GROUNDED CAPITAL: VENTURE FINANCING AND THE GEOGRAPHY OF THE INTERNET INDUSTRY, 1994-2000

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Abstract

Despite the rhetoric in the popular and business press trumpeting the removal of "the limitations of geography", a number of researchers have demonstrated that rather than simply dispersing, the Internet in fact exhibits an uneven spatial pattern throughout the United States and world. Using a combination of interview and regression methodologies, this article argues that the regional distribution of venture capital investing played a central role in determining the location of new Internet startups. This was largely due to the premium that entrepreneurs placed on one of the hallmarks of venture capital, *i.e.*, speed, and the reliance of venture capitalists upon local networks and knowledge for their investments. The ability to provide these types of value-added inputs in a timely manner is greatly assisted by geographic proximity. Rather than being an easily moved and fungible commodity, venture capital investing depends upon non-monetary inputs such as knowledge about possible investments and prefers to be close to companies in order to monitor and assist them. Thus, despite telecommunications technologies and global financial markets that have vastly expand the geographic range of economic interaction; regions remain central to economic development in the current economy.

Keywords: venture capital, internet, e-commerce, dot-coms, entrepreneurship, regional development

Introduction

Despite the rhetoric in the popular and business press trumpeting the removal of "the limitations of geography", a number of researchers have demonstrated that rather than simply dispersing, the Internet in fact exhibits an uneven spatial pattern throughout the United States and world. (Kolko, 1999; Townsend, 2001a; Kellerman, 2000; Telegeography, 2000; Zook, 2000; Zook, 2001) This has particularly been the case for the entrepreneurial activity surrounding Internet or dot-com companies that has clustered in a relatively small number of US regions. Although this sector continues to evolve, the market downturn in technology stocks that started in April 2000 provides a useful delineation to mark the end of this initial period of the commercial Internet. This era, running roughly six years from April 1994 when Netscape was formally incorporated to April 2000, tells a remarkable story of how a new communications technology changed from a tool of academics and computer geeks into a new medium used by mainstream society.

Using a combination of interview and regression methodologies, this article argues that the regional distribution of venture capital investing played a central role in determining the location of these new Internet startups. Although Florida and Smith (1990, 1993) and Smith and Florida (2000) are skeptical about supply side arguments for venture capital's role in regional development, particularly as a form of public policy, venture capital was central in the expansion and location of the Internet industry. This was largely due to the premium that entrepreneurs placed on one of the hallmarks of venture capital, *i.e.*, speed, and the reliance of venture capitalists upon local networks and knowledge for their investments. The emphasis on speed and efforts to capture first mover advantage made the acquisition of venture capital a strategic asset for both its monetary and non-monetary inputs that could provide quick and competitive boosts to companies. In addition, the advantages that venture capitalists offered through their connections within its larger regional environment, e.g., Florida's and Kenney's (1988a) concept of social structures of innovation or von Berg's and Kenney's (2000) use of embeddedness, served to concentrate dot-com companies near their sources of capital.

Research Methodology

This article consists of three main research methodologies. The first is the creation of meaningful measures on the geography of Internet companies at the level of the metropolitan statistical area (MSA). Reliable data on dot-com companies is extremely difficult to obtain at any

scale and this analysis uses specially developed datasets outlined later in the article. The Internet industry (also referred to as dot-com firms) is defined as companies involved in the creation, organization, and dissemination of informational products where a significant portion of the business is conducted via the Internet. These informational products could be about the sale of physical items, e.g., eBay or Webvan, the sale or distribution of digital products or content, e.g., DoubleClick or Napster, the sale and use of services, e.g., Travelocity or E*Trade, the use of a database search engine, e.g., Inktomi or Google, or the convenience of portals or destination sites, e.g., Yahoo, Amazon or AOL. This definition purposively encompasses firms from a wide array of traditional industries because the new methods for communication and distribution offered by the Internet have a wider impact than any one particular sector and entrepreneurs were actively starting dot-com firms in almost every industry.

Based on the clustering pattern that this data reveals, the second research component of the article is based on 44 interviews conducted with people actively involved in the formation of a new Internet companies. These interview subjects were often the founders of the company or were very knowledgeable about the early history and creation of the firm. The interviews were open ended, lasting approximately one hour and were conducted in the spring and summer of 1999 in the San Francisco Bay and New York metropolitan regions. All interviews were taped and transcribed and due to human subjects requirements for this research all subjects were guaranteed anonymity. The interviews began with a request for the subject to briefly outline their own career history with particular attention on how their company was founded and what factors were important for this process. These interviews with entrepreneurs were supplemented by an additional 36 interviews with venture capitalists and angel investors during the same time period and in the same regions. This interview data reveals a broad understanding among Internet entrepreneurs that venture capital was a pivotal actor in the creation and expansion of their companies and that proximity was an important competitive asset.

In order test this finding, multivariate regression is used to explore the explanatory power of a number of regional attributes in the distribution of the Internet industry. The quality of the data in this author's opinion, however, prevents this analysis from proving the relationship between the activity of venture capitalists and the location of the Internet industry. Although regions may contain similar endowments of capital and labor, the way in which these are embedded and function in regionally based systems, produce considerable variation in the way

venture capitalists work. (Florida and Kenney, 1988b; Green and McNaughton, 1989; Mason and Harrison, 1999) Nevertheless, the modeling exercise does not contradict the data obtained from interviews and suggests that venture capital was central in determining the geography of Internet firms.

Entrepreneurship, Venture Capital and Regional Development

At the simplest level of analysis the geographical factors shaping the location of the Internet industry include external economies, the ability to create and commercialize new knowledge, and the availability of skilled labor. The first, external economies, has long been recognized by regional scholars. A concentration of any type of economic activity will bring about basic benefits such as an available workforce and infrastructure such as roads and electrical power. While these things are certainly necessary in the new economy they are more a measure of the size of a region than its potential for innovative and knowledge based economic development. The second factor, the creation of commercially viable knowledge from existing scientific capabilities, is most commonly measured by patents but includes a much wider range of harder to measure activities. A common public policy tool during the 1980's and 1990's was the creation of science parks and incubators. However, the process of transforming knowledge within a university into a commercially viable application is fraught with difficulties (Luger and Goldstein; 1991). The final of these attributes is the supply of skilled labor within a region. Because the main input for the Internet industry is skilled workers, it is attracted to areas where these are in great supply such as cities. However since by definition, innovation often relies upon new knowledge and skills, e.g. in the case of the Internet industry this includes Java programming and selling advertising on websites, there is not necessarily any one location that has a pre-existing endowment of the necessary inputs. Instead these new skills emerge from related industries and the general knowledge base of a region.

While all three factors play a role in the development of the Internet industry, they are not sufficient in explaining why the entrepreneurial behavior behind dot-com companies was concentrated in certain regions as opposed to others with similar externalities, knowledge, and labor. In order to answer this question one needs to consider how entrepreneurship is embedded

in a larger regional system[1]. A number of different conceptions exists for these systems, social structures of innovation (Florida and Kenney, 1988a), culture of risk-taking (Saxenian, 1994), institutional endowment (Maskell and Malmberg, 1999) or ecosystem (Brown and Duguid, 2000) and all attempt to encompass the wide range of regional actors and processes involved in economic development and contrast sharply with more neo-classical and atomistic conceptions of entrepreneurs.

Malecki (1997) notes that much of the research on entrepreneurship in the past has been on the personal attributes of the entrepreneur as opposed to the local context in which he or she operates. This tradition, primarily based in business and management schools, focused on issues such as personality traits of entrepreneurs (MacMillian *et al*, 1985) or having a parent who was an entrepreneur (Roberts and Wainer, 1971). In large part, this business literature omitted the local environment as a variable in the emergence of entrepreneurs and new firms, except for some recognition of the largely local nature of contacts used by entrepreneurs (Birley, 1985). Running parallel to this tradition, is the work of economic geographers and regionalists who focused on how regional attributes contribute to new firm formation, particular in innovative and high technology regions (Scott, 1982; Lloyd and Mason, 1984; Markusen *et al* 1986; Sweeney, 1987). This work has resulted in an increasing recognition that entrepreneurs depend upon "agglomeration and proximity to utilize nearby sources of information, skilled labor, technology, and capital" (Malecki, 1997; 69) and resulted in an increasing focus on entrepreneurial activity and regional development beginning in the late 1980s.

