Buy Local? The Geography of Successful and Unsuccessful Venture Capital Expansion

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We document geographic concentration by both venture capital firms and venture capital-financed companies in three elite cities – San Francisco, Boston, and New York. We find that firms open offices based on the success rate of venture capital-backed investments in an area. Geography is also significantly related to outcomes. Venture capital firms based in the elite locales outperform, regardless of the stage of the investment. Ironically, this outperformance arises from outsized performance outside of the venture capital firms' office locations, including in peripheral locations. Outperformance of non-local investments suggests that policy makers in regions without local venture capitalists might want to mitigate costs associated with established venture capitalists investing in their geographies, rather than encouraging the establishment of new firms.

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I. Introduction

From Silicon Valley to Herzliya, venture capital firms are concentrated in very few locations. More than half of the 1,000 venture capital offices listed in *Pratt's Guide to Private Equity and Venture Capital Sources* are located in just three metropolitan areas – San Francisco, Boston, and New York. More than 57% of the companies financed by venture capital firms are located in these same three cities. This paper examines the location decisions of venture capital firms and the impact of venture capital firm geography on investments and outcomes.

The location of venture capital firms matters for the development of entrepreneurial firms because venture capitalists provide more than just risk capital. Venture capital firms typically invest in early-stage and high-technology companies where informational asymmetries are high. These are firms in which the future prospects are highly uncertain and the potential for agency conflicts are severe. Venture capital funding contracts provide for staged financing and venture capitalists are constantly evaluating their portfolio companies (see, for example, Sahlman (1990), Gompers (1995), and Kaplan and Stromberg (2003)). Venture capitalists use their industry knowledge to be actively involved in the management of the companies they fund, through board membership, management recruiting, and the provision of management incentives.

The cost of providing this oversight is likely to be sensitive to the distance between venture capitalists and the firms in which they invest. The ability to monitor the portfolio company, to coach the management team, and to provide introductions may depend upon the ability to frequently interact with the company. For example, Lerner (1995) shows that venture capitalists are more likely to serve on the boards of geographically proximate companies. Moreover, this involvement is likely to translate into tangible economic progress. Research shows that venture capital-backed companies outperform their peers in many dimensions: i) operational

growth (Hellmann and Puri (2000)) ii) post-IPO performance (Brav and Gompers (1997)) iii) innovation and patenting activity (Kortum and Lerner (2000)) and iv) the potential for scale (Puri and Zarutskie (2008)). Similarly, Gompers and Lerner (2001) show that venture capital-backed companies have disproportionately contributed to jobs, market value, and revenues.

Reflecting this awareness, states and municipalities are placing increasing emphasis on encouraging the establishment of venture capital communities in their regions, e.g., how to help Cleveland become the next venture hub. A 2001 National Governors Association report stated, "Venture capital is critical to growing the new businesses that will drive the 'new economy.' Finding ways to nurture the culture of entrepreneurs, and the capital that feeds them, must be the top priority of states."[1] An estimate by the National Association of Seed and Venture Funds is that state venture capital funds in 2008 totaled $2.3 billion[2]; meanwhile, an increasing share of the approximately $50 billion that states spend on industrial incentives is going to venture-backed firms, a trend that is likely to be accelerated by provisions in the recently enacted stimulus bill favoring clean technologies (Engardio (2009)). Thus, it is vitally important to understand the geography of venture capital.

In this paper, we proceed in three steps. First, we document the clustering of venture capital in three "elite" metropolitan areas (combined statistical areas or CSAs): San Francisco/San Jose, Boston, and New York. There is a long literature on industrial clustering dating back to Marshall (1920). Some clustering is to be expected, since geographically localized knowledge spillovers are likely to be especially important for high-technology

[1]National Governors Association, Center for Best Practices, "Issue Brief Growing New Businesses with Seed and Venture Capital: State Experiences and Options," 2001, http://www.nga.org/Files/pdf/VENCAPITAL.PDF (accessed April 11, 2009).

[2] http://www.nasvf.org/nasvf/web.nsf/pages/documents.html/$file/3-24-08%20Table%20of%20State%20Venture%20Funds%20Distributed%20to%20Response%20Group.pdf (accessed April 11, 2009).

companies (as modeled in Ellison and Glaeser (1997), and documented in biotechnology by Zucker, Darby and Brewer (1998)). Further, Glaeser (2007) finds variation in the self-employment rate across metropolitan areas.

We find, however, a level of venture capital localization that far exceeds entrepreneurial localization. Glaeser finds that variation in the self-employment rate is related to variation in demography and industry concentration, but does not find any correlation between this broad measure of entrepreneurship and venture capital. We find that a one standard deviation increase in the number of venture capital offices in a region increases venture capital investments in that area by 49.7%. The C(3) ratio of self employment was 10.7%[3], while the comparable C(3) ratio of venture capital partners is 60.5%.

Of course, association does not indicate causation. The localization of venture capital firms that we identify may simply reflect the localization of industries in which venture capitalists invest. But which came first – the venture capitalist or the entrepreneurial company? Mollica and Zingales (2007) find evidence that it is the venture capitalist, showing that venture capital firms increase both patents and the total number of new businesses, using the size of state pension funds as an instrument for the number of venture capital firms.

We examine venture capitalists' decisions to open offices in new geographies. Instead of expanding to regions with few VC firms, VCs tend to open branch offices in the same three elite cities. For example, a Boston-based firm is likely to open a San Francisco/San Jose office. In fact, one of the most important determinants of the number of VC offices in a region is the success rate for all previous VC investments in that region. The success rate for previous VC investments explains an additional 10.9% of the variance in the number of offices in a region.

[3] C(3) ratio of self-employment calculated using 2000 micro-level Census data from the Integrated Public Use Microdata Series (IPUMS) at http://usa.ipums.org/usa/.

Similarly, the most important determinant of a VC firm's decision to open a branch office is the percentage of its investments in that area in the past five years.

Since the relationship between VC firm location and their investment locations is endogenous, we examine the relationship between success and distance from VC investors. Overall, venture capital firms based in the elite locales outperform, even after controlling for firm experience. Surprisingly, much of the VC outperformance in elite cities arises from non-local investments. This finding is counterintuitive, since venture capitalists might be expected to be the most involved with the geographically closest companies. We observe this outperformance of non-local companies in both early- and late-stage investments. Thus, this wedge in expected returns does not seem to be the result of established VC firms' cherry-picking later-stage enterprises, and may indicate economically meaningful geographic differences in the availability of venture capital. Perhaps venture capitalists have a higher hurdle rate for investments that have a higher monitoring cost (non-local investments). This higher hurdle rate may reflect the imputed (personal) cost of traveling to remote locations.

We find additional evidence that there may be a higher investment threshold for non-local deals. If a venture capital firm has done or will do another investment in the same geographic area, there is a 2% drop in expected success. VCs may lower their threshold on a potential deal if they have a lower marginal cost of visiting the area, i.e., if the venture capitalist is already visiting one portfolio company, the personal cost of visiting a second company is substantially lower.

In aggregate, the geographic patterns we observe may be efficient. Venture capital firms locate in areas that offer them the highest concentration of profitable investments. Travel to other geographies is costly and will be undertaken only when an investment offers prospects for

a high enough return. If the supply of venture capital is a limiting factor for the establishment of new firms, policy makers in regions with low concentrations of venture capital may wish to provide incentives for established VCs based in elite cities to invest in their region.

This paper is related both to the existing literature on venture capital and on the importance of geography for economic growth. Several papers document how venture capitalists monitor and advise their portfolio companies (Barry, Muscarella, Peavy and Vetsuypens (1990), Lerner (1995) and Hellman and Puri (2002)). Bengtsson and Ravid (2009) find VC contracts are more high-powered as geographic distance increases, indicating that monitoring and soft information decrease with distance. In economic geography, Zook (2002) argues that the regional distribution of venture capital investing played a role in determining the location of new Internet startups.

More generally, there is an extensive literature documenting the continued importance of geographic clusters despite increasing globalization (see for example, Porter (1990), Krugman (1991), Ellison and Glaeser (1997), and Ottaviano and Thisse (2004)). Saxenian (1994) examines the importance of local industrial systems for entrepreneurial activity in Silicon Valley and along Route 128 near Boston. Fallick, Fleischman, and Rebitzer (2006) document high rates of intra-industry labor mobility in the computer industry in Silicon Valley, consistent with agglomeration economies in investment technology clusters. In addition, there is a growing interest in understanding conditions that foster entrepreneurship. Glaeser (2007) shows that more than half of the heterogeneity in the self-employment rate can be explained by demographic and industrial variation. Several papers document the importance of geographic factors such as local birth (Michelacci and Silva (2007)) and entrepreneurial levels of peers (Giannetti and Simonov (2008)).

