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An Examination of Social Capital in Silicon Valley

Introduction and Executive Summary

It is difficult to imagine an example of regional economic development that is more successful than California's Silicon Valley, or more famous. Investors from all over the world arrive with suitcases of money to place in what they hope will be the Valley's next success story. Ambitious, educated people—mostly young—from dozens of nations arrive to take their chances in start-ups fueled by stock options. Regional development theorists study Silicon Valley to identify the underlying characteristics that have enabled this area to become one of the most innovative and prosperous regional economies in the world. Policy makers visit seeking to determine whether the characteristics identified by the theorists and journalists—and the stories they are told during their visit—can somehow be transferred to develop innovation-based economic development in their own regions.

Riding the newest wave of regional development theory is the notion of ***social capital*** popularized by Robert Putnam in his influential book, *Making Democracy Work.*[1] Putnam's idea refers to the complex of local institutions and relationships of trust among economic actors that evolve from unique, historically-conditioned local cultures. Such institutions and social relationships, built upon the experiences of a shared deep history, become embedded within a localized economy and form what Putnam describes as *networks of civic engagement* that facilitate the activities of politics, production and exchange. In these locales of tight civic engagement people know one another and one another's families; they meet frequently in non-work related organizations and activities. They constitute a dense and rich social *community*. Business relationships are embedded in community and family structures. Those structures not only generate contact and information transmission. They reinforce trust by sanctioning, in powerful and

[1] Robert D. Putnam, *Making Democracy Work: Civic Traditions in Modern Italy*. (Princeton: Princeton University Press, 1993a).

multidimensional ways, the breaking of trust. In Putnam's model, cooperation based on trust, which in turn is rooted in complex and deep social ties, propels development. It is an inherited historical characteristic.

Does the analytic wave of Regional Development represented by Putnam's model of social capital apply to Silicon Valley? No. To use a Valley metaphor, the wave breaks at the shores of Silicon Valley in a way that precludes successful surfing. Put more formally, the thesis of this essay is that Putnam's particular concept of social capital, whatever its power as an explanation of local prosperity elsewhere, does not fit the experience of Silicon Valley. Worse yet, it risks obscuring understanding of the nature of the social capital on which Silicon Valley was built and through which it continues to construct itself.

The sources of technological dynamism in Silicon Valley can be described in many ways, but there is little truth in the idea of Silicon Valley as a community of dense civic engagement. 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 resultant 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.

Silicon Valley is, however, an economic space built on social capital, but it is a vastly different kind of social capital than that popularized by the civic engagement theorists. In Silicon Valley, social capital can be understood in terms of the collaborative partnerships that emerged in the region owing to the pursuit by economic and institutional actors of objectives related specifically to innovation and competitiveness. It is the networks resulting from these collaborations that form the threads of social capital as it exists in Silicon Valley. What these networks of innovation in Silicon Valley share with the networks of civic engagement is simply and only a common network-like structure.

There is virtually nothing in the history of Silicon Valley to connect its networks of innovation to a dense civil society.

The network environment in Silicon Valley is the outcome of historically-conditioned, specifically-chosen collaborations between individual entrepreneurs, firms and institutions focused on the pursuit of innovation and commercialization. Its foundations can be traced in part to ideas proposed by Alfred Marshall and Thorsten Veblen that have influenced social capital theory. These collaborations also result from what some theorists refer to as "historical accident", as well as broader, nationally-based, institutionally-driven trajectories of development, and competitive choice.[2] They are buttressed by the nature of the Silicon Valley markets for labor and capital, by the internal dynamic of successive innovation, and by the simple momentum of economic success. From the convergence of local historical chance, national historical currents, and choice emerged the collaborations at the foundation of Silicon Valley's technological dynamism. This paper seeks to describe the social capital networks in Silicon Valley by reviewing how these historical choices were made, examining the relationships resulting from these choices, and inquiring whether policy can help create functionally comparable relationships in other economic regions.

