a critical part of venture capital investing is industry experience that generates a network of contacts to identify good investment opportunities and the know-how to manage these investments. Thus, one cannot simply redeploy financial and human capital from other sectors and expect to be able to make good investments within an industry. In fact, the existence of financial and human capital deployed in other industries could serve as an impediment to making investments in an industry with increased investment opportunities. 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 and Healthcare—were unable or unwilling to shift focus to a different industry, e.g., the Internet and Computers. Alternatively, the Biotechnology and Healthcare specialists in a venture capital firm may be unwilling to sit on the sidelines and curtail investments in those industries to allow the Internet and Computers partners to invest additional capital. This prediction is in line with the view that diversified firms have a difficult time redeploying capital into sectors with more investment opportunities. Scharfstein and Stein (2000), Scharfstein (1998), and Rajan, Servaes, and Zingales (2000) all show how the presence of diverse business segments can lead to a reduced ability to invest in new, profitable opportunities. Similarly, a large literature has empirically examined the decreases in efficiency,

valuation, and performance for companies that are in multiple lines of business. Berger and Ofek (1995) examine the market valuation of focused, single segment firms as compared to diversified firms and find that diversified firms sell at a discount to comparable single segment firms. Berger and Ofek (1999) show that performance of diversified firms improves after they divest unrelated divisions and focus.

The third and final hypothesis is that the response to an increase in investment opportunities does not come from incumbent venture capitalists, but rather from entrants into the industry. Several papers have examined the inability of older firms within an industry to respond to new investment opportunities. The most prominent example of this is Xerox, which developed many of the key technologies underlying the personal computer, but which failed to commercialize these technologies (summarized in Hunt and Lerner (1995)). Henderson (1993) presents evidence of the organizational incapacity of firms to respond to technological change. Using data from the semiconductor photolithography industry, she shows that incumbents were consistently slower than entrants in developing and introducing new technologies. In this hypothesis, young, less experienced venture capital groups would be more likely to increase their investments in response to new opportunities within an industry arose.

Our findings appear most consistent with the view that industry-specific experience enables firms to react to industry-specific investment opportunities. We find that venture capital organizations with the most industry experience increase their investments the most when there is a boost in two key measures of an industry's investment opportunities, industry Q and IPO activity. Their reaction to an increase in these industry measures is greater than the reaction of venture capital organizations with

relatively little industry experience and those with considerable experience but in other industries.

Although organizations with more industry experience increase their investments in response to IPO activity and Q, this increase does not come at the expense of performance. We find only a small, statistically insignificant reduction in the success rate despite big increases in investment activity. In fact, the differential in success between the most experienced and least experienced venture capital groups within an industry increases when IPO activity and Q increase.

Taken together, these findings are consistent with the view that when organizations are diversified, it is difficult for them to redeploy human and financial capital across sectors. The evidence thus suggests that the internal market for financial and human capital within venture capital organizations does not operate so smoothly. The evidence also suggests that entrants are not critical to explaining the cyclical nature of venture capital activity within an industry.

This paper is organized as follows. The next section describes the construction of the data and provides some basic summary statistics. We describe the data and summary statistics in Section 2. Section 3 examines the determinants of venture capital organization investment activity, comparing organizations along various measures of experience and specialization. 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.[3] 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. 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. Summary Statistics

The first panel of Table 1 presents data on three characteristics of venture capital firms that we use throughout the paper. The first such characteristic, "Overall Experience," is the total number of investments made by a venture capital firm prior to

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

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 overall experience. The specialization measure is not computed for the first investment by each venture organization since it would always be equal to one.

We 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 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.

The second panel 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. Table 1, Panel B 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 first panel of Table 1 presents the distribution of overall 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. We provide as well 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.

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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 overall experience. Specialization, on the other hand, is not highly correlated with the experience measures; in fact, it is negatively correlated with overall 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

In this section, we examine how different types of venture capital firms respond to the changes in investment opportunities. We focus on differences among venture capital firms in overall investment experience, industry investment experience, and industry specialization. We use two measures of investment opportunities in our analysis, industry Q and IPO activity.