The paper is organized as follows. The next section describes the construction of the data. Section III examines the geography of venture capital firms and geographic factors associated with the supply of venture capital. Section IV describes the geography of venture capital-backed companies. Section V reviews the determinants of venture capital investment success. Section VI proposes some implications of venture capital expansion for policymakers and Section VII concludes the paper.

II. Data Sources

The first of two data sources we use is the *Pratt's Guide to Private Equity and Venture Capital Sources*. The annually updated *Pratt's Guide* collects information about the capabilities, focus, and size of venture capital and buyout organizations throughout the world. This information was collected by Venture Economics, formerly an independent research firm and later a unit of Thomson, through a survey annually distributed to private equity firms. We hand collect information from *Pratt's Guides* released between 1974 and 2005 about the office locations of venture capital firms. This information allows us to determine the location and year of founding and closing of each venture capital firm's main office and branch offices. We include only offices in the United States, since that is where the Pratt's coverage is most comprehensive.

The *Pratt's Guides* provide venture capital office location information at the zip code-level, but we assign venture capital offices to locations at the Combined Statistical Area (CSA) level. In cases such as San Diego, where a city is not located in a CSA, we assign venture capital offices in the city to the appropriate Metropolitan Statistical Area (MSA). We use CSA because the MSAs in some cases may be too narrowly defined. For example, the cities of Palo

Alto/Menlo Park, Berkeley, and San Francisco, CA are located in three different MSAs. On the east coast, New York City is located in a different MSA than nearby cities such as Stamford and Greenwich, Connecticut, where New York area investors often choose to base their operations. Therefore we use CSAs which appropriately assign Palo Alto and San Francisco to one location and similarly assign New York and Greenwich in one location.

Our second data source is Thomson's VentureXpert (formerly Venture Economics) database. The database was started in 1977 and has since been back-filled through the 1960s. It provides information about the dates of venture financings, the investors involved in each financing round, the amounts invested in each round, and the outcome of each venture capital-backed company in the database. We use these data to create our main outcome measure of venture capital investment success: whether each venture-backed company went public through an IPO or has registered for an IPO. In addition to information on financing rounds and outcomes of venture capital investments, the database also provides information about the location of each portfolio company. As with the *Pratt's Guide* office location data, we assign portfolio companies to a locale at the CSA level and, in cases where a portfolio company is located in an MSA that is not located in a CSA, at the MSA level. For the purposes of this study, we restrict our analysis period to investments made between 1975 and 2005. We drop investments prior to 1975 due to data quality concerns discussed by Gompers and Lerner (2004) and omit companies receiving initial investments after 2005 to account for the typical start-up to exit maturation period of venture capital-backed companies.

We merge the *Pratt's Guide* data with the VentureXpert data and obtain investment data for 2,030 of the 3,290 venture capital firms cataloged by *Pratt*'s. Conversely, we were able to match 80% of VentureXpert investments to firms tracked by *Pratt*'s. 75% of all venture capital

firms identified by VentureXpert with at least 5 or more investments are matched to the *Pratt's Guide* location data. The remaining unmatched VentureXpert firms are mostly foreign venture capital firms, corporate VCs, and banking institutions.

Using venture capital office location information from the *Pratt's Guide* merged with investment and portfolio company information from the VentureXpert database, we are able to generate variables indicating the location of the venture capital firm relative to the location of the portfolio company it is investing in. For each portfolio company a venture capital invests in, we use our merged data set to classify the deal as: 1) Main Office – portfolio company is located in the same CSA as the investing venture capital firm's main office (defined as the first office opened by the investing venture capital firm. If the firm was established with multiple offices, the CSA in which the firm made the most investments in its first five years of existence is classified as the main office); 2) Branch Office – portfolio company is located in the same CSA as one of the investing venture capital firm's branch offices (defined as any location in which the firm has an office, other than the main office); 3) Outside – portfolio company is located in a CSA in which the investing venture capital firm does not have its main office or a branch office. This classification allows us to examine differences in outcomes based on the proximity of the venture capital firm to a portfolio company, as well as differences in performance by office type.

In addition to our data on venture capital, we collect state-level information on characteristics related to employment and innovation. Information about the level of educational attainment in a state is from annual editions of the *Statistical Abstract of the United States*. Data on each state's Gross Product is taken from the Department of Commerce's Bureau of Economic Analysis. To measure the business environment of each state, we obtain information on state marginal income tax rates and long-term capital gains tax rates from the National Bureau of

Economic Research's TAXSIM model. Finally, we collect information about local innovation and patenting rates from the U.S. Patent and Trademark Office.

III. Geography of Venture Capital Firms

Table I reports the location of venture capital firms by CSA across time. The three elite cities, San Francisco/San Jose, New York City, and Boston, are home to more than half of all venture capital offices in all years reported. Over time, the three elite cities have maintained their numerical advantage despite an approximately three-fold increase in the number of venture capital firms and branch offices between 1985 and 2000. Also notable is the paucity of venture capital offices located in smaller cities. Less than a third of all venture capital main offices and branch offices are located outside of the top nine CSAs. In contrast, approximately 80% of the working-age population lived outside of the top nine CSAs in 2000[4].

In Table II, we compare the lifespan of main offices and branch offices. We calculate a simple measure of longevity, the number of years between the office opening and closing. In cases where the office remains open through the end of our sample in 2005, we calculate the number of years between the office opening and 2005. Since the data is right censored, more recently opened offices will have lower lifespans. Therefore we construct a second measure, potential lifespan, in which we normalize the age of each office by dividing the age of the office by the number of potential years the office could have been open. Potential years are defined as the number of years between office opening and 2005. On average, a main office's lifespan is 2.2 years greater than the lifespan of a branch office. This difference is statistically significant and the result is similar when using the potential lifespan measure. The relatively longer

[4] Calculated using 2000 micro-level Census data from the Integrated Public Use Microdata Series (IPUMS) at http://usa.ipums.org/usa/.

longevity of main offices is true in the elite cities as well, although branch offices located in the elite cities have longer relative lifespans than other branch offices.

The finding that main offices are longer-lived than branch offices suggests that venture capital firms are more likely to close branch offices. Venture capital offices in the elite cities (main or branch) are longer-lived than offices in other locales. This longevity may reflect differences in deal flow (supply of venture capital investments) between these locations, or differences in preferences of investors (limited partners) to invest in funds with offices in these cities. Other factors contributing to longevity may include issues we document in later sections: the concentration of portfolio companies located in the elite cities and the outperformance of venture capital firms based in the elite cities.

In Table III, we take a multivariate approach to analyzing the determinants of venture capital firm location. We estimate a series of six models in which the dependent variables measure the number of total, main, and branch venture capital offices in a CSA in a given year. All regression models are estimated at the CSA-Year level and we restrict the analysis to CSAs where at least one main or branch office existed between 1975 and 2005. In some CSA-Years, the number of offices can equal zero. For example, this can occur in the case where a venture firm opens an office in a remote area such as Sioux City, Iowa in 1995 and closes it in 2000. Prior to 1995 and after 2000, the number of offices reported in Sioux City would equal zero.

A key explanatory variable of interest is the success rate of all previous venture capital investments in the CSA. This variable is constructed by calculating the percentage of previous venture capital-backed companies established in the CSA previous to that year that have gone public. We also include controls for local characteristics which should be associated with venture capital investments. These controls include the log gross state product per capita, the

state's marginal income tax rate, and the state's long-term capital gains tax rate in the year prior to the investment. In order to capture an area's potential for innovation, we control for the percentage of population with a college degree in that CSA, as well as the log number of patents per capita issued in the state in the previous year. We include year fixed effects to control for changes in the supply of venture capital and investment opportunities. Finally, all standard errors are robust and calculated after clustering at the CSA level.

The three principal findings of these regression models are as follows: 1) venture capital offices are concentrated in locales where venture capital investment has previously been successful; 2) regions with high concentrations of venture capital offices are in states with higher levels of gross state product per capita; 3) venture capital offices are concentrated in areas with high levels of innovation as measured by the number of patents per capita issued in the previous year. Focusing on the first column, where the dependent variable measures the log number of total venture capital offices, moving from the 25th percentile of the regional success rate for previous venture capital investments to the 75th percentile of the regional success rate increases the number of offices in a CSA by 2.9. Increasing log gross state product per capita from the 25th percentile value to the 75th percentile value increases the number of offices in a CSA by 4.2. Finally, with respect to innovation, a CSA in a state at the 75th percentile of innovation as measured by patents per capita will have 1.2 more offices than a CSA in a state at the 25th percentile level of innovation. Relative to an average of 11.5 venture capital offices in a CSA-year, these factors are economically and statistically associated with the number of venture capital offices in a CSA. The results for the remaining regression models, which utilize dependent variables representing the log number of main offices and branch offices yield similar results. Measuring the success rate in the CSA over the past five years rather than since 1975

yielded similar regression results. These findings appear consistent with findings about the development of venture capital ecosystems (Saxenian (1994)). Prior successes and innovation attract additional venture capital to a region and aid in the development of a self-sustaining environment for entrepreneurs. The results also highlight the "catch 22" issue in venture capital branch offices. A high level of existing venture capital activity and success induce entry into a market. A nascent startup market may find it difficult to attract venture capital entrants.