Silicon Valley is traditionally defined as an area beginning about 35 miles south of San Francisco and extending through San Jose. It encompasses some 1,500 sq. miles, with a population of 2.3 million, and 1.2 million jobs (although “the Valley” has been rapidly extending beyond these borders). About one-fourth of the residents are foreign born. The area has added about 200,000 jobs since 1992, with about 53,000 added in 1997. Average annual wages are $46,000 (vs. $29,000 US average).[3] In 1997, venture capital invested into Silicon Valley amounted to $2.7 billion, constituting about 21% of the national total.[4] About 3,575 new firms were incorporated in the Valley in 1997: over 73 firms were classified as “gazelles,” that is companies with at least $1 million in sales

[2] Paul David, "Historical Economics in the Long Run: Some Implications of Path-Dependence," *Historical Analysis in Economics*, Graeme Donald Snooks, ed. (London: Routledge, 1993) pp.29-40; W. Brian Arthur, "Competing Technologies, Increasing Returns, and Lock-in by Historical Small Events," *The Economic Journal*, 1989, Volume 99, pp.116-131.
[3] Joint Venture: Silicon Valley Network, *1998 Index*. See http://www.jointventure.org/resources/1998index/index.html
[4] Price Waterhouse Coopers, *Venture Capital Survey*, 1998

that sustained annual compounded growth rates of at least 20% for the previous four years.[5]

The Silicon Valley economy is dominated by rapid innovation and commercialization in an expanding set of new technologies. Micro electronics (semi conductors, e.g. Intel, AMD, National Semi, Cadence, LSI) and later computers (Apple, Sun Microsystems, HP, Tandem) put the Valley on the world map, and continues to be a major activity; computer networking, both hardware and software, (e.g. Cisco, Netscape, Yahoo, Broadvision) has recently exploded as a major and shaping activity. Bio-technology along with medical devices and drug delivery systems constitutes the third major new technology in which the Valley is a world center, if not the world center. Along with these core industries, venture finance and intellectual property law have become major activities in their own right. The Valley is an enormously prosperous region. Standard data, which rely on wages and salaries (more than 150% of the national average) miss the critical turbo charger: capital gains from stock options which add hugely to the valley's wealth accumulation, not just at the very peak of the income distribution, but quite a way down into the engineering, professional and managerial ranks, and occasionally even lower. The constraint on this growth is classic, Ricardo's law of rent: real estate prices, rising wages (average wages in software, semiconductor and semi-equipment firms hit $85,500 in 1996!) and congestion (average delays in auto traffic keep rising in the past three years) create a constant spin-off of new plants and facilities into other, lower cost regions. Silicon Valley firms no longer manufacture many semiconductors in the Valley.

The main networks of social capital in Silicon Valley are not dense networks of civic engagement, but focused, productive interactions among the following social institutions and entities:

1. The great research universities—Stanford, UC Berkeley and UC San Francisco (UC Medical school) with 1) their innovative approach that creates tight relationships to outside actors who commercialize applications of their research and researchers and 2)

[5] Joint Venture: Silicon Valley Network, *1998 Index*.

their recruitment of faculty and graduate students from all over the world, not just locally or nationally. (For a non-trivial example, about one-third of the graduate students at Berkeley in electrical engineering and computer science are foreign nationals; a similar proportion of the faculty is foreign born).[6]

2. US government policy, *in the early phases of microelectronics and computer networking*—both as sponsor of University research and critically, as lead-user.

3. Venture Capital firms: not only as home grown source of early stage capital but also as locus of high-tech investment expertise and Godfather services to start-up companies such as the provision of experienced executives at critical moments of a firm's development, strategic and operational advice, links and leads to potential customers and partners.

4. Law firms, which provide another source for locating key personnel, finance contacts, as well as corporate and intellectual property legal services, and who often take payment in stock rather than cash.