While availability of capital is always included on lists of important factors in regional entrepreneurial growth (Sweeny, 1987; Castells and Hall, 1994; Friedman, 1995; Malecki, 1997), regional research during the 1980s and 1990s was dominated by a focus on inter-firm relations (Piore and Sabel, 1984; Scott, 1988, 1993; Saxenian, 1994). In part this reflects a widely if not explicitly accepted idea from neoclassical economics that that capital moves freely (Martin, 1999). Nevertheless, a number of researchers began to study a specific kind of capital financing, *i.e.*, venture capital, that was increasingly active in funding innovative startup companies and

[1] The literature on regional embeddedness is large and for that reason will not be covered here. However, this tradition can be traced back to theories of flexible specialization (Piore and Sabel, 1984), embeddedness (Granovetter, 1985), inter-firm connections and institutions (Saxenian, 1994) and conventions and untraded interdependencies (Storper, 1997).

differs in many ways from more traditional funding sources available to entrepreneurs or companies[2]. While the bulk of entrepreneurs may prefer to self-finance their businesses or rely on bank and other types of debt financing in order to retain control of the company, others may be willing or forced to rely upon private equity financing. Young innovative companies without tangible collateral and/or with an ability and need to grow quickly are generally unable to secure bank loans and rarely have the personal resources required to completely funding their company. These firms are good candidates for venture capital that will invest in exchange for an equity stake.

This type of financing – which invests in a portfolio of high risk/high return companies and generally includes active participation on the part of the investors – has proven an important mechanism in helping entrepreneurs translate their ideas into successful companies. Zider (1998) argues that a combination of the structure and regulations of capital markets makes it very difficult for young companies with viable ideas or technologies but without assets to gain access to the necessary capital to expand their business. Banks are constrained by usury laws and are unable to charge the level of interest for loans that the risk profile of these companies requires. Public markets and investment banks generally are not interested or cannot make investments in companies that have not reach a certain threshold of size, sales and profits[3]. Venture capitalists fill a niche between an entrepreneur's ability to self-finance and the point at which banks and public markets would be able and willing to provide financing.

Due to the high risk involved in venture capital investing, a great deal of emphasis is placed on gaining information about companies, entrepreneurs, competitors and market conditions before making investments and monitoring companies after investing. Gompers and Lerner (1999; 130) argue that "By intensively scrutinizing firms before providing capital and then monitoring them afterwards, venture capitalists can alleviate some of the information gaps and reduce capital constraints. Thus…it is the nonmonetary aspects of venture capital that are critical to its success." This conclusion reflects a long-standing recognition of the importance of

[2] The focus on venture capital is but one strand of this research on financial geography that includes research on the geography of other financial systems, *i.e.*, retail banking, stock markets or global centers for finance to name just a few. See Martin (1999) for an overview of the breadth of this research.

[3] Although during the Internet era these standards were not stringently enforced, Zider (1998) notes that historically firms needed "sales of about $15 million, assets of $10 million, and a reasonable profit history" to raise money in public markets.

non-market factors to venture investing (Gorman and Sahlman, 1989; Bygrave and Timmons, 1992). Gompers and Lerner (1999; 180) argue that this need for information and oversight has led venture capitalists to focus on local firms in an effort to minimize the cost of their involvement with firms[4].

Although risk capital has been available historically, it was largely an *ad hoc* system in which wealthy individuals backed entrepreneurs and firms that had come to their attention (Bygrave and Timmons, 1992; Kenney and Florida, 2000). While this system still exists today in the form of angel or individual investors (Harrison and Mason, 1992; Mason and Harrison, 2000), it has been accompanied by an increase in the sophistication and institutionalization of risk capital. Beginning shortly after the Second World War and greatly expanding at the end of the 1970s, the historical system of angel investing was augmented by an evolving series of formalized venture financing institutions. The current most widely implemented model in the United States, the venture capital limited partnership, has professionalized and expanded the opportunities for entrepreneurs to gain access to risk capital in exchange for equity in their company. Many of evaluation tools and financing arrangements used by limited partnerships have been adopted by angel investors as well, creating sources of risk capital that run the gamut of tens of thousands to hundreds of millions of dollars.

The scholars that examined the economic geography of venture capital in the late 1980s were initially focused on documenting the location, spatial mismatch and flows of venture capital investing both in the United States and elsewhere (Leinback and Amrhein, 1987; Green and McNaughton, 1989; Florida and Kenney, 1988b; Martin, 1989; Green, 1991). This initial step highlighted the concentration of venture capital in a few regions and linked venture capital with the development of high technology clusters. Researchers were also concerned with placing

[4]Another factor behind the local focus of venture capitalist is their use, creation and transfer of knowledge. A growing consensus has formed around the important of knowledge in economic development. (Lundvall and Johnson, 1994; Leonard, 1995; Castells, 1996) Central to these arguments and particularly germane to economic geography is a distinction first developed by Polanyi (1966) between codified knowledge that can be passed on easily and tacit knowledge that is based on specific contexts and experiences and is extremely difficult to transfer. This "sticky" quality of tacit information has increasingly been used to explain the clustering of industries and as a reason for why localities and regions continue to play an important role in economic development in an increasingly globalized economy (Maskell and Malmberg, 1999; Malecki, 1999; Howells, 2000; Gertler, 2001). Although related to Gompers' and Lerner's argument about the cost of acquiring information keeping venture capital investment local, the concept of tacit knowledge raises issues of the inability to access some types of knowledge at any cost without a local presence. Due to space limitations, however, this topic cannot be adequately addressed in this article.

venture capital within existing regional development and innovation theory (Thompson, 1989; Florida and Kenney, 1988c; Malecki, 1990) and modeling (often with mixed results) the relationship between the location of venture capital firms and the location of venture capital investment (Green and McNaughton, 1989). Florida and Kenney were and continue to be some of the most active researchers on venture capital and regional development. They theorize venture capital as a third way in Schumpeter's dichotomy of corporate versus individual entrepreneurism (Florida and Kenney, 1988a) and argue that venture capitalists act as catalysts or "technological gatekeepers" who facilitate and direct innovation in regions with strong social structures of innovation, *i.e.,* concentrations of human capital, universities and public research and development. (Florida and Kenney, 1988a, 1988b)

Later Florida, in collaboration with Smith, returned to many of the same issues highlighted in his and Kenney's earlier work. In particular, Florida and Smith analyze the causal role of venture capital in stimulating the development of high technology. They argue that a supply of venture capital alone is not sufficient to promote regional economic growth because much of private venture capital flows to a few high technology regions. (Florida and Smith, 1990) Thus, they see venture capital investment as an outcome of high technology clusters rather than a driver of this development. Later research in which they model the causal factors behind venture capital investments produces results in which the location of investments is not related to the existence of a local supply of venture capital (Florida and Smith, 1993). Florida and Smith acknowledge that this finding contradicts other work on venture capital and regional development, *e.g.*, Malecki (1990) and Friedman (1995), and point to a number of factors within the data that may be responsible for this result[5]. Florida and Smith's conclusion is that the venture capital investment process is "both highly mobile and highly local" in that capital would flow to regions with the best opportunities but once there is dependent upon a localized network of venture capitalists and coinvestment (Florida and Smith, 1993; 448).

