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Innovation and Social Capital in Silicon Valley*

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The high cost regions of Europe, North America, and Japan recognize that the key to their economic vitality is innovation. Increasingly, many also accept that the primary units of competition based on high quality, innovative products are not nations, but firms within regions, some of which occasionally bridge national boundaries. This has resulted in a significant increase in interest in the nature and functioning of such regional economies, variously known as clusters or industrial districts.

The distinctive nature of industrial regions was first mentioned in the economics literature by Alfred Marshall more than a century ago. Today a great number of industrial regions have been identified throughout the world, with such clusters as Prato and Modena for Italian textiles (Brusco 1982; Lazerson 1995), and Hollywood for American film production (Scott 2002) being frequently cited. Yet the region that receives the greatest attention, particularly with regard to high technology production, is Silicon Valley.

In explaining the vibrancy of Silicon Valley and other regional economies many have referred to the concept of social capital. There is surely something to industrial clusters beyond the external agglomeration economies of specialized inputs and labor pooling. Indeed Marshall cited knowledge spillovers within a cluster as one of the principle benefits of locating near existing firms. Within an industrial district, he argued, the secrets of the trade are available to all as if it were in the air, though we know this is not, in fact, true as they are really available to those within the network. The existence of social capital has also been cited as an important benefit to producing within an economic region. The term social capital, although highly elastic, is typically used to refer to the social underpinnings of the relations among economic actors within a region. Some have

argued that social capital is a driving force behind the vibrancy and durability of economic regions. This essay discusses this, first by developing a usable definition of social capital, and then by applying it to Silicon Valley and other industrial regions.

Social Capital as a Concept

In early 1995 the term social capital achieved a level of prominence in the United States as a result of Robert Putnam's article "Bowling Alone: America's Declining Social Capital" in the *Journal of Democracy*. The argument Putnam advanced in this article is that America has seen a significant decline in civic engagement over the last several decades, and that this decline is symptomatic of a decline in social connectedness among Americans. This decline can be measured in numerous ways; including a significant decline in voting turnout, attendance at public meetings, reported trust in government, and a significant decline in membership in voluntary organizations

The title of his article, and the measure of decline in civic engagement that captured peoples' attention, is based on Putnam's observation that as the number of bowlers in America increased by ten percent between 1980 and 1993, the number of those bowling in leagues declined by 40 percent. Americans, although bowling more, are bowling alone.

While not everyone accepts these trends as indicating that civic society is declining in the U.S., there is widespread agreement that there is a decline in community in America, and that Putnam's data is suggestive of this.¹ What needs to be asked, though, is whether the civic engagement Putnam describes is an accurate description of social

¹ Fukuyama (2000, pp. 52-55) presents a useful discussion of Putnam's data and what they mean. Lehmann (1996) also presents an interesting argument as to why Putnam's argument resonates so well in the U.S.

capital, and what value social capital has for economic development and innovation.

Putnam's original use of the term social capital is found in his 1993 work *Making Democracy Work: Civic Traditions in Modern Italy*, and in this work social capital is intimately tied to economic development, and is even a precondition to it. Putnam argues that the vitality of Northern Italy as compared to the south is due to the civic virtue or networks of civic engagement that are found in the north. These networks of civic engagement are based within the community itself, and are maintained by social and family ties. Because business relationships are embedded within community and family structures, the trust underpinning these relationships are maintained by social and familial sanctions.

James Coleman's (1988) description of the wholesale diamond market in New York City provides one of the best examples of the role of social sanctions in maintaining trust in exchange. Here diamonds worth hundreds of thousands of dollars are passed from one merchant to another for purposes of inspection in negotiating a sale. There is no formal guarantee that the merchant receiving these diamonds will return them without substitution. There is, though, a social structure based on family, community, and religious affiliation within which these exchanges take place that guarantee that failure to meet one's obligations would be met with the loss of these ties and expulsion from a highly lucrative market. The social capital represented by these ties allows for transactions to occur that would otherwise be very costly to facilitate through bonding and insurance, or would not take place at all. In addition to dramatically reducing transactions costs in this market, such a closed community also limits competition from those outside the community thereby supporting high rents which would be lost to those

who defect.²

There is significant evidence that the description of social capital found in the above examples facilitate economic development, but does such a model of social capital apply to all settings, and in particular does it apply to such a dynamic and productive region as Silicon Valley? Stephen Cohen and Gary Fields (2000) specifically address this question and conclude that no, there is very little of the civic engagement Putnam describes in northern Italy that one can find in Silicon Valley. In fact, not only does this fail to describe Silicon Valley, but Silicon Valley is, in some important ways, quite the opposite.