The use 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 equal weighting all public companies in industry that went public with in that SIC code.

Our second, less standard measure of investment opportunities is the level of 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 investment opportunities in venture capital both because it uses data

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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 investment opportunities of the types of investments in our sample.

Figure 1 shows the relationship between industry venture capital investment activity and the two measures of investment opportunities 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.

Table 3 presents a more systematic, regression-based analysis of the relationship between the number of investments and our investment opportunity measures. 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 also 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 investment

opportunity measures. We use 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 investment opportunities.

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 as a measure of investment opportunities 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 experience and investment activity. This is not surprising given that more experienced venture capital firms are less likely to have financial and human capital constraints.   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 investment opportunities. 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 investment opportunities. In this table, we add to the specifications in Table 4 variables that interact our measures of investment opportunities with our measures of firm characteristics, i.e., overall 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 overall experience, industry experience, and specialization refers to venture capital firms in the top quartile, while those with low overall 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 experience increases the level of investment, not just the sensitivity of investment to IPO activity. More experienced venture capital firms invest 11.9% more than inexperienced firms when IPO activity is low and 22.4% more when IPO activity is high.

We also find that experience appears to work through industry-specific as opposed to overall experience. 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 measure of investment opportunities. 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 as a measure of investment opportunities.

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 human capital is an important channel through which experience influences a venture capital organization's investment reactions to cyclical investment opportunities. As noted earlier, we posit that overall experience is a reasonable proxy for access to capital; firms that have made many investments in the past should be able to more easily raise capital to fund new investments within an industry. However, we do not find that overall experience, and thus access to capital, leads to greater investment in response to increases in investment opportunities. And the results seem to reject the notion that less experienced venture capital firms are able to react more quickly to investment opportunities. Rather, the results suggest that when investment opportunities increase, venture capitalists with the

most industry experience are the ones who can take advantage of these opportunities, perhaps through their industry contacts, knowledge, or a combination of both.

C. The Determinants of Investment Success

While more experienced venture capital firms are more responsive to our measures of investment opportunities, this does not necessarily imply that their investment is more efficient. They may, in fact, be an over-reacting to an apparent increase in investment opportunities. 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 the possibility that industry experience and specialization lead to inefficient investment, 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 overall—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.[4] Each initial investment by a venture

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[4]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.

capital firm in a portfolio company is used as an observation.[5] 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 the success of 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 investment opportunities.

Table 7 makes clear that experienced venture capital firms do not perform worse on average as a result of investing more in when IPO activity and Q increase. Indeed, on average, they perform better. Table 8 digs a little 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,

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[5]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.

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 investment opportunities. Our analysis used Q and the IPO activity of venture capital-backed firms as proxies for investment opportunities. 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 of investment opportunity 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

This paper examines the effects of experience and specialization on venture capital investment activity and success in response to changes in the opportunity set. We argue this setting is particularly well suited for the empirical assessment of both the extent and results of diversification as well as the role of specialization. We frame the analysis with a series of hypotheses, which suggest that specialist organizations and organizations with greater industry experience will be able to respond more quickly to new opportunities, but will be less able to redeploy assets when there are few attractive investments in that industry.

We then analyze over forty thousand venture capital investment decisions over the past two decades. We find that not only do specialized organizations respond more sharply to increases in the number of venture-backed IPOs in an industry, but that these investments tend to be more successful. These findings are consistent with the theoretical suggestions above.

In particular, our results suggest that capital constraints are unlikely to be the more important factor influencing the differential investment activity of experienced and specialized venture capital organizations. The critical factor appears to be human capital.

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 have acknowledged, 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.) Second, during much of the period under study, the venture organizations had largely identical structures, with loosely affiliated partners pursuing transactions with a considerable degree of independence. The past few years have seen a surge of experimentation. Some groups have sought to "institutionalize" their investment processes, while others have tried to combine scale with flexibility by forming affiliate networks. (For a discussion of these changes, see Gompers and Lerner, 2001.) The consequences of these organizational innovations merit further analysis.