The importance of localized networks is supported by other research both within the geographic and business literatures (Elango *et al*, 1995; Gupta and Sapienza, 1992; Bygrave, 1988; Bygrave and Timmons, 1992; Malecki, 1990; Friedman, 1995) which argues that the use

[5] In particular, they cite the high levels of exporting venture capital from New York and Chicago and the fact that because the analysis is done at the MSA level, investments from the San Francisco MSA into the San Jose MSA are classified as non-local venture capital.

of local networks are crucial for the exchange of specialized knowledge as well as for the direct involvement of venture capitalists in their portfolio companies. (Sapienza, 1992; Gorman and Sahlman, 1989; Gompers and Lerner, 1999) During the late 1990s, this local focus served to concentrate dot-com companies in regions where they could be close to their sources of venture capital.

Clustering of the Internet industry

Obtaining accurate and meaningful geographic measures of the Internet and dot-com companies is a difficult undertaking. Researchers have relied on data on Internet hosts (Hargittai, 1999; Jordan, 2001); bandwidth (Abramson, 2000; Malecki, 2000; Townsend, 2001a); IP addresses (Dodge, 1998; Cheswick and Burch, 1998); links between webpages (Brunn and Dodge, 2001) and domain names (Moss and Townsend, 1997; Kolko, 1999; Zook, 2000; Zook 2001). In many ways domain names are the best indicator of the commercial Internet because they suggest an effort to organize and distribute some body of information and also have the advantage of containing the unique contact information of the person or entity that registered them.

While domain names are still a useful indicator of Internet activity, it must be acknowledged that the activity associated with particular domain names varies dramatically. The domain name yahoo.com is certainly a much more important site for content on the web than zooknic.com. This weighing issue is resolved somewhat by the fact that major Internet content firms generally register multiple variations of their domain name both to protect their Internet brand and to allow differentiation between various products they offer[6]. This gives additional weight to the most important Internet content firms and counter-balances the phenomenon of smaller and less used domains. Nevertheless, the use of total number of domain names is a cruder indicator of the Internet industry than is desirable for this analysis. Additionally the ending of the NSI monopoly on domains in 1999 has dramatically reduced the cost of registering a domain[7]. This has resulted in a surge of registrations by a wide range of existing businesses and individuals and further dilutes the value of domain names as the sole indicator for the

[6] For example, in July 1998 Wired Magazine had over 75 registered ".com" domain names and Amazon.com had registered dozens of names such as amazonfilms.com or amazonkids.com.

[7] From a price of $35 a year com, net and org domains now sell for as low as $8.95 a year and Network Solutions has gone from an monopoly to having about 47.5 percent of the market in two years (Author's research).

Internet industry. In order to counteract this problem, this paper introduces two new measures of the Internet industry based on specially developed datasets.

Alexa's Top 1000 Web sites

An alternative technique first discussed by Paltridge (1997) relies upon various efforts on the web to rank top websites. This produces a weighed distribution of domain names that provides a better indication of the most important web sites. Although the exact methodology of these rankings systems are often proprietary, they are generally based upon variables such as pageviews – the number of times a site is accessed, unique visitors – counting individuals rather than hits, and other traffic measures. One of the most useful of these top web site lists is the monthly survey from May 1999 to the present by Alexa.com. Based on the aggregated, traffic patterns of 500,000 web users worldwide, Alexa provides free listings of the 1000 most visited websites on the World Wide Web. Looking at the viewing habits of users from individual countries or regions can further refine this data. In additional to providing this ranking, Alexa also furnishes the estimated number of pageviews that each website received. Pageviews are the number of pages with in a web site that are downloaded. For example, a search at Yahoo! in which a user views 15 different pages of indexes, counts as 15 pageviews[8]. This allows one to make direct comparisons between various websites and also proves a useful measure of weighing the importance of websites. The domain names associated with these rankings can then be located geographically by using the registration information for the domain names that can be obtained from a whois query.

Database of Internet Industry Firms

The other indicator introduced in this paper is a database of 815 firms belonging to the Internet industry. At the heart of this database is Hoover's Online Business Network that contains information on approximately 14,000 public and private firms worldwide. Firms were selected from this database if they were classified by Hoovers as belonging to the Internet Sector or were otherwise identified by the author. These firms were then reclassified by the author

[8] Other common measures include, hits, i.e. the number of times a web page is visited so that one person can be counted as many times as they visit, and unique visitors, the number of different people who view a site. The unique visitor metric only counts a person once in a given time period. The validity of measures of use for websites is a matter of some controversy due to the fact that the numbers from various measurement companies can vary quite a bit. Because these numbers are used as a basis for evaluating a company's performance they can have a big impact on a firm's ability to raise capital, attract employees and justify its stock price.

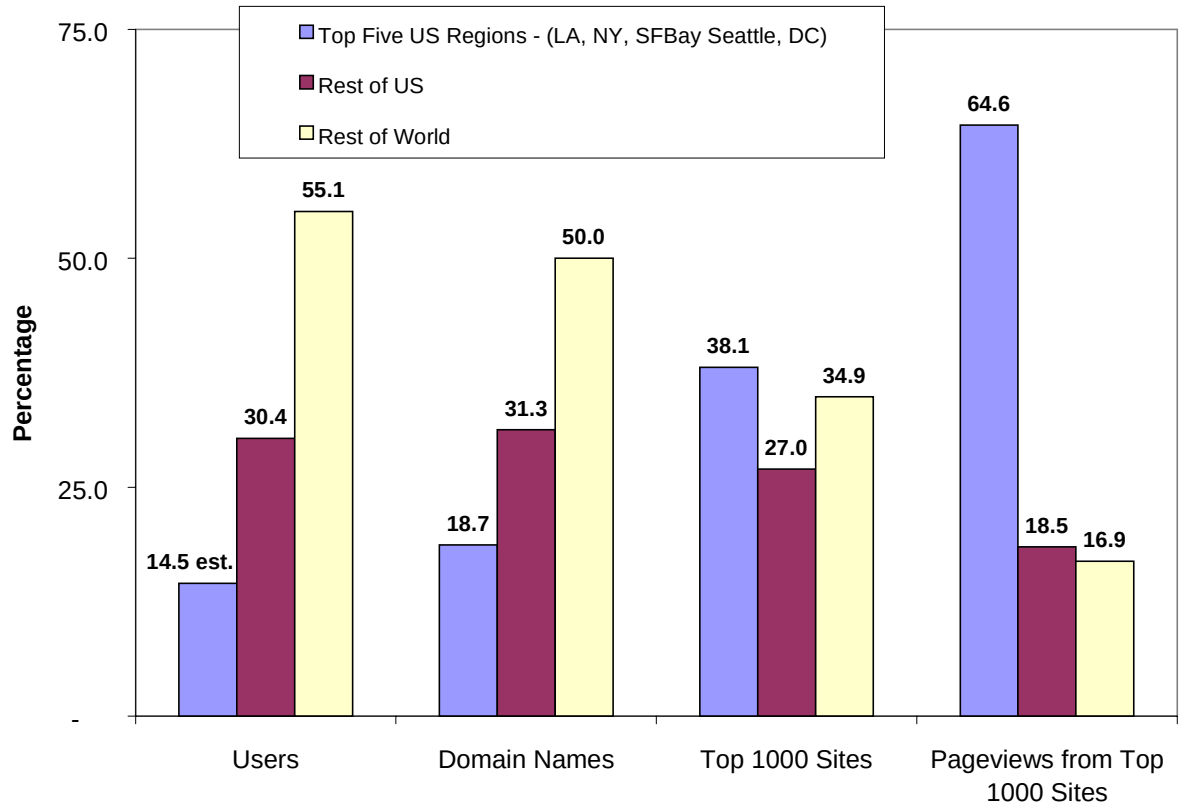
according to whether they were founded explicitly to take advantage of the Internet (dot-coms) or if they had existed prior to the Internet but were moving towards making the Internet a significant part of their business (pre-existing). While these 815 firms certainly do not include all companies in the Internet industry, they do represent a sample of the most important and leading firms in this industry.