For those who have lived in Silicon Valley, Cohen and Field's (2000: 191) description is apt. "Silicon Valley is notoriously a world of strangers; nobody knows anybody else's mother there. There is no deep history, little in the way of complex familial ties, and little structured community. It is a world of independent - even isolated - newcomers. With its spatially isolated and spread-out residential patterns, its shopping strips and malls, its auto gridlock, its rapid demographic turnover, and the rampant individualism among its most talented workers, Silicon Valley would be hard pressed to present the image of a close-knit civil society that, according to the social capital theorists, is the precondition for economic prosperity."

Moreover, this description is not unique to Silicon Valley and could readily be applied to a large number of economically vital regions in the United States. In many regions, one's work is often all consuming. Community is defined by the professional peer group and not by the physical neighborhood where one sleeps. What is needed, then,

² As an illustration that this trust is not based on innate morality, in early June two diamond dealers in the Diamond District were arrested for involvement in a drug money laundering ring. Fellow merchants

is a definition of social capital that applies to these regions along with those described by Putnam.

Definitions of Social Capital

Jane Jacobs in her classic 1961 work on urban development, *The Death and Life of Great American Cities*, is probably the first to use the term social capital in her description of the social networks one finds in mixed-use neighborhoods in large cities. Fukuyama (2000) has observed that the term has also been used in connection with inner-city economic development and other contexts on occasion. It was the sociologist James Coleman, though, who first used the term in a way that has general application to economic development.

For Coleman, social capital is defined by its function. "It is not a single entity but a variety of different entities, with two elements in common: they all consist of some aspect of social structures, and they all facilitate certain actions of actors - whether persons or corporate actors - within the structure. Like other forms of capital, social capital is productive, making possible the achievement of certain ends that in its absence would not be possible." (Coleman, 1988, p. S98)

In developing his concept of social capital, Coleman drew a distinction between it and the forms that reside in physical objects and humans. Unlike physical capital and human capital, social capital resides in, or is inherent to, the structure of relations between and among actors. For Coleman a crucial aspect of social capital is its public good aspect. Because social capital is embedded in relations among individuals rather

expressed surprise, saying those arrested were well respected and trusted. Said one, "On 47th Street, everything is on the trust". June 6, 2003 New York Times.

that in the individuals themselves, actors who generate social capital will only capture a part of its benefits and this will result in an underinvestment in social capital.

The second crucial element in defining social capital is accounting for the role of trust. Since social capital facilitates cooperation among actors within a social structure, social capital must provide the basis for trust among these actors. Trust can be defined in a variety of ways, but most simply it is the expectation that someone will behave in a certain way towards you. Social capital in numerous ways shapes these expectations among actors, and when these expectations are of honest and reliable behavior we think of them as trust.

Social Capital and Organizational Forms

Social capital can be a useful term in describing economic development when we examine settings where social capital, and the trust it supports, is necessary for economic exchange. Not surprisingly, it is in economics where social capital has received the least interest. Consider, the classic 1937 article by Ronald Coase "The Nature of the Firm", where he concluded that the firm is more than a black box production function. His key insight was that firms, although arising within market economies, were in fact hierarchical governance structures. Typically, the firm in mainstream economic theory had been described as a box in which inputs are placed, a technology is applied, and an output is produced. The internal operation of the firm was ignored by an exclusive emphasis on prices and external market relationships.

Coase, in his lecture upon receiving the Nobel Prize, relays how his concept of the nature of the firm evolved in his academic training. Competition, he was taught, acting through a system of prices provides all of the coordination necessary. "And yet we had a

factor of production, management, whose function was to coordinate. Why was it needed if the pricing system provided all the coordination necessary? The same problem presented itself to me at the time in another guise. The Russian Revolution had taken place only 14 years earlier. We knew very little about how planning would actually be carried out in a communist system. Lenin had said that the economic system in Russia would be run as one big factory. However, many economists in the West maintained that this was an impossibility. And yet there were factories in the West, and some of them were extremely large. How did one reconcile the views expressed by economists on the role of the pricing system and the impossibility of successful central planning with the existence of management and of these apparently planned societies, firms, operating within our own economy." (Coase, 1992, p.715)

The answer, Coase hypothesized, was that there were costs to using the price system, and that firms come into being and expand up to the point that they perform the economic coordination function more efficiently and at a lower cost than the price system by means of market transactions. In the 1970s transaction cost theorists led by Oliver Williamson extended this analysis. When transactions are clouded by uncertainty about their outcome, and when they require transaction, or asset, specific investments, these transactions tend to be internalized inside hierarchically organized firms in the presence of opportunism and bounded rationality. Opportunism simply means that economic actors will engage in self-interest with guile, while bounded rationality means that contracts between parties covering all contingencies cannot be written.