5. The leading figures in University engineering departments, venture firms, law firms and operating firms in the Valley know one another—through frequent business and professional contact. The density of lawyers in this community (about one lawyer per ten engineers) provides an operational definition of the limited role of informal, familial and communitarian trust.[7] The opposite of trust is "accountability" and the arbiters of accountability are accountants and auditors; in Silicon Valley they outnumber the lawyers. In sum, there is one lawyer-accountant duo per five engineers.[8]

[6] Graduate Division, University of California at Berkeley, *Department of Electrical Engineering and Computer Science Statistics*, December 1997.
[7] Employment Development Department, Labor Market Information Division, *Occupational Projections*, June 1997. See http://www.calmis.cahwnet.gov/htmlfile/msa.htm.
[8] Ibid.

6. Stock options: employees (not counting a firm's "founders" and CEO) often hold options and shares amounting easily to 10 or 15% (or more at the early stages) of a firm's capital value. These reward success with giant payoffs (as well as serve to extend loyalty and employment tenure of key employees for the several years of the option holding period. The amounts are non-trivial. For example, a currently super successful Valley firm, Cisco Systems, now has a capital value that exceeds that of the Ford Motor Company.

7. The Valley labor market has several important characteristics that define the Valley's particular brand of social capital. First there is no stigma in leaving a large and very successful company such as Hewlett Packard or Sun Microsystems to launch a start-up. A few years ago, this was not the case (for example, in many leading companies in Europe – not to mention Japan). What also continues to differentiate the Valley is that should the start-up fail, jobs await a seasoned entrepreneur at large Valley firms—as well as through venture capitalists and head hunters looking for executive leadership for other new companies. Second is rapid turnover. People (at all levels) shift from company to company. This has many consequences, one of which is technology diffusion. In Silicon Valley technology and know-how have legs. Third is recruitment of talent, especially scarce technical and entrepreneurial talent, from literally the entire world. To meet the needs of their clients, Silicon Valley law firms have developed a substantial capability—sometimes in-house, sometimes networked—in immigration law.

8. Finally, there is the specific nature of the industrial activities that shape the region's social capital, valuing and strengthening some kinds of social structures compared to others, as well as defining its industrial specialization. In much of the recent literature that focuses on the social characteristics of Marshallian districts too little attention has been paid to how substantively different industrial activities favor different industrial and social structures. For example, in our view, comparisons between Boston's high tech industrial district and Silicon Valley vastly neglect the important differentiating characteristics between defense electronic systems and then mini computers—the defining

activities on the Boston side—as compared with micro electronics and computer networking, the defining activities in Silicon Valley. Similarly, great research universities, abundant engineering talent and venture capital play only a limited role, if that, in Milan's dynamic "Marshallian district" for high fashion, or in the Italian tile-making district, or in Detroit's—and now Kentucky's—auto districts, or in Georgia's carpet and towel belt. Ultimately, what you do shapes how you do it—all the way back up the value chain, and all the way out into forms of social organization. It would be ill-advised policy that strives to make electronics innovation or new software applications in the same social milieu as footwear, underwear, diamonds, axels, auto seats or carpeting.

It is the cooperative—and competitive—interaction of these critical elements that defines Silicon Valley as a system of social capital. All the rest, such as informal conversations in bars or bowling teams is, relative to other places, somewhat underdeveloped and ancillary. Unlike Putman's vague, but radically deterministic concept of the historic formation of civic culture and social capital—which fixes the future development paths of the Italian regions he studies back in the late Middle Ages—these key elements of social capital both accurately define the reality of the Silicon Valley's experience, and are far more amenable to shaping by well-informed policy.[9]

The Lineage of Social Capital and its Critique

In his engaging account of the divergent economic fortunes manifested by different Italian regions, Robert Putnam insists that there is a connection between the degree of social capital accumulated within a region and its economic performance. The vexing question for Putnam, along with others sympathetic to his approach, is what constitutes this elusive concept, social capital.

[9] On how Putnam sets the development trajectory of his regions as fixed by the late middle ages, and more generally on the deterministic character of Putnam's concept, see Jonah Levy, *Tocqueville's Revenge*, (Harvard University Press, 1998) and S. Tarrow in *American Political Science Review*, 1996, 90 (2), pp. 389ff.