Distribution of Internet Use and Production

Although earlier work (Zook, 2000) demonstrates the concentration of the Internet in specific urban centers such as New York, the San Francisco Bay and Los Angeles, it is important to acknowledge that the Internet is diffusing rapidly to the rest of the world. A useful distinction to keep in mind while looking at data about the Internet is whether the variable represents "using the Internet", *i.e.*, emailing, surfing, searching, or "making content for the Internet", *i.e.*, creating a website or other content. This rudimentary supply and demand relationship provides some useful insights on exactly how the Internet is spreading to the world. (Zook, 2001) While the use of the Internet is rapidly decentralizing and has increased the ability for isolated businesses or individuals to access the rest of the world, the majority of Internet industry firms remain concentrated in key locations in the United States.

To illustrate the difference between the indicators for the Internet in use in this article, Figure 1 shows the geographical distribution of users, domain names, top 1000 websites and the pageviews associated with these top 1000 sites. Figure 1 compares these Internet indicators in three distinct geographic groupings: (1) the top six Internet regions in the US – Boston, Los Angeles, New York, San Francisco Bay, Seattle, and Washington DC, (2) the rest of the United States and (3) the rest of world. For each of these indicators, the combined scores for the three geographic groups equals 100 percent. Although the Internet industry is not limited to these six US regions, this exercise demonstrates the extent to which this industry has clustered in these key centers.

Figure 1, Concentration of Internet industry indicators globally, Jan/Feb 2000



Source: ***Users*** *- Nua's How Many Online http://www.nua.ie/surveys/how_many_online/index.html - Distribution to top five regions is an estimate based on CPS data; Domain* ***Names*** *- Author's Survey – January 2000;* ***Top 1000 Web sites and Pageviews*** *based on the top 1000 web sites (measured by pageviews) accessed by All Internet users – from Alexa - http://www.alexa.com/ - February 2000 - Geographic location is based on the registration address of a web site's domain name*

The first indicator, users, is often the one cited to demonstrate that the Internet is diffusing and it is clear that it is. Throughout the six years of the commercialization of the Internet, the share of users located in the United States has steadily dropped although is still accounts for 40 percent of the world's total users. However, use of the Internet for email or shopping is a very different thing than the production of its content. Internet use is clearly diffusing to all parts of the globe but at the present time these users are primarily consuming content that is derived from the US and from the top regions in the US. For example, although it is remarkable that the top five regions in the US account for 20.3 percent of domain names worldwide, it is even more striking that these same regions contain over 41.5 percent of the top 1000 websites and house websites that account for close to 68 percent of the total pageviews of

all Internet users[9]. Although this concentration of Internet content production is not unexpected it is important to realize the extent to which this exists. While, this concentration of Internet content production in the US is declining, it still remains very concentrated in the US and often the top foreign sites are offshoots of US Internet companies. For example, in September 2000 at least ten percent of the 378 top 1000 sites located outside the US were local versions of established US companies, e.g., ebay.co.uk or yahoo.co.jp, and these types of sites account for 23 percent of the pageviews for non-US based websites.[10]

The new indicators of the Internet industry used in this paper confirm the top regional concentrations of domain names outlined in earlier work on the geography of domain names. These top regions, San Francisco, New York, Los Angeles, Seattle, Washington DC and Boston form the principle centers of the Internet industry for both the US and the world. This pattern of uneven territorial distribution of the Internet industry or dot-com companies forms the dependent variable for the next section of this paper. Limiting the analysis to the United States, this paper analyzes the causal factors behind the clustering of the Internet in particular regions.

Why has the Internet industry Clustered?

Industrial development depends on any number of factors and establishing a clear and causal relationship between venture capital and the Internet industry while controlling for other variables is a difficult undertaking. Nevertheless, this article argues that such a causal relationship does exist. This, however, should not be taken as a simplistic supply-side argument in which access to capital guarantees entrepreneurial growth. Rather, the argument of this article is that venture capital was a driver in a cyclically process of entrepreneurial activity during the commercialization of the Internet that both created new and successful firms and in so doing, set the stage for subsequent rounds of investments in ever decreasing amounts of time. While the commercialization of the Internet would have no doubt taken place without the efforts of venture capital[11] it is likely that it would have been much slower and would have had a significantly different structure (Mandel, 2000).

[9] Because the database on Internet firms is limited to the United States it was not included in Figure 1. However, 56.2 percent of the dot-com firms in this database are located in the top six regions.

[10] The following companies were included in this calculation - yahoo, amazon, msn, yahoo, lycos, excite, geocities.

[11] Although data on venture capital investing, such as presented in Table 1 and Figure 2, is generally limited to institutionalized sources of venture capital such as limited partnerships, individual investors are important sources of

Continued concentration of venture capital

In the late 1990s venture capital continued to be concentrated within a few regions of the United States. As Table 1 illustrates the top ten metropolitan areas accounted for 68 percent of all venture capital investment during 1997 and 1998. The traditional centers for venture capital investment, the San Francisco Bay and Boston, continued to receive the bulk of investments during this time although their shares have dropped from the levels reported by Florida and Smith (1990) during the 1980s.

Table 1, Distribution of Venture Capital Investments, 1997-1998

Region	Share of the Total Number of VC Investments, 97-98
SF Bay CMSA	27.2
Boston CMSA	11.8
New York CMSA	6.0
Los Angeles CMSA	4.4
Philadelphia, PA CMSA	3.6
Washington DC CSMA	3.4
San Diego, MSA	3.3
Denver, CO CMSA	2.9
Atlanta, GA MSA	2.7
Seattle CMSA	2.6
Top Ten Regions	67.9

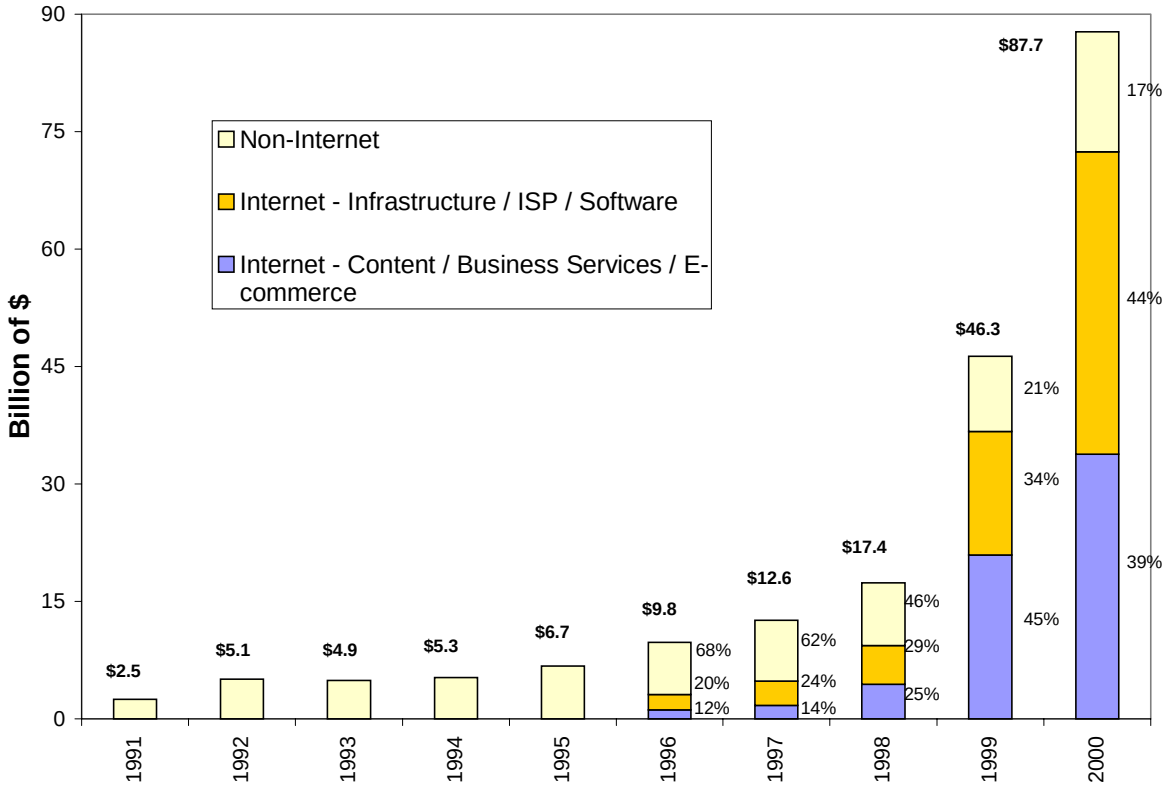
Source: PricewaterhouseCoopers Moneytree survey - Aggregated to MSA/CMSAs by author