A fundamental observation of transaction cost economics is that competitive conditions may very well hold in bargaining ex ante, but not ex post. This will occur if the transaction between two parties is characterized by asset specificity, where asset

specificity refers to the extent to which an asset's value is exclusively tied into an exchange. The loss in value of the asset should the transaction not be completed is the hazard associated with the transaction. This hazard gives rise to transactions cost if the other party is opportunistic and if bounded rationality prevents this contingency from being fully accounted for in negotiations.

If the assets the parties commit to the transaction are not specific then the relationship can be governed by a sequence of spot markets. All three attributes; bounded rationality, opportunism, and asset specificity, are necessary to generate the transaction costs which give rise to hierarchies over markets (Williamson, 1983).

Of course, there are significant inefficiencies associated with hierarchies, particularly with regard to the processing of information. Hayek (1945) argued that the fundamental problem of economic organization is adaptation to changing circumstances and that this adaptation is most effectively achieved by decentralized price data. The reason hierarchies face difficulties in coordinating economic activity is that the necessary data is never given to one mind. The problem of finding a solution to economic allocation is that the information needed exists as incomplete and contradictory bits of knowledge dispersed across a large number of individuals. The price system is the solution to the allocation problem because prices allow the man on the spot, the individual closest to the particular problem and the one who knows the most about it, to act on this information. Prices coordinate the separate actions of these individuals, each of whom holds personal and unique knowledge that could never be effectively transmitted to the center of a hierarchy.

Clearly, markets and hierarchies differ in their applicability to different circumstances. But are these the only two organizational forms, and are all observed

forms simply a hybrid of these two? Walter Powell, among others, argues that non-market, non-hierarchical forms between these two pure types are not hybrids, but are a separate organizational form (Powell, 1990).

Although all economic exchange is embedded in a particular social context (Granovetter, 1985), some forms of exchange are encased in more dense social relationships than others. That is, some forms of exchange are more dependent on relationships and reputation, are less guided by authority and prices, than others. It is this social dimension that differentiates networks from markets and hierarchies.

Markets are remarkably efficient in conveying information through prices when the items that are exchanged are well specified and understood, and the context within which these take place is, at least, relatively stable. For example, in disrupted markets, such as say Afghanistan in 2003, the information conveyed in prices can become extremely distorted. In stable environments, it can appear that prices alone direct production and exchange among anonymous individuals, though even, in these cases, if one examines the entire value chain particularly upstream, one finds long-term relationships that do not operate only on a pure price system. Aside from basic norms of civility supported by law, in abstracto, market exchange does not require shared values, a shared language, or even knowledge of another's existence – though here again it is important to note that English is becoming a shared language for global business transactions. However, in particular transactions especially where there are a large number of customers, markets where there are no relationships among anonymous actors are possible.

The transactions cost model argues that hierarchies arise to internalize market transactions characterized by high transaction costs – this can cut costs and lower risks.

Hence, Chandler's (1977) visible hand becomes a solution to the coordination problem. Communication within hierarchies occurs within the context of the employment contract. Relationships among members of a hierarchy surely matter, but exchanges that occur in a hierarchy are most strongly shaped by one's position within the hierarchical structure of authority (Powell, 1990: 302). In the extreme case one's position within the structure of authority completely defines exchange in the hierarchy to the point of anonymity. In the military you don't salute the person, you salute the uniform.

Networks differ from these other forms of economic organization in terms of the identity of the actors and the relationships among them. Reciprocity is a crucial consideration in these relationships. Unlike market actors, members of a network engage in reciprocal exchange where benefits are given without the expectation of immediate benefits in return. In other words, the exchanges are not treated as though they are taking place on a spot market. Although benefits may very well balance out in the long run, network exchange is not simultaneous and is not subject to the short-term rational calculations of a market transaction – the issue that much of the network proponents miss is whether there is a *long-term* rational calculation. Often, the distinction between short-term and long-term rationality and efficiency is missed.