According to Putnam, social capital is akin to a "moral resource."[10] It refers to the features of social organization that facilitate coordination and cooperation for mutual benefit.[11] Social capital is embodied in what Putnam calls "networks of civic engagement" that evolve over time owing to historical traditions of citizen involvement in a broad range of social, economic, and political activities. Where there is a vibrant civil society, there are bonds of trust and reciprocity. These bonds facilitate the networks of civic life at the core of social capital. The relative strength or weakness of these networks within a region will have a paramount impact on the character of the region's economic life.

Despite the somewhat mysterious nature of how these networks actually get created, Putnam is very clear on the link between social capital and economic development, and the policy implications of this link. Communities, he argues, did not forge networks of civic engagement because of their prosperity. On the contrary, communities in Putnam's view become prosperous because they are civic.[12] "The social capital embodied in networks of civic engagement seems to be a precondition for economic development..."[13] According to Putnam, there is an obvious policy lesson to be learned from the connection between social capital and economic prosperity, and he implores policymakers to take note of the way that "civics matters." The policy lesson to be drawn from Putnam's thesis is that if communities create networks of social capital, prosperity is likely to follow.

Two distinct theoretical lineages converge in Putnam's work on the relationship between social capital and localized economic performance. One tradition derives from Alfred Marshall and his notion of economic vibrancy within localized industrial districts. The other tradition, perhaps less commonly associated with social capital, is traceable to the writings of Thorstein Veblen on how institutions create competitive trajectories of growth and technological innovation.

While the emphasis of Marshall's monumental work is the power of supply and demand to generate equilibrium prices in markets, he nevertheless established a unique

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[10] Robert D. Putnam, "The Prosperous Community: Social Capital and Public Life." *The American Pro*spect, Spring 1993b, p. 37.
[11] Ibid. (1993b), pp. 35-36; (1993a), p. 167.
[12] Ibid., pp. 152-162.
[13] Ibid. (1993b), p. 37.

framework for understanding the dynamism within certain localized regions through his concept of external scale economies.[14] According to Marshall, economies of scale are not restricted to the internal operations of the individual firm. The concentration of firms in an industry in one location can also provide benefits to individual firms owing to the effects of proximity to one another. Such firms that are clustered together can take advantage of access to specialized suppliers, skilled labor, and an environment enabling the spillover of technological knowledge from one firm to another. For Marshall, these external economies operated much like internal economies by lowering costs and helped explain the phenomenon behind the agglomerations of firms from the same industry that Marshall termed industrial districts. In his celebrated metaphor describing the concentration of the cutlery industry in the area of Sheffield, England Marshall writes that in such a district where firms from the same industry are concentrated: "The mysteries of the trade become no mysteries, but are as it were in the air..."[15] Thus, from Marshall and his notion of external scale economies emerges a picture of localized economic vibrancy, nurtured by the cost savings of resource-sharing and information exchange that occurs within a localized industrial environment. But Marshall's magistral work provides more of an understanding of an "industrial district"—that is a successful specialized local economy—than any special insight into the nature of social capital.

In contrast to Marshall, Thorstein Veblen rejected the neoclassical notion of equilibrium in markets and embraced metaphors from evolutionary biology in arguing that the key to economic development resided in the capacity of institutions to adapt to ever-changing market conditions.[16] Veblen likened the economy to an evolutionary phenomenon of disequilibrium in which competition and natural selection prevailed.[17] In this evolutionary process, industrial structures, spawned from market competition, and institutions develop in an interlocking embrace. Once established, however, within the context of this interactive evolution, institutions play a fundamental role in shaping the

[14] Alfred Marshall (1890: I), "*Principles of Economics.*" Two Volumes. (London: Macmillan and Company,1961) pp. 267-277, 314-320.
[15] Ibid. (1890: I), p. 271.
[16] Thorstein Veblen (1898), "Why is Economics Not an Evolutionary Science?" *The Quarterly Journal of Economics, Volume* 12, pp.373-97.
[17] Thorstein Veblen (1899), "The Theory of the Leisure Class: An Economic Study of Institutions. New York: B.W. Huebsch, 1924, p. 188.

market process by assuming one of two basic tendencies. Institutions either remain static and rigid, thereby giving rise to a type of "friction" between an existing industrial structure and the institutional arrangements that have emerged around it.[18] Or, institutions may adapt to changing market forces enabling industrial structures and economic development to assume a dynamic, and more technologically advanced character. What Veblen was intent upon uncovering were those factors promoting or precluding institutional adaptation that enabled the process of technological innovation to occur for economic advance.