Starting in the mid 1990s, the amount of venture capital invested in the United States increased by more than 1300 percent from 1995 to 2000. To put this in perspective, during the 18 months from July 1999 to December 2000, more venture capital was invested than in the

risk capital as well. (Harrison and Mason, 1996) Recently Jeffrey Sohl, the Director of the Center for Venture Research at the University of New Hampshire, cited an increase of 60 percent from 1997 to 2000 in the number of active individual investors often referred to as angel investors. (cited in Helyar, 2000) Getting an accurate count of angel investing in the United States is extremely difficult and is the matter of some debate. Gaston (1989) estimates that there were over 700,000 informal investors who controlled $36 billion in capital in the late 1980s, Wetzel (1994) put the number at 250,000 investing $10-$20 billion per year and van Osnabrugge and Robinson (2000) estimate that there is $50 billion a year of entrepreneur and angel investment in very early stage companies. In comparison, Mason and Harrison (2001 estimate significantly lower levels of angel investing in the United Kingdom. The line between angel and institutionalized investing is ill defined and angels are increasing well organized and play much the same role in assisting companies that venture capitalists do. While difference do remain in terms of the amount of funding and abilities, in general this article includes angel investing when it refers to venture capital investing.

previous 30 years[12]. The majority of this investment went into Internet related companies, accounting for almost 90 percent of the increase between 1996 and 2000. In 1995, Internet companies were not even a distinct category from computer hardware or software. In 1996, the first year for which PricewaterhouseCoopers separates out Internet related investments, they total less than 30 percent of venture capital committed but accounted for 83 percent of venture capital investments in 2000[13].

Figure 2, Growth and Composition of Venture Capital Investments in Nominal Dollars, 1991 – 2000



Source: 1991 – 1994 Venture Economics; 1995-2000 PricewaterhouseCoopers/Venture One Moneytree Survey

[12] This analysis is adjusted for inflation and is based on Venture Economics data that is the only source that has time series data that completely covers this period.

[13] The sectoral definitions used by PWC and presented in Figure 2 do not correspond exactly with this article's definition of the Internet industry. There is, however, a significant overlap between the categories of Content, Business Services, and E-commerce combined into one meta-category in Figure 2 and the definition used in this article.

This growth reflects the response to the wildly successful public offerings of early Internet companies such as Netscape and Yahoo! in 1995 and 1996 (both of which were funded by venture capital). Venture capitalists who had been scanning for the next promising technological breakthrough, jumped on the opportunity of the Internet and began to fund and be approached by a wide variety of Internet entrepreneurs[14].

Entrepreneurial incentives to get big fast!

Based upon the examples of Netscape and Yahoo! in which great advantage accrued to first movers, entrepreneurs perceived that one of their greatest challenges was acting quickly. As one former entrepreneur later turned angel investor notes, "The Net has changed everything. You don't have to have great products. You can have mediocre products, it's really about marketing and partnerships. That is the most important thing today. Getting as many people to know and have emotional equity with your company as possible. That's it! It's getting people emotional and getting people to have a vested interest in your success."

Although Internet entrepreneurs also relied upon other regional resources such as skilled labor, management recruiters, etc., the influx of capital was central to the fast expansion of companies. Traditional time horizons of five to seven years from startup to profitable company were dramatically compressed and cornerstones of company evaluation such as profitability and price of stock to earning ratios were supplanted by a pursuit of market share and "eyeballs", *i.e.*, visitors to a website. As Freeman (1998) argues in his analysis of Silicon Valley, "The issue here is speed. It is time. It's almost to the point that it matters less what you do than when you do it. An important part of the venture capitalist's job is to move this along rapidly, to make the right decision at the right time." Thus, securing venture capital quickly was perceived as the first step towards becoming a millionaire and more and more entrepreneurs pursued this dream. As a San Francisco based Internet entrepreneur argues, "The one reason and one reason only that there are so many companies are out here is because this is where the capital is. It allows you to move fast which is key since Internet time is seven times as fast as any other kind. Capital attracts

[14] Zider (1998) argues that one of the greatest myths of venture capital is that it invests in good people with good ideas. Zider (1998) observes that "The reality is that they invest in good industries - that is, industries that are more competitively forgiving than the market as a whole. In effect, venture capitalists focus on the middle part of the classic industry S-curve. They avoid both the early stages, when technologies are uncertain and market needs are unknown, and the later stages, when competitive shakeouts and consolidations are inevitable and growth rates slow dramatically." This focus on investing in industries rather than people is quite relevant to this surge of interest in dot-com companies.

companies, companies attract like companies and people, but they only attract them because there is capital here. It all revolves around capital."

While interview subjects also listed a number of other challenges such as recruiting management and other skilled workers, creating a marketing plan, and courting customers, these issues were often perceived as closely tied to a company's financial situation. As the founder of a Silicon Valley business-to-business company remarks, "I'm saying that relative to the challenge of how to find the people to fuel the company, the technical challenges, the sales challenges were not as great. If you have enough sales people you can make enough sales, if you have enough engineers you can build stuff. If you have no money, you can't have enough engineers. It's hard, especially in a game where time is everything…and time is everything in the Internet space. The sooner you get funded, the faster you can hire resources, the faster you can get a solution to market and the faster you can create distance between you and the next company, which is what the race is all about."

In addition to obtaining it, entrepreneurs were also concerned about the source of their capital and distinquish between "smart money" and "dumb money". Smart money comes from people, generally venture capitalists or well-connected angel investors, who have an expertise in a particular sector or technology and have connections and networks to other companies who are potential customers, suppliers or partners. In addition to providing a company with money, which is the only contribution of dumb money, smart money can help companies in any number of ways. As the founder of a San Francisco e-commerce company argues, "Smart money is always the only money you want. And what does that mean by smart money? It means that the person has a massive Rolodex. That's really what it means and they may not know squat about your business but if they can get doors opened for you at Netscape, Eudora, or Lotus or Microsoft, they are worth their weight in gold."

Looking for smart and local capital

Getting the most from a venture capitalist or "smart money", however, is constrained by geography because many venture capitalists prefer to invest locally or in partnership with another venture capitalist that is near the firm (Florida and Kenney, 1988a; Florida and Smith, 1993; Saxenian, 1994). The interaction between geography and venture capital funding is well recognized by the entrepreneurs interviewed. The founder of an E-commerce company based in

the San Francisco Bay is certain that his location played an important role in his ability to secure capital. "You can't be anywhere. To start companies you need to raise capital and investors would prefer to make investments locally because they have to spend time with the companies. I know some venture firms that say, 'If I can't drive there within an hour, I don't make the investment.' Especially in an early stage company, you want to have regular contact with the company, so access to capital drives a lot of decisions. Investors prefer to invest locally because they're always the ones on the plane having to travel to company."

Other managers of Internet companies also highlight their location as an advantage. The CEO of an Internet software company reports that her venture capitalists told them, "'You have tremendous value just by being in the Bay area.' We have better access to the venture community, a high quality venture community which makes the partnerships are easier." Many of the venture capitalists also cite accessibility to capital as important to the future of Internet firms. "Access to capital is strategic weapon. Just look at a company like Amazon that just raised a billion dollars in debt. The ability for a company to fundraise fast, and then recruit and assemble a team fast is an advantage. I just think that part of how the venture capitalists help is that they are all just lined up on the same corridor and it's easier. People literally can meet someone at a moments notice and when you're trying to get an hour's worth of a venture capitalist's time, which is pretty precious today, you're just more likely to meet with a venture capitalist just because it more convenient for you to drive down 280 than for you to hop on an airplane to come out here."