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Table 1: Sample Characteristics

Panel A: Sample Characteristics

	0.25	0.50	0.75	Mean	s.d.	N
Sample						
Overall 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						
Overall 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						
Overall 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						
Overall 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						
Overall 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 B: 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 A 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. *Overall 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 *Overall Experience*.

Panel B 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.

Table 2: Venture Capital Firm Characteristics

Panel A: Characteristics by Quartile

N		Number of Investments Mean	S.D	Number of Industry Investments Mean	S.D	Specialization Mean	S.D		Success Mean
Overall 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 *Overall 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 *Overall Experience*, *Industry Experience* and *Specialization*.

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.
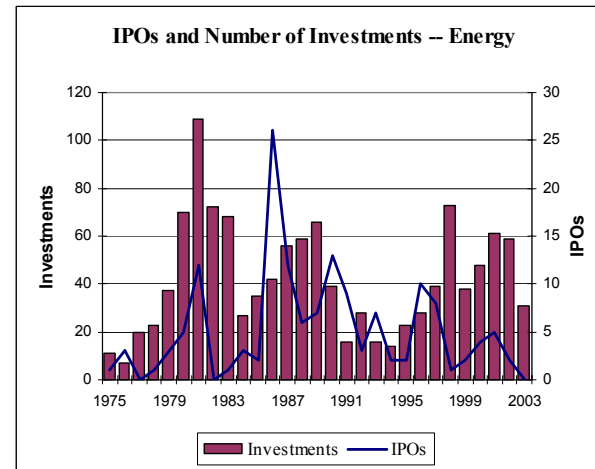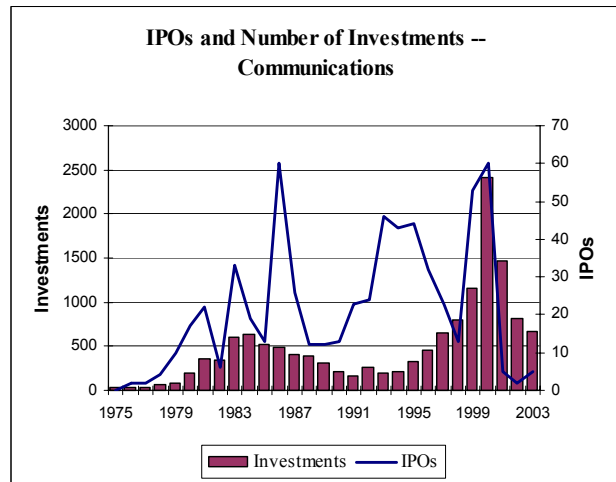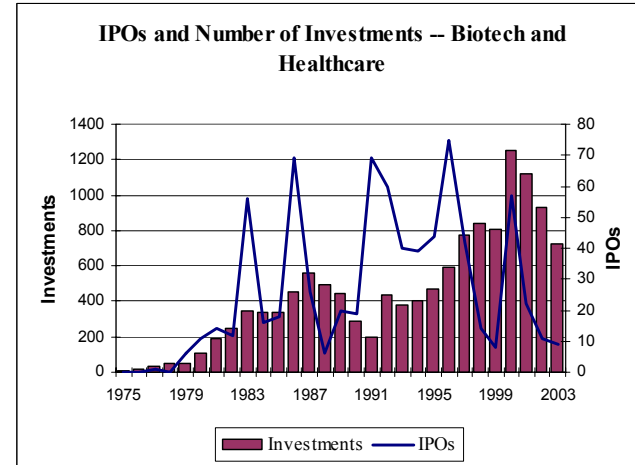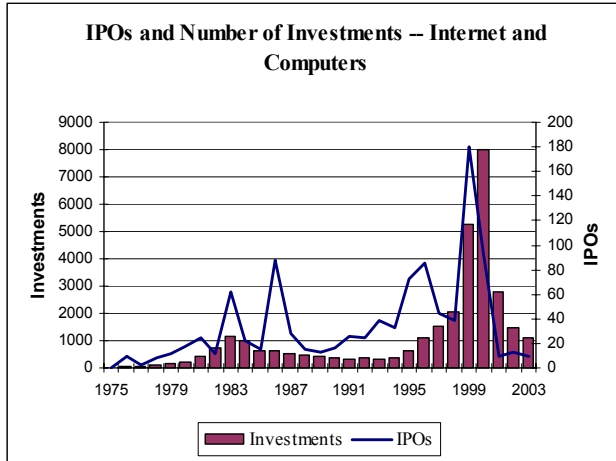
Figure 2: Q and Number of Investments for Selected Industries
The graphs show years on the x-axis, the number of venture investments in the industry as a line calibrated on the left y-axis and Q as bars calibrated on the right y-axis.
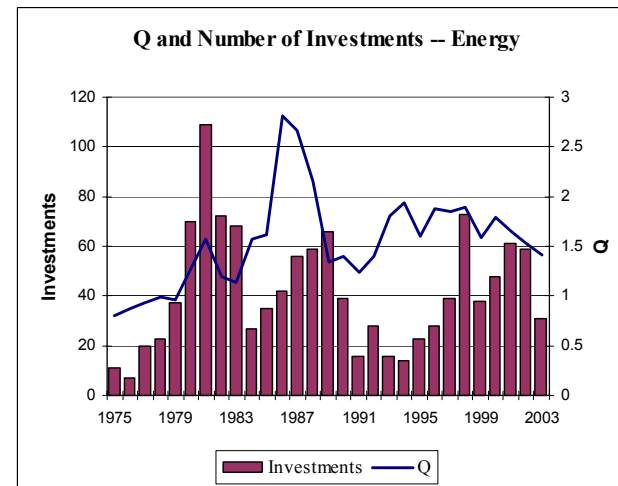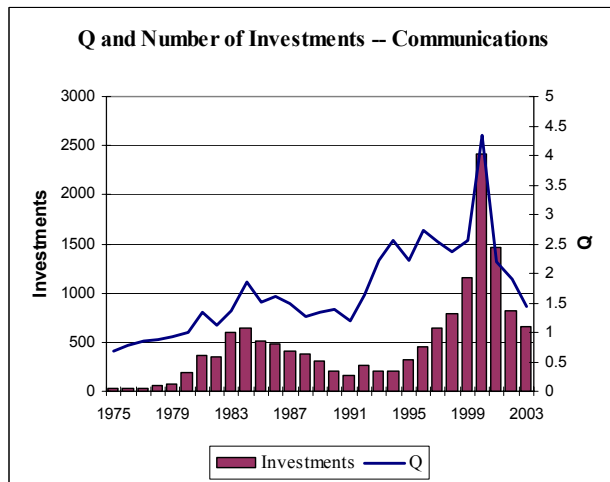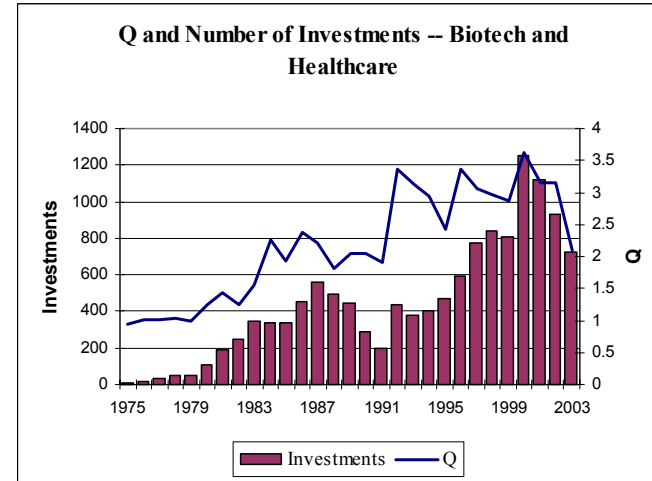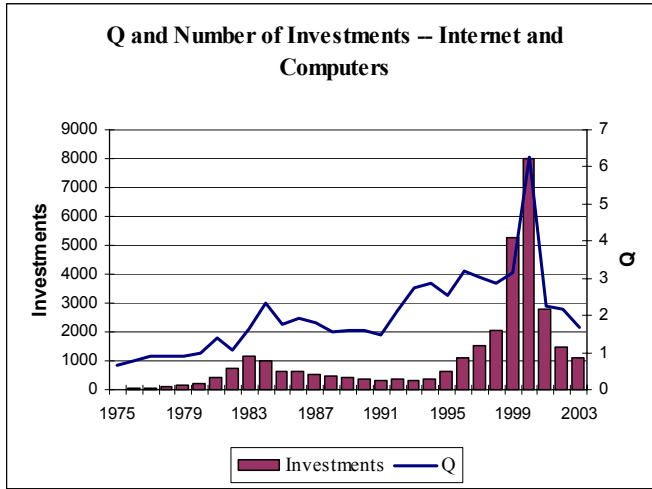
Table 3: Measure of Investment Opportunity