Central to the coherence of these network relationships is the rather ineffable factor termed “trust.” In general, all the research has shown that the “longer the shadow of the future” is the greater the likelihood that cooperation, or trust, will emerge between them (Axelrod 1993). Trust is a remarkably efficient lubricant to economic exchange as it reduces the uncertainties associated with exchange.

Extending Powell's and others' concept that networks are a third organizational form, Paul Adler (2001) argues that trust is the key coordinating mechanism of the

network form of organization.³ In addition he distinguishes three sources of trust, and three mechanisms by which these sources are generated based on the work of Coleman (1990).

Three sources of trust can be distinguished:

- i. Familiarity through repeated interaction.
- ii. Calculation (calculative form of trust).
- iii. Norms that create predictability and trustworthiness.

Three mechanisms by which trust is generated:

- i. Direct interpersonal contact.
- ii. Reputation through a network.
- iii. Institutional or social context of the exchange.

The first source of trust, familiarity, depends only on frequent interaction between two actors who come to know and trust one another. Calculation, or the calculative form of trust (Williamson, 1993), is supported by reputations maintained within a network. Norms shape one's trust of actors and are supported by the social or institutional context of the exchange.

If we accept that trust is the coordinating mechanism of networks, along with price and commands being the respective coordinating mechanisms of market and hierarchy, these concepts can be pulled together into a table illustrating some of the characteristics of these organizational forms.

³ Adler uses the term community instead of network to describe the third ideal organizational form along with market and hierarchy. As is frequently the case in this literature very similar concepts may go by different names. Indeed, Adler uses the term network more narrowly than it is used here.

Table 1

Organizational Form	<i>Market</i>	<i>Network</i>	<i>Hierarchy</i>
Coordinating Mechanism	Price	Trust	Command
Mechanism Foundation	Contract Law	Social Capital	Authority

Source: Adler (2001), Powell (1990), authors

Social capital provides the foundation for trust in network forms of organization just as contract law maintains the legal foundation of the market and authority provides justification for obedience in hierarchies. Within this framework a definition of social capital can be offered that adheres to Coleman's functional definition of social capital, and also provides a usable definition that can be applied to both Northern Italy and Silicon Valley.

Social capital is defined as the means by which reciprocal, or non-simultaneous, exchange can occur in network forms of organization. These means are the support for the trust that is required among parties for this type of exchange to occur. Social capital is the setting whereby individuals can prove their trustworthiness, individuals can be monitored for their trustworthiness, and sanctions can be applied in the event that this trust is violated.

Trust, and the social capital that supports it, is the common element to the industrial districts described by Putnam, and Silicon Valley. The way in which social capital supports trust in these regions differs greatly. In Silicon Valley the foundation of trust is one based on a reputation for competence. Adler (2001) refers to this type of trust as reflective, Williamson (1993) refers to it as calculativeness, and Sabel (1993) calls it studied trust.

Within Silicon Valley Cohen and Fields (2000) argue that the basis of trust is reputation for performance, and not one's social or familial connections within the larger community. "Frequent, commercially focused contacts generate judgement: 'He's reliable; he's straight; you can count on him to fulfill his end and do it well, reliably, on time.' This is the stuff of reputation, of commercially valuable trust." p.216.

The importance of networks linking individuals across different companies within Silicon Valley is emphasized in Annalee Saxenian's *Regional Advantage*. In her view the technical expertise of Silicon Valley is spread across hundreds of enterprises tied together by interfirm networks characterized by cooperation as well as competition. The personal bases for these networks conforms to what has been outlined above. Saxenian provides the following description of social relationships among engineers in the valley:

"The informal socializing that grew out of these quasi-familial relationships supported the ubiquitous practices of collaboration and sharing on information among local producers. By all accounts, these informal conversations were pervasive and served as an important source of up-to-date information among competitors, customers, markets, and technologies...". pp. 32-33.

Of course, for our definition of trust the quasi-familial relationships that Saxenian detects in Silicon Valley are not necessary. What is necessary is the type of trust that comes from knowing someone can deliver. A family member that cannot deliver is not useful in Silicon Valley. In fact, in contrast to Northern Italy, in very few Silicon Valley firms do family members inherit high-level managerial spots.