We next explore the determinants of each venture capital firm's decision to expand by opening a branch office. Branch offices are an interesting subset to consider, since they may be more responsive to local conditions. Non-elite cities may be interested in encouraging branch offices, since branch locations benefit from the expertise and connections of a strong head office. The dependent variable in these probit models is one in the year that the venture capital firm opens an office in the CSA. In order to reduce the choice set to a more likely subset of firm expansion areas, we only include Firm-CSA-Year observations in regions in which the venture capital firm has at least one investment in that CSA prior to the year in question. In years prior to the opening of the office the dependent variable is equal to zero. If the venture capital firm never opens an office in the CSA, all of its Firm-CSA-Year observations will have the dependent variable equal to zero. The firm will then have observations in the CSA beginning in the year that it makes its initial investment until the earlier of the year it opens an office in the CSA or 2005. This methodology results in over-sampling of larger firms and firms with longer histories, since they may have invested in more regions or are in the sample for a longer period. We include fixed effects at the VC firm level to control for any differences in firms' predisposition for expansion. Results are similar if we include all possible cities as choices for firm expansion.

Table IV presents summary statistics for the characteristics of venture firms for each Firm-Year and Firm-CSA-Year analyzed. Branch office expansion is quite rare. In our sample, firms open branch offices in CSAs where they have previously invested in only 0.4% of Firm-CSA-Years. Venture capital firms exhibit a strong local bias. We define local bias as the percentage of a venture capital firm's investments that are made in a CSA over the past five years divided by the percentage of all venture capital investments that are made in the CSA over the past five years. Average local bias is 5.79, implying that the share of investments in a venture capital firm's portfolio made in a given CSA over the past five years is nearly six times greater than one would expect based on aggregate venture capital investment patterns. The average five-year success rate of a venture capital firm in a CSA is 18.6%. On average, firms have made 49 previous venture capital investments. Because there is a time trend and the number of investments a venture capital firm makes will increase over the course of the firm's lifespan, we follow our previous work (Gompers, Kovner, Lerner and Scharfstein (2008)) and calculate a measure of adjusted venture capital firm experience. This measure is equal to the log of one plus the number of previous investments made by the venture capital firm minus the log of one plus the number of prior investments the average venture capital investor has made as of the year in question. The average adjusted experience of VCs in our sample is -0.44 (one observation per each year the firm was in existence), reflecting the relative inexperience and short lifespan of the average firm.

We test to see if a firm's organizational structure affects the decision to expand to a new geographic location. Our first measure of organizational structure is industry diversification. We calculate a Herfindahl-Hirschman Index, using the nine major industries identified by Gompers, Kovner, Lerner and Scharfstein (2008). The Herfindahl is equal to the sum of the

squares of the percentage of the firm's investments over the previous five years in each of the nine industry classifications. A firm with a Herfindahl value of 1 has invested in only one of the industries over the past five years. The average Firm-Year Herfindahl is .44, implying that over the past five years the average firm made at least 46% of all its investments in a single industry. Our second measure of organizational structure is size, as measured by the number of partners at the firm. The average venture capital firm is small and employs 5.4 individuals; 3.4 of whom are General Partners.

Table V reports results for Firm-CSA-Year level probit models of the determinants of opening a venture capital branch office. We examine the factors associated with opening a branch office for 7,328 Firm-Years and 42,302 Firm-CSA-Years. Each specification includes venture capital firm-year fixed effects. Because CSAs appear in the regressions multiple times in each year, we calculate robust standard errors clustered by CSA. A major finding is that a firm's own success rate in a CSA over the past five years does not play a significant role in the firm's decision to open a branch office in the CSA. However, the success rate for all VC investments in a CSA over the past five years is important to the firm's decision to open a branch office. Using the coefficients from specification 2, we find that a 10% increase in the overall success rate of venture capital investments in a CSA increases the likelihood of a new branch office in that region by approximately 35%. This implies that venture capital firms are chasing the success they observe others experiencing in CSAs. Interestingly, while overall industry success in the area is important, we do not find evidence that a venture capital firm's own success in a CSA is associated with opening an office. The results seem to indicate that the overall environment is what attracts new offices. It is not the personal experience of a firm, but the attractiveness of the ecosystem that matters.

Surprisingly, we find that experienced venture capital firms are less likely to open branch offices. Moving from a firm at the 25th percentile of adjusted VC firm experience to a firm at the 75th percentile of adjusted VC firm experience actually decreases the likelihood of opening a branch office in a year by 35%. This is initially puzzling, since the most experienced and successful firms likely have the easiest access to additional capital for expansion. Perhaps the most successful firms are already seeing the most interesting investment opportunities, regardless of the geographic region of the company. Even after controlling for experience, firms based in the San Francisco/San Jose CSA are 50% less likely to open branch offices than are venture capital firms based in other locales. Well-known San Francisco/San Jose firms with a single U.S. office include Kleiner Perkins, Sequoia Capital, Accel Partners, and U.S. Venture Partners. Given the high concentration of portfolio companies in the San Francisco/San Jose CSA we document in the following section, this result is not unexpected.

IV. Geography of Venture Capital-Backed Portfolio Companies

Much like venture capital firms, venture capital-backed portfolio companies are heavily concentrated in the three elite cities. Table VI presents a distribution of the geography of portfolio companies from our combined *Pratt's Guide*/VentureXpert data set. As with venture capital offices, approximately half of all venture capital-backed portfolio companies are located in San Francisco/San Jose, New York, or Boston. 54% of all investments in venture capital-backed companies are made in companies located in these three cities. Moving beyond the three elite cities, 79% of all portfolio companies are located in the top 12 CSAs and 81% of all venture capital investments are made on companies in the top 12 CSAs.

We examine the location of portfolio companies in relation to the offices of their venture capital investors. Of the 12,358 investments in the sample that involve a venture capital investor located in the same CSA, 80% of these are in one of the three elite cities. More than 60% of San Francisco/San Jose companies have their venture capital investor located in their region, while less than 15% of companies headquartered in Philadelphia can say the same. Overall, most investments (57%) are made by venture capital firms outside of their home CSA. Despite the importance of monitoring in venture capital, many venture capitalists do invest outside of their home region. San Francisco/San Jose and New York are the only two CSAs in which a majority of the venture capital-backed companies were investments made by local venture capitalists (main or branch).

In Table VII, we explore the determinants of the number of new venture capital financed companies in each CSA year. We include "new" companies only once, in the year in which we observe the first investment by any venture capital firm in VentureXpert. We exclude CSAs in which no venture capital investment has ever been observed. Similar to Table III, these models are estimated at the CSA-Year level, include year fixed effects, and robust standard errors are calculated after clustering for CSA. On average, 4.2 portfolio companies are formed in a CSA-Year. Analyzing the third regression column, we estimate that the number of venture capital firms in a CSA is positively associated with the number of venture capital-backed companies. Moving from the 25th percentile to the 75th percentile of venture capital offices in a CSA increases the number of venture capital-backed companies formed by 1.8 companies. This result indicates that increasing the number of venture capital firms in a CSA, and hence the availability of capital in a CSA, should be associated with an increase the number of innovative startup companies in the CSA that are venture-capital backed. Interestingly, we also find that five

additional venture capital-backed portfolio companies will be formed in San Francisco/San Jose versus a CSA that is not San Francisco/San Jose but shares the other observed features. All else equal, venture capital firms still invest in a greater number of San Francisco/San Jose portfolio companies than in other CSAs. Finally, we observe that more venture capital-backed companies are formed in CSAs with greater levels of past success. Moving from a CSA at the 25th percentile of the previous success rate to a CSA at the 75th percentile previous success rate increases the number of venture capital-backed companies formed by 0.4 companies. These results support the findings of Gompers, Lerner, and Scharfstein (2005), who find that regions with previously successful venture capital-backed companies that went public are more likely to spawn additional venture capital-backed companies.