This local orientation is born out by a simple analysis of the correlation between the number of venture capital offices and the number of venture capital investments at a range of geographic levels. As Table 2 illustrates, there is a statistically significant correlation between these two variables at all levels of geography from 5 digit zip codes to MSAs and it increases as the geographic range expands. Moreover, this geographic correlation is even stronger for earlier stage investments. By concentrating on nearby investments, particularly critical at early stages, venture capitalists are able to work more closely with companies and take advantage of local networks of contacts to lower cost, gain tacit knowledge and manage risk.

Table 2, Correlation between Venture Capital Offices (1999) and Investments (1999 to 3rd Qtr 2000)

	All VC Investments		Early Stage VC Investments	
	Correlation	Num. of Observations	Correlation	Num. of Observations
5 digit Zip Code	.298*	1920	.286*	1316
4 digit Zip Code	.502*	1057	.541*	782
3 digit Zip Code	.748*	387	.808*	387
MSA	.773*	184	.817*	184

** significant at the 0.01 level; Source: Number of VC Offices - Pratt's Guide to Venture Capital, 2000 Edition; Venture capital investments from PricewaterhouseCoopers MoneyTree's survey*

The persuasiveness of capital agglomeration

Based on this recognition that firms located near sources of venture capital have better access to the funding, networks and advice of venture capitalists, many founders of Internet companies saw their location as a competitive advantage. Although most of the interview subjects started their companies in the same place they had been prior to becoming an entrepreneur, many argued that knowing that there was ready access to capital made it much easier to take the risk of starting a company. One described the San Francisco Bay region as "a caldron of financing" which "enticed you to take a chance." In addition to the effect that local venture capital had within its region, many subjects noted that it also served as an attraction for people to relocate near it. "I speak to some CEOs in Austin and Atlanta and Chicago and you hear about the fact that there is this growing venture community in Austin and to an certain extent, Atlanta, and they say flat out that they're reconsidering location because they're afraid they're not going to get the next round of financing. Just the concentration of money in Silicon Valley can be persuasive."

This "persuasiveness" is confirmed by the entrepreneurs interviewed who chose to relocate to the San Francisco Bay either prior to starting or after founding an Internet company elsewhere. While this became particularly intense during the commercialization of the Internet, it is a process that has long been bringing people to regions like the Bay area[15]. The founder of

[15] Saxenian's (1994, 1999) research has repeatedly documented this trend.

an Internet services company in San Francisco, relocated from the East Coast at the start of the 1990s because it seemed to be a place where he could explore some of the business plans he "…kept in a crazy idea folder. I grew up in New York, worked there, and I quickly learned that it [his job at a top tier bank] bored me. I always wanted to start a company and I wanted to work with a younger company. I think it was the idea of California that made me want to move out here…Out in San Francisco the entrepreneurs are the rock stars and the whole system revolves around them. It's all set up to plug money into your crazy ideas."

This accessibility to capital and the means to explore new ideas also proved highly influential on the decisions of entrepreneurs who relocated to the San Francisco Bay to start companies after the Internet boom had begun. Although any location decision is based on a number of factors including personal preferences, business connections, labor supply, etc., the entrepreneurs interviewed consistently cited the availability of capital as a leading variable in their decisions. As the co-founder of a San Francisco based Internet software company remembers, the list of possible locations was relatively short in his mind.

> "When we looked where there was capital there were really four or five areas. The three big ones in order were, San Francisco, Boston, New York, when we looked where there was both angel and venture money that could capitalize software and Internet companies. The second wave had Austin, Atlanta and Seattle. We really only saw six areas and three really big ones where starting a company from nothing and growing it was really possible. Those three we felt were relatively equal in having great talent pools, but San Francisco had much better access to capital."

Another company founder who moved his firm of half a dozen people, from Toronto to Palo Alto echoes this sentiment. Largely this was because he felt that in order to succeed he needed to be in the center of Internet activity and venture capital that was interested in investing in Internet companies.

> The difference between there and here is black and white. In Toronto when I would meet with VCs, I would spend a lot time trying to explain why the Internet was so important, trying to educate them as to what an opportunity it was. Often I spent so much time doing this that I never even got to present my business plan. They didn't get it. So we came out here to get close to the venture capital that knew something. If you're an aspiring actor you go to Hollywood and if you're an Internet company you come to Silicon Valley. Out here they just get it and you can spend your meeting actually going over your business plan."

The power the agglomeration of venture capital in the San Francisco Bay is particularly striking when compared to other regions since it is by far the largest concentration of venture

activity in the country. While this has changed somewhat as the commercialization of the Internet took place, it was particularly influential earlier on in the commercialization of the Internet. As a New York based entrepreneur notes, "Getting money meant going to California because no one in New York would talk to you. You'd talk to the VCs and they'd tell you that they didn't know that this [the Internet industry] existed. They couldn't believe that it was a phenomenon." Eventually, the fortunes made by Internet companies in 1996 and 1997 attracted a significant amount of capital into companies around the country. Although the San Francisco Bay remained the largest concentration of activity, other regions began to see more and more venture investing in these types of companies.

Testing the Importance of Venture Capital

To test the findings from the interview data, this analysis uses a multivariate regression to explore the explanatory power of a number of regional attributes in the distribution of the Internet industry. The quality of the data used in this analysis in this author's opinion, however, prevents this analysis from proving the relationship between the activity of venture capitalists and the location of the Internet industry. Although the most important input from venture capitalist's are their networks, connections and ability to work with companies, it is not possible to get a reliable measure of this and instead this analysis relies upon the number of venture capital investments in a region to proxy this[16]. In addition, this simple measure of size masks a great deal of differentiation in regional venture capital systems in terms of sector, stage and involvement. Therefore, this analysis is best seen as an effort to reject the findings of the interview data that argue that venture capital played a leading role in the location and creation of these firms. The inability of these regressions to do so suggests that venture capital investing did play an important role in determining the location of the Internet industry.

Introducing the variables

This analysis is conducted at the regional level defined either as MSAs or CMSAs where available. Because of data availability issues with the dependent variables, the models contain approximately ninety regions where any venture capital investing has taken place. The goal of this analysis is to match factors of labor, education attainment and venture capital investments in

[16] Also problematic are the measures of the Internet industry used as the dependent variables in this model that are samples rather than complete populations of Internet firms.

existence in 1998 midway through the commercialization process of the Internet to outcomes in the year 2000.

This paper uses two dependent variables for the location of the Internet industry. The first dependent variable is the number of **Top 1000 web sites** that were located within a region in February 2000. This data, based on Alexa.com's survey, is a reliable measure of the most visited web sites on the Internet. Thus, it includes some companies that are not necessarily classified as dot-coms, *e.g.*, Cisco Systems or Apple, but because these sites are heavily visited, they are clearly providing important content to web consumers. A second variable, which was developed independently from the first and is more representative of dot-coms is also included. This second independent variable is based on the database of **Internet companies** developed from the Hoovers On-line database. Because this listing of companies was hand selected by the author it uses a more precise definition than the first and only includes companies that were founded explicitly to use the Internet in their business, *i.e.*, dot-coms.

The independent variables were selected to represent regional factors that have long been identified as supporting regional economic development. The first one, **Total employment**, is simply a measure of size of the region and provides an indicator of the extent of a region's external economies. The second variable, the **Number of patents per employee** is included as a measure of a region's ability to support the creation and commercialization of new knowledge. Finally, because the supply of skilled labor is often cited as an important factor in regional development, particularly in the context of highly innovative and emerging industries (Florida, 2000), this analysis includes the **Percent of the population with a BA/BS degree**. In addition to these three variables that are supportive of knowledge-based development in general, the models in this analysis include a number of specifically Internet related variables.