The nature of the trust that is required for such exchanges of information is revealed when Saxenian (p.33) notes that: "Local engineers recognize that the quality of the feedback and information obtained through their networks depends upon the credibility and trustworthiness of the information provider. This sort of quality is only assured with individuals with whom you share common backgrounds and work

experiences." Common professional backgrounds and shared work experiences provide the trust that these exchanges are credible. Over time an individual's reputation is enhanced by reciprocal trading of know-how (Von Hippel, 1987). However, failure can quickly erode one's reputation, and the phone stops ringing.

Networks and Innovation

Adler (2001), Powell 1990), and many others maintain that networks are better suited to the coordination of knowledge intensive, high technology production than are either markets or hierarchy. If, as has been argued here, social capital is the foundation of trust, and trust is the coordinating basis of networks, then a direct path from social capital to innovation has been identified.

Powell (1990) argues that the differing forms of organization all have different strengths and weaknesses. Markets are remarkably efficient in processing information when all of the relevant information can be expressed by price. It has been well established (Stiglitz, 1994), though, that markets fail to function well in the allocation of knowledge due to incomplete information and the public goods aspect of knowledge. Robertson and Langlois (1995) argue this explicitly linking innovation, networks, and vertical integration together.

Theoretically, hierarchies are particularly well suited for mass production and distribution, but when confronted with unanticipated changes their liabilities are exposed.⁴ All of Hayek's criticisms of economic planning, of the difficulty of collecting widely spread and individually held knowledge to the center, applies to firm level

⁴ It is interesting to note that in the real world the large hierarchical firms have far longer life expectancies and lower rates of failure than do small firms, even those in networks. The large firms have enormous reserves of capital and human talent that provide them with resources to adjust to change.

hierarchies as well.

Networks, Powell (1990) argues, are lighter on their feet than hierarchies. Networks are particularly well suited in the exchange of commodities, such as knowledge, whose value is difficult to measure. Technological know-how is not easily traded through markets, nor is it readily communicated through a corporate hierarchy. The relational nature of the ties between members of a network, the absence of explicitly quid pro quo exchange among them, enhances the transmission of knowledge among members of a network. (Powell, 1990: 303-304; Adler, 2001).

Each organizational form, we argue, has evolved and survived in those economic and technological environments where they are well suited to the organizational demands put upon them. The argument made here, and by many others, is that network forms of organization are particularly well suited to those environments where knowledge is the indispensable input into the productive process. And it is this type of knowledge intensive environment that produces innovations.

Networks in Silicon Valley

How can we conceptualize how networks actually operate within Silicon Valley? Alfred Marshall's (1980) observations on the nature of economic regions are remarkably applicable to Silicon Valley and all industrial clusters. Marshall advanced three reasons why industries would cluster geographically. The first of two reasons is the ability of regions to support specialized suppliers of goods and services as inputs, the second is their ability to support a large market of workers with highly specialized skills. Both of these capabilities can be described as external economies of scale to the region, as distinguished from the internal economies of scale of an individual firm. Marshall's third

reason why firms tended to cluster is due to knowledge spillovers or externalities. When a firm shares the same neighborhood as other firms in the industry it receives knowledge held by firms in the cluster as a spill-over. "The mysteries of the trade become no mysteries; but are as it were in the air..." (Marshall, p.271).

In Silicon Valley, there is a very high level of knowledge held within individual firms, but this would be true whether they were located in clusters or in isolation. In Silicon Valley, there is also a very high level of knowledge about the firms as well. This information is differentially more available to those in the Valley **and** in the network. This knowledge is not just technical, it is a knowledge about who is a good manager or well connected. It is embedded in the social setting, a knowledge that comes from learning and being in the place where the knowledge is being used, and having an opportunity to use it in that setting. It is about knowledge use and production in action.

The knowledge described above, Marshall's "mysteries of the trade", are held in what Brown and Duguid (2000: 24-25) call communities of practice. "At whatever level or task, small groups working closely together, sharing insights and judgement, both develop and circulate knowledge inevitably as part of their practice." Although shared practice makes it easy to circulate knowledge within the group, or community of practice, the absence of shared practice makes it difficult to share this information outside the group. Once this limitation is recognized it becomes clear that information within a firm cannot be costlessly transmitted among the diverse communities of practice that comprise the entire firm.

Even as these communities of practice explain why knowledge does not move costlessly within a firm, they also show how knowledge can be transmitted across firms via these communities or networks. In fact, Brown and Duguid refer to these networks as

networks of practice to distinguish them from communities of practice where individuals work together. Networks of practice are comprised of individuals engaged in a similar practice, and it is this similar and shared practice that acts as an informal conduit of information between firms.