| | '(1) | '(2) | Detrended | |
			(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) IPOs		(2) IPOs		(3) IPOs		(4) IPOs		(5) IPOs		(6) Q		(7) Q	
IO Measure														
IO 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		Industry		Industry		Industry		Industry		Industry		Industry	
	Year		Year		Year		Year		Year		Year		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 investment opportunity measure (IO 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)

IO Measure	(1) IPOs		(2) IPOs		(3) IPOs		(4) IPOs		(5) IPOs		(6) IPOs		(7) Q		(8) Q	
IO 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 * IO Measure	0.0604										0.0603				0.0502	
	[12.18]	***									[12.93]	***			[14.01]	***
Industry Experience * IO Measure			0.0541				0.0583						0.0574			
			[12.17]	***			[13.63]	***					[13.54]	***		
Non-Industry Experience * IO Measure					0.0348		-0.0080						-0.0035			
					[6.51]	***	[2.15]	**					[1.24]			
Specialization * IO 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 investment opportunity measure (IO 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

IO Measure	(1) IPOs		(2) IPOs		(3) IPOs		(4) IPOs		(5) IPOs		(6) IPOs		(7) Q		(8) Q	
IO 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 * IO Measure	0.0357										0.0409				0.0371	
	[5.54]	***									[6.50]	***			[8.08]	***
Industry Experience * IO Measure			0.0342				0.0404						0.0374			
			[5.61]	***			[7.17]	***					[6.83]	***		
Non-Industry Experience * IO Measure					0.0138		-0.0114						-0.0035			
					[2.14]	**	[2.33]	**					[0.90]			
Specialization * IO 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 investment opportunity measure (IO 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)
IO Measure	IPOs	IPOs	IPOs	IPOs	IPOs	IPOs	IPOs	Q	Q
IO 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 investment opportunity measure (IO 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)

IO Measure	(1) IPOs	(2) IPOs	(3) IPOs	(4) IPOs	(5) IPOs	(6) Q	(7) Q
IO 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 * IO Measure	0.0026				0.0059		0.0039
	[1.36]				[2.62] ***		[1.74] *
Industry Experience * IO Measure		0.0045	0.0094			0.0095	
		[1.52]	[2.27] **			[2.33] **	
Non-Industry Experience * IO Measure			-0.0052			-0.0059	
			[1.95] *			[2.20] **	
Specialization * IO 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 investment opportunity measure (IO 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)
Ever Invested in That Industry In the Past					
N	**46,650**				
Experience * Lagged IPOs	0.0568				
	[9.14] ***				
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
					[11.04] ***
Ever Invested in That Industry In the Sample					
N	**53,594**				
Experience * Lagged IPOs	0.0563				
	[9.73] ***				
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
					[7.36] ***

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 investment opportunity measure (IO 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.