Given the reliance of the Internet industry upon the computer technology, which forms its infrastructure, it is important to test the role of concentrations of high tech activity to see whether this has had an impact on the location of the Internet industry. This is represented by the **Percent of a region's jobs that are in high technology industries**[17]. A related path dependent argument is that the Internet industry is less connected to high technology jobs as traditionally

[17] The definition used is Saxenian's (1994), *i.e.*, SIC Codes, 357- Computer and Office Equipment, 366 - Communications Equipment, 367 - Electronic Components and Accessories, 376 - Guided Missiles and Space Vehicles and Parts, 38 - Instruments, and 737 - Computer Programming and Data Processing.

defined, and more involved with information processing jobs that fall across many different industrial sectors. To obtain a measure of a region's labor force that is involved in this type of information manipulation, the **Percent of a region's jobs that are in informational industries** is used[18]. Because these two labor force variables share some sectors in common they are not included in the same models but compared to one another.

Some regions in the United States had an earlier introduction to the Internet, e.g., connections to ARPANET and NSFNET in the 1980s and early 1990s, than others,. Simply being one of these early centers could provide a region with a head start or early knowledge spillovers that would provide its Internet industry an advantage in developing quickly. This factor is represented in the **Commercial domain name specialization ratio in 1994**. This ratio is similar to a location quotient and measures the extent to which a region was specialized in the use of the Internet before the commercialization process started.

The final independent variable is based on this dissertation's hypothesis that the development of the Internet industry has been greatly influenced by the availability of venture capital in a region. This is measured by the **Total number of venture capital investments in 1997 and 1998**. based on the PricewaterhouseCoopers Moneytree survey of venture capital investments. Although venture investing is available for later years, this time period is used to reflect the time lag between venture capital investment and the performance of a company. Historically, venture capitalists expected that it might take up to seven or ten years for a return on their investment through some kind of liquidy event. During the commercialization of the Internet, however, this time horizon shrank and companies went from initial investment to an IPO in as little as two to three years.

[18] Information industries is defined as **Media and Publication =** SIC 271 – Newspapers, 272 – Periodicals, 273 – Books, 483 – Radio and TV Broadcast Stations, 484 – Cable & Other Pay TV; **Entertainment =** 701 – Hotels, 781 – Motion picture production, 782- Motion picture distribution, 783 – Motion Picture Theaters, 794 – Commercial Sports, 799 – Misc. Amusement & recreational Service; **Advertising and Public Relations =** 731 – Advertising, 874 – Management and Public relations; and **Advanced Users** = 621 – Security brokers and dealers, 622 – Commodity Contracts Brokers, 623 – Security & Commodity Exchanges, 628 – Security and commodity services, 738 – Misc. Business Services, 871 – Engineering & architectural services, 872 - Accounting, auditing & bookkeeping, and 873 - Research and testing services.

Table 3, Summary of Variables

Variable	Description	Source	Mean	Std Dev	Min	Max
Dependent Variables						
Top1000 websites (Log)	February 2000	Author	0.87	1.06	0.00	5.08
Top Internet firms (Log)	May 2000	Author	0.82	1.11	0.00	4.93
Independent Variables						
Total employment (Log)	Size of region/external economies – 1995	US Census*	6.03	1.13	4.05	9.11
Number of patents per job	Ability to create commercially viable knowledge – 1995	US Patent and Trademark Office*	0.45	0.33	0.07	2.30
Population with a BA/BS	Availability of skilled labor – 1990	US Census	0.15	0.04	0.08	0.30
Percent of jobs in high technology industries	Connection between the Internet Industry and high technology – 1995	US Census*	0.03	0.02	0.002	0.12
Percent of jobs in informational industries	Connection between the Internet Industry and information process – 1995	US Census*	0.08	0.03	0.03	0.23
Domain name specialization ratio	Early mover advantage – 1994	Author	0.67	0.84	0.00	4.49
All venture capital investments (Log)	Size of Venture capital activity – 1997-98	Pricewaterhouse Coopers	2.47	1.33	0.69	5.76

** US Census data is estimated for 1995*

Because the two dependent variables and the independent variables of total employment and venture capital investments are highly concentrated in a few regions, the natural log of the variable is used in all regressions to create a more normal distribution. Additionally, two outliers in terms of the number of venture capital investments, even using natural logs, (the San

Francisco Bay and Boston) are excluded from the analysis in order to create a more linear model[19].

Findings

This analysis uses multivariate linear regression to examine the relationships between the variables and understand how the two indicators of the Internet industry relate to the various measures of a region's environment. Each of the dependent variables was regressed against a number of combinations of the independent variables[20]. The results of these models are outlined in Tables 4 and 5. In general, these regressions support the idea that venture capital investments and early involvement in the Internet are important factors in determining the geography of the Internet industry. The findings are less clear-cut on the role of existing high technology or informational industries and educational levels. It found no significant relationship between the patents and the dependent variables. The models in general all had adjusted r-squared values above 0.50, suggesting a robust relationship between the variables.

Five different combinations of the independent variables are outlined in Table 3. Overall, the findings are quite robust with adjusted r-squared values of above 0.50 for all models. As expected, the measure of a region's size is positively correlated to the number of top websites and is statistically significant in a majority of the models. The most consistent finding in these models is for venture capital investments. Although many of the permutations of the model considered are not shown in Table 4, its coefficient is consistently positive and significant at the 95 percent confidence interval and higher. This significance remains constant from simple models that only include total employment for a region, to more complex regressions involving several other indicators of a regions labor force, knowledge and history[21]. These results suggest

[19] If these two regions were included in the analysis, it would make the findings even more supportive of this dissertation hypothesis on the causal role of venture capital investing and the location of the Internet industry.

[20] While it unusual to have completely orthogonal independent variables one issue of concern for these regressions is multicollinearity among the independent variables. For example, the correlation between the log of venture capital investments and the log of employment is 0.47. While this correlation is high by some "rule of thumb" standards this paper includes the full range of variables in order to explore the full range of factors mentioned in the theory section. Moreover, reduced models that dropped the employment and the location quotient for com domains (the two variables most highly correlated with venture capital investment), remained predictive (R-squared of 0.53) with the venture capital variable significant at the 0.001 level.

[21] A F-test on the full (Model 5) and reduced (Model 4) models is significant at 99 percent level (df = 1, 92) and shows that one cannot reject that the variable of venture capital investing adds explanatory powers to the model.

that venture capital investment in a region during 1997 and 1998 is positively and significantly correlated with the number of top web site located in the region at the beginning of 2000.

Table 4, Regression Findings - Top 1000 Web Sites

Dependent Variable: Log of Top Web Sites															
	Model 1			**Model 2**			**Model 3**			**Model 4**			**Model 5**		
Independent Variables	*B*	*t-value*		*B*	*t-value*		*B*	*t-value*		*B*	*t-value*		*B*	*t-value*	
Log of Employment	0.63	8.55	***	0.59	7.73	***	0.12	1.09		0.52	7.28	***	0.18	1.63	
Log of the Number of all VC Investments, 97-98							0.53	5.26	***				0.42	3.91	***
Location Quotient of Com Domains - 1994										0.47	4.33	***	0.30	2.73	**
Percent of Population with BA/BS	0.63	0.31		0.81	0.39		0.17	0.63		0.53	0.28		0.42	0.89	
Number of Patents per jobs	(0.09)	(0.29)		0.29	1.09		0.09	0.38		0.06	0.22		(0.02)	(0.07)	
Percent of High Tech Jobs	9.23	2.26	*												
Percent of Informational Jobs				5.39	1.83		2.60	0.98		0.97	0.34		0.39	0.15	
R-Squared	0.51			0.50			0.62			0.59			0.65		
Adj R-Squared	0.49			0.48			0.60			0.56			0.63		
# of Observations	92			92			92			92			92		
F value	22.7			21.9			28.3			24.8			26.6		

* significant at 0.05
** significant at 0.01
*** significant at 0.001

A second clear finding, although slightly less consistent than the results for venture capital investing, is the historical involvement with the Internet. The indicator of a region's domain name specialization ratio in 1994 is consistently positive and in most models, simple or complex, statistically significant. This suggests that regions that early centers of the Internet were at an advantage over other regions in producing web sites that were the most visited in 2000.