V. Determinants of Venture Capital Investment Success

It is natural to wonder whether there any performance consequences of the geographic concentration we observe. In essence, if there is a venture funding gap, i.e., if supply of good ideas exceeds the availability of capital, remote venture capital locations may have greater success rates than elite venture capital markets. We next compare the performance of firms based in and outside of the elite cities. Table VIII compares the mean success rates of elite based firms and non-elite based firms. Overall, firms based in the elite cities have an average success rate that is 4.4% higher than venture-backed firms based outside the elite cities. Elite-based VC firms outperform other VC firms, whether we examine main office, branch office, or outside investments. These differences are all statistically significant at the 1% level. VC firms from the elite cities appear to outperform when restricting our sample to investments made both inside the elite cities (17.3% vs. 14.2%) and outside of the elite cities (19.0% vs. 13.1%). This

outperformance also persists when we restrict the sample to early-stage (15.1% vs. 11.3%) or late-stage deals (20.7% vs. 15.7%). These bivariate analyses provide strong suggestive evidence that VC firms from the elite cities outperform VC firms based outside of the elite cities. To confirm these results we analyze the determinants of success using a multivariate approach.

Table IX reports summary statistics for variables used in the multivariate analyses of the determinants of venture capital investment success. 66.4% of the investments in the sample are made by VC firms based in one of the three elite cities. The overall investment success rate is 16.4%. Interestingly, investments in the main office region appear to underperform relative to other geographies. Average success rates for investments in the main office regions are 14.5%, while the branch office and outside office investment success rates are both approximately 17%, a difference that is statistically significant at the 1% level. Of course, our success measure is relatively blunt, and does not distinguish between home runs and singles (investments that return ten times vs. two times invested capital). For a subset of 5,109 investments for which we were able to find valuation information from SDC or Factset, we looked at the scale of investment success. We calculate exit multiples on venture capital investments as the exit value of the portfolio company divided by paid-in capital. While branch office investments and outside investments are more likely to IPO, exit multiples are similar across main office investments, branch office investments, and outside investments.

Of course venture capital firm quality may vary and be associated with geography and outcomes. We proxy for quality with experience: the average adjusted VC firm experience in the sample is 0.48, indicating that the average VC making an investment is more experienced than the average VC firm in that year. This is not unexpected because more successful VC firms tend to make more investments, and is consistent with previous research. Another important variable is the stage of the company at the time of investment. In terms of company stage at financing,

more than half (51%) of venture capital investments in the sample are made in the initial round of investment. A greater proportion of main office investments (56.6%) are made in the initial round versus 44.5% of branch office investments and 47.9% of outside investments. Finally, industries may have different geographic patterns and success rates. Venture capital investments in the sample are heavily concentrated in three industries: computers and internet (45.3%), biotech and healthcare (21.3%), and communications (17.6%).

Table X uses a multivariate approach to analyze the factors associated with successful venture capital investments. All regression models control for the quality of the venture capital firm (using adjusted experience), year of investment, the round of investment, the industry of the portfolio company, and the location of the portfolio company. The first column reports a key finding of the paper. The coefficient on the dummy variable indicating that the VC firm is based in one of the three elite cities (*ELITE*), which is statistically significant, indicates that venture capital firms based in the elite cities have a 3.1% higher probability of succeeding. Controlling for location, branch office investments and outside investments have an approximately 2.0% higher probability of success than main office investments.

To identify the source of excess performance of venture capital firms based in the elite cities, we add interactions between *ELITE* and the branch office investment and outside investment dummy variables in the third column of Table X. After adding these interaction variables, the coefficient on *ELITE* falls from 0.031 to 0.010 and is no longer statistically different from zero. As expected, venture capital firm experience continues to have a positive and statistically significant association with investment success. At the means of the other variables, venture capital firms at the 25th percentile of adjusted VC firm experience have a predicted success rate of 12.0% versus a predicted success rate of 13.4% for firms at the 75th

percentile of adjusted VC firm experience. However, the interaction of *ELITE* and adjusted VC firm experience is not statistically different than zero. This indicates that firm experience is not mediated through the firm being located in an elite city.

The coefficient on the interaction of *ELITE* and outside investment is 0.029 and statistically significant at the one percent level. Investments made by venture capital firms from the elite cities in portfolio companies located in CSAs not local to the venture capital firm's offices have a 2.9% higher probability of succeeding. The coefficient on the interaction of *ELITE* and branch investment is 0.021, not statistically different than zero. The drop in value of the coefficient on *ELITE* and the statistical significance of the interaction between *ELITE* and outside investment provide evidence that the outperformance of venture capital firms based in the elite cities can be attributed to their outsized performance in investments made outside of the venture capital firms' office locations.

Finally, in the fourth column, we find evidence that venture capital firms may lower the threshold for investment quality in areas where they invest multiple times. The coefficient on the dummy variable indicating that the venture capital firm has made one or more investments in the CSA in the two years before or after the date of investment is -0.021. When a VC firm has recently invested or will invest in the near future, its investments have a 2.1% lower probability of success. Perhaps venture capital firms lower the bar on a new investment if they have a lower marginal cost of visiting the company. A general partner may be willing to make an investment in a company with less promising prospects than the average company she invests in if another investment already takes her to the CSA on a regular basis.

To the extent that location is important because venture capital firms are actively monitoring the businesses they invest in, we would expect location to be particularly important

for early-stage businesses. Table XI restricts our regression models to include only early stage investments, with of course a reduced sample size. The control variables in Table XI are identical to the controls in Table X, with the exception that we omit investment round controls from the specifications in Table XI. In the first column, we again find that venture capital firms from the three elite locales outperform venture capital firms based in other locales. The coefficient on *ELITE*, which is statistically significant, is 0.014, indicating that venture capital firms based in the elite cities have a 1.4% higher probability of succeeding than venture capital firms based outside of the elite cities. This difference in probability of success between elite based firms and non-elite based firms is lower than the difference for the entire sample, but still represents a significant level of outperformance. Furthermore, we find that branch office investments have a 2.5% higher probability of success versus main office investments and outside investments have a 1.5% higher probability of success versus main office investments.

Similar to Table X, we add interactions between *ELITE* and branch investment and *ELITE* and outside investment in the third column of Table XI and obtain similar results to those shown in Table X. In column four, we find that the coefficient on the dummy variable indicating that the venture capital firm has made one or more investments in the CSA in the two years before or after the date of investment is also similar. Thus, even in early-stage investments, we find evidence of lower success rates in regions where VCs are located and in regions where VCs make multiple investments.

VI. Implications

The concentration of venture capital firms that we document may be an efficient allocation of scarce resources. Many venture capital investments are in industries where

geographically localized knowledge spillovers are likely to be important. Accordingly, venture capital firms locate to maximize benefits from these spillovers. A virtuous cycle of co-location is maintained as entrepreneurs choose to locate their businesses closer to funding sources, pools of talented employees, and academic researchers. The higher success rate for companies based in the elite cities suggests that these may be optimal geographies for founding new venture-backed businesses.

However, this allocation of resources may not be desirable from the perspective of local governments and other cities that seek local employment growth and consequent spillovers. Our results on the determinants of branch office openings suggest that anything that policy makers do that contributes to an increase in the number of successful venture-backed investments in a region will also increase the probability of a venture branch office opening in that region. Local governments may want to consider supporting the efforts of funds such as Village Ventures, which is based in Williamstown, Massachusetts and focuses on new ventures outside of the elite areas, or Draper Fisher Jurvetson, which has a network of smaller affiliated firms located in diverse geographies such as Houston, Texas and Pittsburgh, Pennsylvania.

Our results that investments made by firms based in the elite cities outperform suggest that venture capital groups based in these elite cities may be focusing on "home runs" when doing non-local deals. This may be because they have less access to proprietary deal flow and there may be higher personal costs associated with monitoring these companies. Since experienced venture capital firms achieve consistently higher success rates in these investments, policy makers outside of the elite cities may wish to provide incentives for more experienced firms to invest outside of their home areas. Finally, since we find evidence that a venture capital firm's existing investments in a region affect expected success on other deals in that region,

bringing first-time venture capital investors to a region may be more effective than subsidizing existing investors.

VII. Conclusion

We document the geographic concentration of venture capital firms in three elite areas, San Francisco, New York, and Boston. We find the success rate of venture capital investments in a region is an important determinant of venture capital firms' decisions to open new branches. While venture capital firms located in elite cities outperform, that outperformance is not driven by local investments. Interestingly, some of the performance disparity between local and non-local investments disappears when the venture firm does more than one investment in a region, suggesting that as the marginal monitoring cost falls, venture capital firms may reduce their expected success rate for investment in a distant geography. Our findings are informative both to researchers in economic geography, and to policy makers who seek to attract venture capital. Perhaps cities seeking to become the next Silicon Valley should instead seek to attract direct flights to Silicon Valley.