The matrix Brown and Duguid describe of vertically, hierarchically linked, heterogeneous communities of practice (engineering, design, marketing) within a firm; connected horizontally to other firms by networks of practice that tie together similar communities of practice, goes a long way towards conceptualizing the flow of information within Silicon Valley and the nature of knowledge spillovers within industrial districts. The type of exchange and communication of knowledge that occurs across these networks of practice requires frequent and close interaction among individuals. The nature of these interactions is reciprocal and therefore requires trust. Because this trust is best maintained by face-to-face interaction geographical proximity is important.

This matrix, or ecology, also shows how knowledge embodied in people migrates within an industrial district like Silicon Valley. Individuals, in appropriating the returns to their own knowledge, may choose to move from one firm to another, or most importantly for innovation, attempt to start up a new firm. This mobility of people within a cluster, particularly in starting up their own firms, is one of the principal ways by which knowledge spills over in a cluster. (Audretsch and Keilbach, 2002).

In Silicon Valley and other places like Israel, one of the great forces assisting and even pulling people and the ideas they hold out of existing firms and into start-ups is venture capital (Kenney and Florida, 2000; Avnimelech et al., 2003). Indeed, within Silicon Valley venture capitalists are but one actor in the institutional infrastructure that

has evolved to enable the creation and growth of new firms (Bahrami and Evans, 2000; Florida and Kenney, 1988; Schoonhoven and Eisenhardt, 1989).

Silicon Valley can be considered as two intertwined but analytically separable economies. The first set of organizations consists of established firms, corporate research laboratories, and universities that are the constituents of the existing economy that are in one form or another not unusual for any industrial cluster. Silicon Valley, however, has another set of organizations that combine to create an "economy" predicated on facilitating entrepreneurs in the creation of new firms. Kenney and von Burg (2000) argue that this other economy is the *differentia specifica* of high-technology regions such as Silicon Valley or Route 128, and is the trait that sets them apart from most other regions of industrial clustering.

The organizations of the first economy, either because of their charter to do research as in the case of universities and R&D laboratories, or as a by-product of their normal activities as in the case of firms, create inventions that may be capable of being capitalized in an independent firm. This ability to extrude an invention from an existing firm is facilitated by the rapid pace in high-tech industry, which often creates technological discontinuities and accompanying economic opportunities. In the electronics industry there have been recurring discontinuities, and very often the existing firms are unwilling or unable to exploit them, or simply miss them because they are preoccupied with their current businesses and customers (Christensen 1997).

The organizations of the second economy are dedicated to the creation of new firms to exploit such opportunities. Just as computers and microprocessors are the actual products of the firms found in the first economy, new firms can be seen as the products of the institutional infrastructure of the second economy dedicated to the creation of new

firms. One can refer to the particular constituents within this infrastructure that a start-up wishing to go public must turn to as the firm's entrepreneurial support network.

One of the principal advantages of choosing to locate a new firm in a cluster is to access the knowledge spillovers that are to be found there. But as Powell et. al. (2002) argue, the existence of an infrastructure within a cluster that fosters knowledge transfer and the provision of capital is an important element in the firm's decision as well. This infrastructure, or support network, is comprised of universities, law firms, research institutes, venture capitalists and other professionals. This entrepreneurial support network maintains channels of communication among market participants that not only supports the public good nature of technological knowledge, these channels also reduce the transaction costs of comprehending and utilizing such information (Antonelli, 2000).

In capitalist economies, quite naturally, access to capital is a requirement. Two financial intermediaries, venture capitalists and investment bankers, provide this access. The role of spatial and network proximity for financial intermediaries has attracted significant attention recently. Agnes (2002) in a study of the interest rate swaps industry found that "different financial services have differing informational contents, with implications for the local embeddedness of financial services firms." Abolafia (1997) finds that the necessity of social and physical proximity differs by the nature of the financial product. So, for highly standardized products such as listed equities and government bonds, traders need not be proximate, whereas for other more idiosyncratic financial instruments proximity is of greater importance.