The results for the percent of a region's jobs that are high tech are positive and is significant in the first model. This suggests a positive correlation between centers of high technology and successful Internet firms. However, If Models 2 to 5 used the variable measuring the size of high technology industry rather than informational industry, the significance of high technology industries disappears although its coefficients remain positive. The size of a region's informational industry remains positive in all the models but does not appear to be statistically significant with this dependent variable.

The variables of educational level and proprietary knowledge within a region are not significant in explaining the distribution of top web sites. Although the coefficient for educational level remains positive in all of the models presented here it does not emerge as significant variable. This is somewhat surprising given that many researchers have found that education levels correlate with increased entrepreneurial activity (Florida, 2000). One possible

reason for this is the relative age of this variable to the others, particularly the dependent variables and changes in regional education levels since the decennial census of 1990 could be basis for this. Also there is some correlation between this measure of educational levels and the other variables. While not debilitating to this analysis they do point to the limits of this dataset and could also account for this finding.

The results for the second dependent variable, regressed against the same independent variables, demonstrate much of the same relationships noted in the first model. The same five combinations of independent variables are outlined in Table 3. These models tend to be even more robust than those of the first dependent variable and in generally have adjusted r-squared values of that are higher than those found in Table 4. The most consistent finding is again the correlation between venture capital investing in a region during 1997 and 1998 and the number of Internet firms located in it by mid 2000[22]. The coefficient for this variable is consistently positive and is significant at higher levels than the regressions with the first dependent variable. Likewise, an early history of Internet involvement is positively and significantly correlated with a region being the location of Internet firms in 2000.

Interestingly, the results for the other variables measuring the quality of the region's labor force, proprietary knowledge and involvement in the high tech industry are a bit different with this dependent variable than the first. Whereas the percentage of the population with a bachelor's degree was never significant when regressed against the number of top web sites in a region, it is significant in the first model with this dependent variable. Additionally, the percent of high tech employment in the region has not emerged as a significant variable in terms of the location of the top Internet companies. However, the size of a region's informational industry is positive and statistically significant in second model. Although its significance drops when variables for historical involvement with the Internet and venture capital investing are included this suggests that the two dependent variables diverge in some interesting ways.

[22] A F-test on the full (Model 5) and reduced (Model 4) models is significant at 99 percent level (df = 1, 92) and shows that one cannot reject that the variable of venture capital investing adds explanatory powers to the model.

Table 5, Regression Findings - Internet Companies

Dependent Variable: Log of Internet Companies															
	Model 1			Model 2			Model 3			Model 4			Model 5		
Independent Variables	*B*	*t-value*		*B*	*t-value*		*B*	*t-value*		*B*	*t-value*		*B*	*t-value*	
Log of Employment	0.67	9.39	***	0.63	8.82	***	0.09	0.99		0.55	8.55	***	0.15	1.61	
Log of the Number of all VC Investments, 97-98							0.61	6.97	***				0.50	5.47	***
Location Quotient of Com Domains - 1994										0.49	4.96	***	0.29	3.07	**
Percent of Population with BA/BS	2.51	2.06	*	1.84	0.94		0.43	0.27		0.43	0.25		0.84	0.55	
Number of Patents per jobs	0.08	0.28		0.33	1.28		0.09	0.45		0.07	0.32		0.01	0.05	
Percent of High Tech Jobs	5.12	1.29													
Percent of Informational Jobs				6.94	2.51	*	3.75	1.65		2.32	0.88		1.63	0.72	
R-Squared	0.56			0.58			0.73			0.68			0.76		
Adj R-Squared	0.54			0.57			0.72			0.66			0.74		
# of Observations	92			92			92			92			92		
F value	28.3			30.9			47.8			36.3			45.3		

* significant at 0.05
** significant at 0.01
*** significant at 0.001

Discussion

The findings of these regressions support the idea that venture capital has played an important role in the development of the Internet industry. In addition to the most basic level of access to money that the variable in these models measure, venture capital has contributed to the clustering of the Internet industry by its provision of a number of non-monetary inputs such as management advice, contacts and mentorship. In many ways these are what are entrepreneurs value most about receiving venture capital (Timmons and Bygrave, 1986). The ability of venture capital to supply this type of value-added input quickly is dependent upon the quality of its networks and is greatly assisted by geographic proximity. The role of spatial proximity in the diffusion of information and construction of social networks is particularly important in understanding this type of regional development and remains true even in the era of a global economy.

It is also suggests that participation in the Internet during its pre-commercial phase provides regions with an advantage over others in the creation of successful Internet firms. As Abbate (1999) and Townsend (2001b) document, the Internet and particularly its predecessor Arpanet, was originally concentrated in a few US Defense department funded computer science departments in major research universities. These regions contained concentrations of people who were among the few to be aware of the Internet and its commercial potential. One result is that the creation of the World Wide Web's "killer app", the Mosaic browser which introduced graphically capabilities, took place in the relatively small, town of Champaign-Urbana, IL which also happened to be one of Arpanet's original nodes. Of course, this head start did not guarantee

that a region would continue to be a major node in the commercial Internet. In the case of Mosaic, the entire team of its original developers were moved *en mass* to Silicon Valley to form the nucleus of Netscape Communications which was instrumental in inspiring much of the commercializing efforts (Reid, 1997; Clark and Edwards, 1999).

There are also interesting differences between these two sets of models in the significance of high technology employment and the education level of a region. While high tech employment is positively and significantly correlated with the number of top websites in a region, employment in informational industries is positively correlated with the number of Internet firms in a region. Although the two dependent variables are related and in fact strongly correlated, these findings demonstrate some important variation between these indicators. While the variable of top web sites does include firms that focus exclusively on Internet content production, they also include the websites of companies that are popular with many of the Internet's users. Since the Internet has long been the domain of computer affectionados is not surprising that many of these popular sites include older high tech companies such Intel, Apple and IBM. This suggest that the correlation between high tech employment and top web sites may be more indicative of the popularity of high technology web sites than a clear causal relationship between high tech and Internet companies. This is supported by the lack of significance for this variable in the second set of models that uses a more select definition of the Internet industry.

The correlation between the number of Internet firms and the percentage of the population with BS/BAs supports an observation often made concerning dot-com companies. Although they are based on the use of technology, many of these companies are not technology companies per se. Rather they leverage the technology of the Internet to re-invent or restructure existing business. Thus, rather than just needing a supply of high skilled engineers or programmers, their labor needs include a much broader set of skills and hence the stronger and more positive correlation to general education measures.

Conclusion

This article argues that venture capital played a central role in the concentration of the Internet industry in a few key regions in the United States. Although both the Internet and capital have been viewed as independent of geography, the development of this industry serves

to highlight the continuing relevance of regions and place-based relations. The creation of successful dot-com companies was not simply a matter of having sufficient supplies of business plans, skilled labor, infrastructure or even capital but the process through which these resources could be quickly organized and combined. As Martin (1999, 11) argues "money is not just an economic entity, a store of value, a means of exchange or even a 'commodity' traded and speculated in for its own sake; it is also a *social relation*." This emphasis on money as a social relation captures venture capitalists' use of systems of personal contacts and networks to exchange scarce information, assess business plans and back startups in a quick and efficient manner. The ability to provide this type of value-added input in a timely manner is greatly assisted by geographic proximity. Far from being an easily moved and fungible commodity, venture capital investing depends upon non-monetary inputs such as knowledge and investors prefer to be close to companies in order to monitor and assist them. Thus, despite telecommunications technologies and global financial markets that have vastly expanded the geographic range of economic interaction, regions remain central to economic development in the current economy. It is likely that this ability to adapt to the changing dynamics of the economy will continue to be relevant in the future as regions attempt to reinvent their economies, enter new industries and innovate.

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