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Table I. Geography of Venture Capital Firm Offices

CSA	*Year*					*Share of Offices*				
	1985	*1990*	*1995*	*2000*	*2005*	*1985*	*1990*	*1995*	*2000*	*2005*
San Jose-San Francisco, CA - Main Offices	**65**	**78**	**97**	**234**	**230**	**15.0%**	**15.1%**	**15.9%**	**17.6%**	**21.6%**
San Jose-San Francisco, CA - Branch Offices	17	32	36	44	33	4.0%	5.9%	6.7%	6.3%	2.8%
New York, NY - Main Offices	**91**	**96**	**96**	**205**	**196**	**21.4%**	**16.9%**	**15.7%**	**16.1%**	**18.4%**
New York, NY - Branch Offices	4	9	13	15	14	0.4%	1.1%	1.7%	1.3%	1.2%
Boston, MA - Main Offices	**44**	**54**	**52**	**93**	**83**	**10.1%**	**10.1%**	**9.3%**	**8.6%**	**7.4%**
Boston, MA - Branch Offices	5	11	13	15	10	0.9%	1.6%	2.1%	2.0%	1.1%
Washington, DC - Main Offices	**12**	**16**	**17**	**54**	**51**	**3.1%**	**3.0%**	**2.4%**	**2.9%**	**4.8%**
Washington, DC - Branch Offices	0	5	5	13	7	0.0%	0.7%	0.7%	1.3%	0.5%
Chicago, IL - Main Offices	**13**	**23**	**26**	**41**	**35**	**2.9%**	**3.9%**	**4.5%**	**4.6%**	**3.3%**
Chicago, IL - Branch Offices	1	4	6	7	2	0.2%	0.7%	1.2%	0.9%	0.2%
Dallas, TX - Main Offices	**11**	**8**	**12**	**27**	**34**	**4.8%**	**4.6%**	**2.8%**	**3.0%**	**3.1%**
Dallas, TX - Branch Offices	6	7	5	5	5	0.2%	1.2%	1.2%	1.2%	0.3%
Los Angeles, CA - Main Offices	**21**	**23**	**13**	**37**	**34**	**2.4%**	**1.2%**	**1.7%**	**1.3%**	**2.8%**
Los Angeles, CA - Branch Offices	1	7	6	8	3	1.1%	1.1%	0.7%	0.3%	0.4%
Seattle, WA - Main Offices	**6**	**8**	**9**	**29**	**28**	**1.3%**	**1.4%**	**1.2%**	**1.3%**	**2.3%**
Seattle, WA - Branch Offices	1	4	5	1	1	0.2%	0.7%	0.7%	0.0%	0.1%
Atlanta, GA - Main Offices	**7**	**12**	**10**	**23**	**23**	**1.8%**	**1.8%**	**1.6%**	**1.4%**	**2.0%**
Atlanta, GA - Branch Offices	1	3	4	5	0	0.0%	0.5%	0.5%	0.3%	0.3%
Other - Main Offices	**115**	**138**	**141**	**298**	**273**	**27.1%**	**25.2%**	**23.0%**	**22.9%**	**23.8%**
Other - Branch Offices	16	20	34	52	47	3.1%	3.2%	6.2%	6.8%	3.6%
Total Main Offices	**385**	**456**	**473**	**1041**	**987**	**88.1%**	**81.7%**	**78.8%**	**86.3%**	**89.0%**
Total Branch Offices	52	102	127	165	122	11.9%	18.3%	21.2%	13.7%	11.0%

Sample consists of 2,039 unique venture capital firms in existence between 1975 and 2005. Geographic locations are assigned at the Combined Statistical Area (CSA) level. In cases where a city is not located in a CSA, we assign venture capital offices in the city to the appropriate Metropolitan Statistical Area (MSA). Main Offices are defined as the first office opened by the investing venture capital firm. If the firm was established with multiple offices, the CSA in which the firm made the most investments in its first five years of existence is classified as the main office. Branch Offices are defined as any location in which the firm has an office, other than the main office. Share of offices is defined as the percentage of total venture capital offices located in the CSA.

Table II. Venture Capital Firm Office Lifespans

	Average Lifespan (Years)			*Average Lifespan (% of Potential Years)*			*Number*	
CSA	***Main***	***Branch***	***Statistical Difference***	***Main***	***Branch***	***Statistical Difference***	***Main***	***Branch***
San Francisco/San Jose, CA	7.95	7.08		0.805	0.598	***	400	93
New York, NY	7.73	6.44		0.684	0.622		417	32
Boston, MA	8.05	5.10	**	0.681	0.506	**	180	42
All elite cities	7.88	6.46	***	0.732	0.580	***	997	167
All other cities	6.87	4.35	***	0.671	0.408	***	1,042	267
Total	7.36	5.16	***	0.701	0.473	***	2,039	434

Sample consists of 2,039 unique venture capital firms in existence between 1975 and 2005. Lifespan is defined as the number of years between the office opening and closing. In cases where the office remains open through the end of our sample in 2005, we calculate the number of years between the office opening and 2005. Potential lifespan is equal to lifespan divided by the number of potential years the office could have been open. Potential years are defined as the number of years between office opening and 2005. Geographic locations are assigned at the Combined Statistical Area (CSA) level. In cases where a city is not located in a CSA, we assign venture capital offices in the city to the appropriate Metropolitan Statistical Area (MSA). Main Offices are defined as the first office opened by the investing venture capital firm. If the firm was established with multiple offices, the CSA in which the firm made the most investments in its first five years of existence is classified as the main office. Branch Offices are defined as any location in which the firm has an office, other than the main office. Elite cities are defined as San Francisco/San Jose, New York, and Boston.

There also exist statistically significant differences at the 1% level in lifespan and potential lifespan between main offices located inside and outside the elite cities and between branch offices located inside and outside the elite cities.

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

Table III. Factors Associated with the Geographic Concentration of Venture Capital Firm Offices

	Log Number of Offices in year		Log Number of Main Offices in year		Log Number of Branch Offices in year	
	OLS		OLS		OLS	
	[1]	[2]	[3]	[4]	[5]	[6]
Success rate of all previous VC investments in CSA	3.7140	3.7070	1.9440	1.9370	0.6100	0.6030
	[5.52]***	[5.51]***	[5.02]***	[5.01]***	[3.57]***	[3.55]***
Log GSP per Capita	1.4820	1.4750	0.7380	0.7350	0.2070	0.2030
	[3.36]***	[3.28]***	[2.61]***	[2.52]**	[1.75]*	[1.68]*
Percent of population with college degree or higher	0.0170	0.0180	0.0210	0.0220	0.0140	0.0150
	[0.65]	[0.69]	[1.53]	[1.59]	[2.09]**	[2.24]**
Log patents per capita	0.3390	0.3410	0.1650	0.1670	0.0540	0.0570
	[2.62]***	[2.61]***	[2.23]**	[2.23]**	[1.71]*	[1.74]*
State long-term capital gains tax rate	0.1660		0.5140		0.5820	
	[0.06]		[0.29]		[0.61]	
State income tax rate		-0.4020		-0.0060		-0.0270
		[0.15]		[0.00]		[0.04]
Includes year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,256	2,256	2,256	2,256	2,256	2,256
R-squared	0.29	0.29	0.29	0.29	0.13	0.13

Sample consists of 2,256 CSA-Year observations for 197 CSAs where at least one venture capital office existed between 1975 and 2005. The dependent variable is the natural logarithm of the number of venture capital offices plus one in the CSA-Year in columns 1 and 2, the natural logarithm of the number of main offices plus one in the CSA-Year in columns 3 and 4, and the natural logarithm of the number of branch offices plus one in the CSA-Year in columns 5 and 6. Geographic locations are assigned at the Combined Statistical Area (CSA) level. In cases where a city is not located in a CSA, we assign venture capital offices in the city to the appropriate Metropolitan Statistical Area (MSA). Main Offices are defined as the first office opened by the investing venture capital firm. If the firm was established with multiple offices, the CSA in which the firm made the most investments in its first five years of existence is classified as the main office. Branch Offices are defined as any location in which the firm has an office, other than the main office. *Success rate of all previous VC investments in CSA* is constructed by calculating the percentage of venture capital-backed companies established in the CSA prior to the current year that have gone public. *Log GSP per Capita* is the natural logarithm of the state's gross product per capita plus one in the previous year. *Percent of population with college degree or higher* is the share of the state population that has graduated from college. *Log patents per capita* is the number of patents per capita plus one issued in the state in the previous year. *State long-term capital gains tax rate* and *state income tax rate* are average state marginal tax rates in the previous year.

Standard errors are clustered at the CSA-level. Robust t-statistics are in parentheses below coefficient estimates.