There is an ample literature suggesting that venture capital investing is a locally embedded practice, because of the importance of their monitoring and informal assistance functions that go beyond simply providing capital (Florida and Kenney 1988; Sorenson

and Stuart 2001; Gilson and Black, 1998). Indeed, Greenwald and Stiglitz (1992) have observed that the venture capital industry shares many aspects with early financial market communities. Because venture capital firms operate in a tightly knit community and have detailed information of the projects they fund and the industries in which their entrepreneurs operate, there is a strong reliance upon trust and reputation in the relationship between venture capitalists and the firms they fund. The critical venture capitalists in a start-up are what are termed the “lead” venture capitalists who are the board members and those most responsible for monitoring and assisting the firm (Gompers and Lerner 1999), and it is these venture capitalists that one would expect to be local.

Investment banks are another part of a firm's entrepreneurial support network. Their expertise and connections with venture capitalists and entrepreneurs are core assets, from which other specialties have arisen. The history of the investment banks is quite interesting. During the early days of Silicon Valley, the New York investment banks being based in New York had minimal presence on the West Coast. To fill in the void, a number of boutique investment banks, including Hambrecht & Quist, Robinson & Steffens, and Montgomery Securities emerged in San Francisco. They specialized in servicing Silicon Valley startups and developed strong technology practices. To take a firm public, they teamed up with a Wall Street firm. The enormous success of these boutiques attracted the major Wall Street underwriters like Morgan Stanley and Goldman Sachs to establish branch offices in Silicon Valley. Also, the large banks intent upon entering the investment banking business acquired the San Francisco boutique firms to secure access to the lucrative IPO underwriting business that was so dependent upon personal networks.

The legal profession is, quite naturally, local in practice even though most large legal firms have numerous branch offices. High-technology lawyers for small start-ups often have a multifaceted role that extends far beyond merely providing the legal services such as incorporation documents, etc. They often advise entrepreneurs and provide introductions to venture capital firms and other business services (Suchman 2000). The most important legal firms evolved to specialize in a high-technology practice that includes some level of involvement in the raising of capital, structuring agreements with key personnel, and ensuring that the entrepreneur's relationship with a previous employer is legal.

All of the actors comprising a firm's entrepreneurial support network, such as venture capitalists, investment bankers, and law firms, serve to lower the barriers to entry for new firms and are therefore an essential component in the innovative capacity of Silicon Valley. And, to the extent that their contribution to the start-up process is based more on their network connections, which, unsurprisingly, mediate the access to capital or legal advice, is the extent to which social capital is indispensable to the innovation process in the Silicon Valley.⁵

Silicon Valley has both strong horizontal networks between actors undertaking the same activities, such as networks of venture capitalists, entrepreneurs, investment bankers etc. These are important for spreading information through the networks of practice. However, it also has rich vertical networks between, for example, suppliers and customers. For this paper they are as important as are the networks of constituents of the second economy such as venture capitalists, lawyers, investment bankers, etc. Thus

⁵ John Seely Brown, former director of the Xerox Palo Alto Research Center (PARC), views venture capitalists and lawyers in Silicon Valley as knowledge brokers whose connections within Silicon Valley are their greatest asset.

Silicon Valley should be seen as a network of networks with a wide variety of ties.

Conclusion

The term social capital is widely used, but has a somewhat imprecise meaning. This paper has developed a definition of social capital that is applicable to both the industrial districts of Northern Italy described by Robert Putnam and the Silicon Valley described by Cohen and Fields and Kenney and von Burg. Using James Coleman's functional definition of social capital, we argued that social capital's function is as a support of trust, and that trust is the coordinating mechanism of network forms of organization. Network forms of organization are better suited to knowledge intensive production than either markets or hierarchy, and that they are therefore more successful in fostering innovation. However, we caution here that in the case of incremental innovation, as Robertson and Langlois indicated networks might not be either the best or only way of organizing such innovation regimes.

The key feature of the definition of social capital developed here is in its role in the support of trust relations among economic actors. Although ours is a functional definition, one of its advantages is that it limits the range of subjects that can be referred to as social capital. The phenomena in American life that can be measured by declining membership in voluntary organizations may very well be social disconnectedness, but we do not think that this measures a decline in social capital if that term is to have meaning for economic development and innovation.

This is not to say that such social connectedness is not important for economic development. It likely is, and the industrial districts of Northern Italy would have to be differently organized absent such social connectedness. But such connectedness is not

essential for the successful operation of every industrial cluster as is the case of Silicon Valley. Rather, we argue that what Northern Italy and Silicon Valley share is the network form of organization. In both regions there is a form of trust, though, quite likely, a different type of trust that creates a form of social capital that supports their economic activities.

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