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

Table IV. Summary Statistics for Factors Associated with the Venture Capital Firm Branch Office Opening Decision

Measure	Observations	Mean	S.D.	P25	Median	P75	P90	Unit of observation
Firm-Year-CSA controls								
Opened a branch office in CSA	42,032	0.0042	0.0648	0.0000	0.0000	0.0000	0.0000	Firm-Year-CSA
Local bias	42,032	5.7907	18.5012	0.9783	1.9320	4.4846	11.0720	Firm-Year-CSA
Percentage of firm's deals in CSA, past five years	42,032	0.0894	0.1076	0.0303	0.0556	0.1034	0.2000	Firm-Year-CSA
Percentage of all deals in CSA, past five years	42,032	0.0526	0.0718	0.0128	0.0259	0.0538	0.1175	Firm-Year-CSA
VC's success rate in CSA, past five years	42,032	0.1857	0.0760	0.0000	0.0000	0.2500	1.0000	Firm-Year-CSA
Success rate of all VCs in CSA, past five years	42,032	0.1452	0.0760	0.0825	0.1307	0.2000	0.2500	Firm-Year-CSA
Firm-Year controls								
VC firm experience	7,328	48.7690	68.6850	13.0000	25.0000	59.0000	113.0000	Firm-Year
Adjusted VC firm experience	7,328	-0.4379	1.0611	-1.1540	-0.4892	0.3241	0.9383	Firm-Year
Firm's industry diversification, past five years	7,328	0.4376	0.2172	0.2800	0.3750	0.5372	0.7715	Firm-Year
Size of firm, prior year	7,328	5.4349	4.9258	3.0000	4.0000	7.0000	10.0000	Firm-Year
Size of firm, number of partners, prior year	7,328	3.4425	3.6964	1.0000	3.0000	4.0000	7.0000	Firm-Year
Firm based in San Francisco/Silicon Valley	7,328	0.2403	0.4273	0.0000	0.0000	0.0000	1.0000	Firm-Year
Firm based in Boston	7,328	0.1288	0.3350	0.0000	0.0000	0.0000	1.0000	Firm-Year
Firm based in New York City	7,328	0.0797	0.2708	0.0000	0.0000	0.0000	0.0000	Firm-Year

Sample consists of 42,032 Firm-Year-CSA observations for 7,328 Firm-Years between 1975 and 2005. Only Firm-CSA-Year observations in regions in which a venture capital firm has at least one investment in that CSA prior to the year in question are included in the sample. Geographic locations are assigned at the Combined Statistical Area (CSA) level. In cases where a city is not located in a CSA, we assign venture capital offices in the city to the appropriate Metropolitan Statistical Area (MSA). *Opened an office in CSA* is an indicator variable that takes on the value of one if the venture capital firm opened a branch office in the CSA-Year and zero otherwise. *Local bias* is the percentage of a venture capital firm's investments that were made in a CSA over the past five years divided by the percentage of all venture capital investments that were made in the CSA over the past five years. *Percentage of firm's deals in CSA, past five years* measures the percentage of the venture capital firm's investments that were made in the CSA over the past five years. *Percentage of all deals in CSA, past five years* measures the percentage of all venture capital investments that were made in the CSA over the past five years. *VC's success rate in CSA, past five years* measures the percentage of venture capital firm's investments in the CSA over the past five years that led to an Initial Public Offering. *Success rate of all VCs in CSA, past five years* measures the percentage of all venture capital investments in the CSA over the past five years that led to an Initial Public Offering. *VC firm experience* measures the number of prior investments the venture capital firm has made. *Adjusted VC firm experience* is equal to the log of one plus the number of previous investments made by the venture capital firm minus the log of one plus the number of prior investments the average venture capital investor has made as of the year in question. *Firm's industry diversification* is a Herfindahl-Hirschman index equal to the sum of the squares of the percentage of the firm's investments over the previous five years in each of nine industry classifications identified by Gompers, Kovner, Lerner and Scharfstein (2008). *Size of firm, prior year* is defined as the number of individuals working at the venture capital firm in the previous year. *Size of firm, number of partners, prior year* reports the number of partners at the venture capital firm in the previous year. *Firm based in San Francisco/Silicon Valley, Boston, and New York City* variables are indicator variables that take on the value of one if the venture capital firm is based in the named city and zero otherwise.

Table V. Factors Associated with the Venture Capital Firm Branch Office Opening Decision

	Opened an office in CSA			
	[1]	[2]	[3]	[4]
Firm's industry diversification, past five years	-0.0008	-0.0002	-0.0023	-0.0016
	[0.50]	[0.14]	[1.43]	[0.24]
Size of firm, prior year	-0.0001	-0.0001	0.0000	0.0000
	[1.29]	[1.15]	[0.33]	[0.14]
Local bias	0.0000	0.0000	0.0000	0.0000
	[4.16]***	[4.00]***	[3.82]***	[3.77]***
VC's success rate in CSA, past five years	0.0001	0.0002	0.0002	0.0002
	[0.10]	[0.18]	[0.20]	[0.14]
Success rate of all VCs in CSA, past five years	0.0152	0.0148	0.0150	0.0146
	[3.93]***	[3.96]***	[4.01]***	[3.97]***
Firm based in San Francisco/Silicon Valley		-0.0025		-0.0021
		[4.05]***		[3.27]***
Firm based in Boston		0.0002		0.0004
		[0.22]		[0.46]
Firm based in New York City		-0.0004		-0.0001
		[0.53]		[1.02]
Adjusted VC firm experience			-0.0012	-0.0010
			[3.73]***	[3.11]***
Firm-Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	42,032	42,032	42,032	42,032

Sample consists of 42,032 Firm-Year-CSA observations for 7,328 Firm-Years between 1975 and 2005. The dependent variable is an indicator variable that takes on the value of one if the venture capital firm opened a branch office in the CSA-Year and zero otherwise. Only Firm-CSA-Year observations in regions in which a venture capital firm has at least one investment in that CSA prior to the year in question are included in the sample. Geographic locations are assigned at the Combined Statistical Area (CSA) level. In cases where a city is not located in a CSA, we assign venture capital offices in the city to the appropriate Metropolitan Statistical Area (MSA). *Firm's industry diversification* is a Herfindahl-Hirschman index equal to the sum of the squares of the percentage of the firm's investments over the previous five years in each of nine industry classifications identified by Gompers, Kovner, Lerner and Scharfstein (2008). *Size of firm, prior year* is defined as the number of individuals working at the venture capital firm in the previous year. *Local bias* is the percentage of a venture capital firm's investments that are made in a CSA over the past five years divided by the percentage of all venture capital investments that are made in the CSA over the past five years. *VC's success rate in CSA, past five years* measures the percentage of venture capital firm's investments in the CSA over the past five years that led to an Initial Public Offering. *Success rate of all VCs in CSA, past five years* measures the percentage of all venture capital investments in the CSA over the past five years that led to an Initial Public Offering. *Firm based in San Francisco/Silicon Valley, Boston, and New York City* variables are indicator variables that take on the value of one if the venture capital firm is based in the named city and zero otherwise. *Adjusted VC firm experience* is equal to the log of one plus the number of previous investments made by the venture capital firm minus the log of one plus the number of prior investments the average venture capital investor has made as of the year in question.

Standard errors are clustered at the CSA-level. Robust z-statistics are in parentheses below coefficient estimates.

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

Table VI. Geography of Venture Capital-Backed Portfolio Companies

	Portfolio Company Location		Main Office Investment Location		Branch Office Investment Location		Outside Investment Location		Share of Investments in CSA		
CSA	*Number*	*% Share of Total*	*Number*	*% Share of Total*	*Number*	*% Share of Total*	*Number*	*% Share of Total*	*Main Office*	*Branch Office*	*Outside*
San Jose-San Francisco, CA	4,063	29.01	5,462	53.91	1,584	71.13	2,612	16.25	56.55	16.40	27.04
Boston, MA	1,634	11.67	1,511	14.91	288	12.93	1,770	11.01	42.34	8.07	49.59
New York, NY	1,224	8.74	1,012	9.99	50	2.25	1,049	6.53	47.94	2.37	49.69
Los Angeles, CA	851	6.08	184	1.82	39	1.75	1,319	8.20	11.93	2.53	85.54
Washington, DC	584	4.17	214	2.11	65	2.92	742	4.62	20.96	6.37	72.67
San Diego, CA	494	3.53	77	0.76	43	1.93	1,028	6.39	6.71	3.75	89.55
Dallas, TX	411	2.93	129	1.27	70	3.14	558	3.47	17.04	9.25	73.71
Seattle, WA	383	2.73	138	1.36	2	0.09	653	4.06	17.40	0.25	82.35
Denver, CO	369	2.63	166	1.64	4	0.18	562	3.50	22.68	0.55	76.78
Atlanta, GA	348	2.48	123	1.21	2	0.09	475	2.95	20.50	0.33	79.17
Chicago, IL	303	2.16	144	1.42	4	0.18	321	2.00	30.70	0.85	68.44
Philadelphia, PA	302	2.16	71	0.70	11	0.49	468	2.91	12.91	2.00	85.09
Other	3,040	21.70	900	8.88	65	3.01	4,519	28.11	16.41	1.19	82.40
Total	14,006	100.00	10,131	100.00	2,227	100.00	16,076	100.00	35.63	7.83	56.54

Sample consists of 28,434 venture capital investments in 14,006 portfolio companies for 2,039 venture capital firms between 1975 and 2005. Geographic locations are assigned at the Combined Statistical Area (CSA) level. In cases where a city is not located in a CSA, we assign portfolio companies in the city to the appropriate Metropolitan Statistical Area (MSA). Main office investment is defined as a portfolio company investment in a CSA in which the investing venture capital firm has its main office. Branch office investment is defined as a portfolio company investment in a CSA in which the investing venture capital firm has a branch office. Outside investment is defined as a portfolio company investment in a CSA in which the investing venture capital firm does not have its main office or a branch office. % Share of Total equals the percentage of portfolio companies or investment type located in the CSA. Share of investments in CSA is defined as the percentage of portfolio company investments in the CSA that are main office investments, branch office investments, or outside investments.

Table VII. Factors Associated with the Geographic Concentration of Venture Capital-Backed Portfolio Companies

	Log Number of Portfolio Companies receiving initial investment in year							
	OLS							
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Log Number of VC firms in CSA	0.74	0.74	0.696	0.696				
	[14.43]***	[14.25]***	[18.90]***	[18.98]***				
Success rate of all VCs in CSA, past five years	1.11	1.101	1.148	1.144	3.417	3.401	3.157	3.155
	[6.85]***	[6.78]***	[7.21]***	[7.24]***	[6.89]***	[6.92]***	[7.01]***	[7.03]***
Log GSP per Capita	-0.306	-0.312	-0.281	-0.29	0.776	0.765	0.673	0.654
	[2.02]**	[2.07]**	[1.84]*	[1.90]*	[2.14]**	[2.06]**	[1.91]*	[1.82]*
Percent of population with college degree or higher	0.038	0.039	0.039	0.04	0.05	0.052	0.052	0.053
	[3.98]***	[3.97]***	[3.98]***	[3.96]***	[2.04]**	[2.12]**	[2.08]**	[2.13]**
Log patents per capita	-0.025	-0.023	-0.028	-0.027	0.232	0.236	0.185	0.184
	[0.58]	[0.53]	[0.64]	[0.62]	[2.08]**	[2.06]**	[1.78]*	[1.75]*
State long-term capital gains tax rate	0.344		-0.401		0.59		-1.38	
	[0.23]		[0.29]		[0.19]		[0.55]	
State income tax rate		-0.252		-0.736		-0.456		-1.672
		[0.18]		[0.54]		[0.17]		[0.68]
CSA is San Francisco/San Jose			1.242	1.243			3.217	3.203
			[7.31]***	[7.88]***			[16.05]***	[17.87]***
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,256	2,256	2,256	2,256	2,256	2,256	2,256	2,256
R-squared	0.74	0.74	0.75	0.75	0.32	0.32	0.42	0.42

Sample consists of 2,256 CSA-Year observations for 197 CSAs where at least one venture capital investment has been made between 1975 and 2005. The dependent variable is the natural logarithm of the number of venture capital–backed portfolio companies in the CSA plus one receiving an initial investment in the current year. Geographic locations are assigned at the Combined Statistical Area (CSA) level. In cases where a city is not located in a CSA, we assign venture capital offices in the city to the appropriate Metropolitan Statistical Area (MSA). *Log Number of VC firms in CSA* is the natural logarithm of the number of venture capital firm offices in the CSA in the current year. *Success rate of all VCs in CSA, past five years* is constructed by calculating the percentage of venture capital-backed companies established in the CSA prior to the current year that have gone public. *Log GSP per Capita* is the natural logarithm of the state's gross product per capita plus one in the previous year. *Percent of population with college degree or higher* is the share of the state population that has graduated from college. *Log patents per capita* is the number of patents per capita plus one issued in the state in the previous year. *State long-term capital gains tax rate* and *state income tax rate* are average state marginal tax rates in the previous year.

Standard errors are clustered at the CSA-level. Robust t-statistics are in parentheses below coefficient estimates.

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

Table VIII. Comparison of Venture Capital Investment Success Rates by Type of Investment and Portfolio Company Location

	All investments:			*Companies in Elite Cities:*			*Companies outside Elite Cities:*		
	Elite city based VC	**All Other**	**Significance of Difference**	**Elite city based VC**	**All Other**	**Significance of Difference**	**Elite city based VC**	**All Other**	**Significance of Difference**
Main Office Investment									
Success Rate	0.154	0.115	***	0.154	--	--	--	0.115	--
% Deals	41.31	21.55		64.92	--		--	33.04	
Branch Office Investment									
Success Rate	0.212	0.152	***	0.225	0.160	***	0.151	0.124	
% Deals	10.20	17.41		13.11	38.13		5.11	6.36	
Outside Investment									
Success Rate	0.193	0.137	***	0.197	0.131	***	0.192	0.140	***
% Deals	48.50	61.04		21.98	61.87		94.89	60.60	
All Deals									
Success Rate	0.179	0.135	***	0.173	0.142	***	0.190	0.131	***
Number	18,888	9,546		12,018	3,320		6,870	6,226	

	Early Stage investments:			*Late Stage investments:*		
	Elite city based VC	**All Other**	**Significance of Difference**	**Elite city based VC**	**All Other**	**Significance of Difference**
Main Office Investment						
Success Rate	0.136	0.103	***	0.177	0.133	***
% Deals	46.39	26.46		36.07	16.72	
Branch Office Investment						
Success Rate	0.196	0.129	***	0.227	0.175	***
% Deals	9.76	17.69		10.64	17.14	
Outside Investment						
Success Rate	0.158	0.112	***	0.224	0.158	***
% Deals	43.85	55.85		53.29	66.14	
All Deals						
Success Rate	0.151	0.113	***	0.207	0.157	***
Number	9,586	4,732		9,302	4,814	

Sample consists of 28,434 venture capital investments in 14,006 portfolio companies for 2,039 venture capital firms between 1975 and 2005. *Main office investment* is defined as a portfolio company investment in a CSA in which the investing venture capital firm has its main office. *Branch office investment* is defined as a portfolio company investment in a CSA in which the investing venture capital firm has a branch office. *Outside investment* is defined as a portfolio company investment in a CSA in which the investing venture capital firm does not have its main office or a branch office. *Success Rate* equals the percentage of investments that led to an Initial Public Offering (IPO). *% Deals* equals the percentage of deals that are main office investments, branch office investments, or outside investments.

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

Table IX. Summary Statistics for Factors Associated with Venture Capital Investment Success

	Investment Type						Investment Type Differences						Overall mean	
	[1] Main Office		[2] Branch Office		[3] Outside		[1] vs. [2]		[1] vs. [3]		[2] vs. [3]			
Variable	mean	s.d.	mean	s.d.	mean	s.d.	Diff.	Sig.	Diff.	Sig.	Diff.	Sig.	mean	s.d.
Success Rates														
Success	0.145	0.352	0.176	0.381	0.175	0.380	-0.030	***	-0.029	***	0.001		0.164	0.370
Firm Characteristics														
Adjusted VC firm experience	0.475	1.106	0.938	0.972	0.418	1.113	-0.463	***	0.057	***	0.520	***	0.484	1.112
Venture Capital Firm based in Elite City	0.793	0.405	0.575	0.494	0.604	0.489	0.218	***	0.189	***	-0.029	***	0.664	0.472
Investment Characteristics														
Stage														
Initial investment in first round	0.566	0.496	0.445	0.497	0.479	0.500	0.121	***	0.088	***	-0.033	***	0.507	0.500
Initial investment in second round	0.186	0.389	0.211	0.408	0.189	0.392	-0.025	***	-0.004		0.022	**	0.190	0.392
Initial investment in third round	0.099	0.298	0.147	0.354	0.119	0.324	-0.048	***	-0.020	***	0.028	***	0.114	0.318
Initial investment in fourth round or later	0.131	0.337	0.180	0.384	0.188	0.390	-0.049	***	-0.057	***	-0.008		0.167	0.373
Industry														
Computers and Internet	0.504	0.500	0.466	0.499	0.420	0.493	0.038	***	0.084	***	0.046	***	0.453	0.498
Communications	0.184	0.387	0.235	0.424	0.162	0.369	-0.051	***	0.022	***	0.073	***	0.176	0.380
Business and Industrial	0.018	0.132	0.016	0.126	0.021	0.144	0.002		-0.003	*	-0.005		0.020	0.139
Consumer	0.047	0.211	0.031	0.173	0.059	0.236	0.016	***	-0.013	***	-0.028	***	0.053	0.223
Energy	0.038	0.191	0.036	0.187	0.043	0.204	0.001		-0.006	**	-0.007		0.041	0.198
Biotech and Health Care	0.170	0.376	0.176	0.381	0.244	0.429	-0.006		-0.074	***	-0.068	***	0.213	0.409
Financial Services	0.018	0.134	0.021	0.142	0.024	0.153	-0.002		-0.006	***	-0.003		0.022	0.146
Business Services	0.012	0.109	0.011	0.103	0.015	0.122	0.001		-0.003	**	-0.004		0.014	0.116
Other	0.009	0.097	0.009	0.092	0.011	0.106	0.001		-0.002		-0.003		0.010	0.102
Number of Observations	9,948		2,227		16,076								28,434	

Sample consists of 28,434 venture capital investments between 1975 and 2005. *Main office investment* is defined as a portfolio company investment in a CSA in which the investing venture capital firm has its main office. *Branch office investment* is defined as a portfolio company investment in a CSA in which the investing venture capital firm has a branch office. *Outside investment* is defined as a portfolio company investment in a CSA in which the investing venture capital firm does not have its main office or a branch office. *Success* is an indicator variable that takes the value of one if the investment led to an Initial Public Offering. *Adjusted VC firm experience* is equal to the log of one plus the number of previous investments made by the venture capital firm minus the log of one plus the number of prior investments the average venture capital investor has made as of the year in question. *Venture Capital Firm based in Elite City* is an indicator variable that takes the value of one if the investing venture capital firm is based in San Francisco/San Jose, New York, or Boston and zero otherwise. *Initial investment round variables* are indicators that report the initial round in which the venture capital firm made an investment in the portfolio company. *Industry variables* are indicators that report which of the nine major industries identified by Gompers, Kovner, Lerner and Scharfstein (2008) the portfolio company is classified under.

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

Table X. Factors Associated with Venture Capital Investment Success

	Success Probit							
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Portfolio company outside VC's office CSAs	0.0221	0.0222	0.0029	-0.0013	0.0221	0.0222	0.0029	0.0186
	[4.44]***	[4.44]***	[0.30]	[0.13]	[4.44]***	[4.44]***	[0.30]	[1.74]*
Portfolio company in CSA of VC's branch office	0.0231	0.0232	0.0049	0.0016	0.0231	0.0232	0.0049	0.0014
	[2.74]***	[2.75]***	[0.32]	[0.11]	[2.74]***	[2.75]***	[0.32]	[0.09]
Adjusted VC firm experience	0.0099	0.0091	0.0092	0.0089	0.0099	0.0091	0.0092	0.0089
	[4.99]***	[2.52]**	[2.55]**	[2.45]**	[4.99]***	[2.52]**	[2.55]**	[2.45]**
VC based in Elite City	0.0313	0.0311	0.0100	0.0069	0.0313	0.0311	0.0100	0.0062
	[6.80]***	[6.66]***	[0.97]	[0.67]	[6.80]***	[6.66]***	[0.97]	[0.60]
VC based in Elite City * Adjusted VC Firm Experience		0.0012	0.0011	0.0014		0.0012	0.0011	0.0013
		[0.29]	[0.26]	[0.33]		[0.29]	[0.26]	[0.30]
VC based in Elite City * Portfolio company outside VC's office CSAs			0.0293	0.0323			0.0293	0.0331
			[2.42]**	[2.66]***			[2.42]**	[2.72]***
VC based in Elite City * Portfolio company in CSA of VC's branch office			0.0206	0.0239			0.0206	0.0246
			[1.09]	[1.26]			[1.09]	[1.30]
One or more investment in the CSA in the two years before or after the date of investment				-0.0209				
				[3.05]***				
One or more investment in the CSA in the two years before or after the date of investment, outside deals only								-0.0211
								[3.10]***
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Round fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Portfolio company location fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	28,434	28,434	28,434	28,434	28,434	28,434	28,434	28,434

Sample consists of 28,434 venture capital investments between 1975 and 2005. The dependent variable is *Success* an indicator variable that takes on the value of one if the portfolio company went public and zero otherwise. *Portfolio Company outside VC's office CSAs* is an indicator variable that takes the value of one if the portfolio company receiving investment is located in a CSA in which the venture capital firm does not have its main office or a branch office and zero otherwise. *Portfolio Company in CSA of VC's branch office* is an indicator variable that takes the value of one if the portfolio company receiving investment is located in a CSA in which the venture capital firm has a branch office and zero otherwise. The omitted investment type category is Portfolio Company in CSA of VC's main office. This category includes all deals in which the portfolio company receiving investment is located in a CSA in which the venture capital firm's main office is located. *Adjusted VC firm experience* is equal to the log of one plus the number of previous investments made by the venture capital firm minus the log of one plus the number of prior investments the average venture capital investor has made as of the year in question. *VC based in Elite City* is an indicator variable that takes the value of one if the investing venture capital firm is based in San Francisco/San Jose, New York, or Boston. *One or more investment in the CSA in the two years before or after the date of investment* is an indicator variable that takes the value of one if the venture capital firm has made one or more investments in the CSA in the two years before or after the date of investment. *One or more investment in the CSA in the two years before or after the date of investment, outside deals only* is an indicator variable that takes the value of one if the venture capital firm has made one or more investments in the CSA in the two years before or after the date of investment and the portfolio company is located in a CSA in which the venture capital firm does not have its main office or a branch office.

Robust z-statistics are in parentheses below coefficient estimates.

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

Table XI. Factors Associated with Venture Capital Investment Success, Early Stage Investments

	Success Probit							
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Portfolio company outside VC's office CSAs	0.0154	0.0155	-0.0069	-0.0107	0.0154	0.0155	-0.0069	0.0058
	[2.61]***	[2.63]***	[0.63]	[0.95]	[2.61]***	[2.63]***	[0.63]	[0.46]
Portfolio company in CSA of VC's branch office	0.0245	0.0247	-0.0125	-0.0150	0.0245	0.0247	-0.0125	-0.0152
	[2.40]**	[2.42]**	[0.71]	[0.86]	[2.40]**	[2.42]**	[0.71]	[0.88]
Adjusted VC firm experience	0.0072	0.0051	0.0064	0.0063	0.0072	0.0051	0.0064	0.0062
	[2.82]***	[1.13]	[1.40]	[1.36]	[2.82]***	[1.13]	[1.40]	[1.36]
VC based in Elite City	0.0144	0.0140	-0.0128	-0.0155	0.0144	0.0140	-0.0128	-0.0162
	[2.46]**	[2.37]**	[1.03]	[1.23]	[2.46]**	[2.37]**	[1.03]	[1.29]
VC based in Elite City * Adjusted VC Firm Experience		0.0030	0.0015	0.0016		0.0030	0.0015	0.0016
		[0.56]	[0.27]	[0.30]		[0.56]	[0.27]	[0.29]
VC based in Elite City * Portfolio company outside VC's office CSAs			0.0350	0.0381			0.0350	0.0389
			[2.35]**	[2.54]**			[2.35]**	[2.59]***
VC based in Elite City * Portfolio company in CSA of VC's branch office			0.0545	0.0583			0.0545	0.0590
			[2.14]**	[2.26]**			[2.14]**	[2.29]**
One or more investment in the CSA in the two years before or after the date of investment				-0.0169				
				[1.92]*				
One or more investment in the CSA in the two years before or after the date of investment, outside deals only								-0.0174
								[2.03]**
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Portfolio company location fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,043	14,043	14,043	14,043	14,043	14,043	14,043	14,043

Sample consists of 14,043 early stage venture capital investments between 1975 and 2005. Early stage investments are investments in portfolio companies that are developing their product or have begun initial marketing, manufacturing, and sales activities for their product. The dependent variable is *Success* an indicator variable that takes on the value of one if the portfolio company went public and zero otherwise. *Portfolio Company outside VC's office CSAs* is an indicator variable that takes the value of one if the portfolio company receiving investment is located in a CSA in which the venture capital firm does not have its main office or a branch office and zero otherwise. *Portfolio Company in CSA of VC's branch office* is an indicator variable that takes the value of one if the portfolio company receiving investment is located in a CSA in which the venture capital firm has a branch office and zero otherwise. The omitted investment type category is Portfolio Company in CSA of VC's main office. This category includes all deals in which the portfolio company receiving investment is located in a CSA in which the venture capital firm's main office is located. *Adjusted VC firm experience* is equal to the log of one plus the number of previous investments made by the venture capital firm minus the log of one plus the number of prior investments the average venture capital investor has made as of the year in question. *VC based in Elite City* is an indicator variable that takes the value of one if the investing venture capital firm is based in San Francisco/San Jose, New York, or Boston. *One or more investment in the CSA in the two years before or after the date of investment* is an indicator variable that takes the value of one if the venture capital firm has made one or more investments in the CSA in the two years before or after the date of investment. *One or more investment in the CSA in the two years before or after the date of investment, outside deals only* is an indicator variable that takes the value of one if the venture capital firm has made one or more investments in the CSA in the two years before or after the date of investment and the portfolio company is located in a CSA in which the venture capital firm does not have its main office or a branch office.

Robust z-statistics are in parentheses below coefficient estimates.

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