What eventually led the insights of Marshall and Veblen to resurface in the social capital literature were the debates initiated in the late 1970s on the differences distinguishing regional economies which rekindled interest in the phenomenon of industrial districts. Providing the catalyst for these debates was a dramatic reversal in economic development trends beginning in the 1970s. These trends included: 1) the tendency of certain regional economies with heavy concentrations of small and medium sized firms to outperform other economies owing to their capacity for innovation;[19] 2) the apparently disproportionate contribution to economic growth and development made by smaller firms in the context of this crisis;[20] and 3) the competitive difficulties experienced by large firms beginning in the late 1970s and their seeming inability to evolve and adapt to a transforming world marketplace.[21] In our view, the starting-point observations about the relative weaknesses of giant firms, especially the ill-conceived assumption about their inability to adapt and evolve, constitute a major weakness at the very heart of this literature. As in its emphasis on local culture and regional development, it was a bit blind to sector specific effects and a bit too quick to generalize from a small set of overlapping case studies. In most sectors, in most of the industrialized world, established industrial

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[18] Thorstein Veblen (1915), *"Imperial Germany and the Industrial Revolution."* New York: Macmillan; Geoffrey M. Hodgson, "Precursors of Modern Evolutionary Economics: Marx, Marshall, Veblen, and Schumpeter." *Modern Institutional Economics.* Richard W. England, ed. (Ann Arbor: University of Michigan Press, 1994), p25.

[19] Sebastian Brusco, "The Emilian Model: Productive Decentralization and Social Integration." *Cambridge Journal of Economics.* Volume 6, 1982, p.167-184.

[20] David L. Birch, *"The Job Generation Process."* Cambridge: MIT Program on Neighborhood and Regional Change, 1979, p. 31; Michael B. Teitz, Amy Glasmeier, and Douglas Svensson, *"Small Business and Employment Growth in California."* Working Paper No. 348, Berkeley: Institute of Urban and Regional Development, 1981.

[21] Michael J. Piori and Charles F. Sabel, *The Second Industrial Divide.* (New York: Basic Books, 1984); see also Bennet Harrison, *Lean and Mean: The Changing Landscape of Corporate Power in the Age of Flexibility*. (New York: Basic Books, 1994), for an opposite view that reviews some of this literature.

giants such as GE, Boeing, Coca-Cola, Hewlett Packard, Nestle, Merck, Monsanto, Unilever, ATT (now Lucent), Ford, Volkswagon, Merrill Lynch, Citicorp, United Parcel Service, and even IBM (not to mention the Japanese majors such as Toyota, Sony, and Toshiba), have grown, adapted and evolved quite handsomely. Big firms proved to be quite flexible and adaptable—perhaps more so than most specialized districts! Theorists working within this particular approach began to reassess what drives the process of economic development within regions, and to contemplate how the factors driving development could be reproduced, through policy choices, from place to place. The result was the "rediscovery of the region" by contemporary regional development theorists and a search for the factors underlying the "resurgence of regional economies."[22]

Perhaps the defining moment in this reappraisal of the region and search for what made certain regional economies technologically dynamic, was the celebrated work by Michael Piore and Charles Sabel, *The Second Industrial Divide* (1984). For Piore and Sabel, the second industrial divide marked a profound historical separation between the formerly dominant system of mass production and a newly-emerging paradigm of flexibly-specialized production. In this divide was a very real phenomenon—the late twentieth-century industrial district—which was the economic and geographical manifestation of the future. In the midst of the difficulties experienced by large firms and the districts dependent upon them certain industrial districts had continued to prosper most notably in Italy, but also in Germany, Japan, and even the U.S. Firms within these enclaves had become more innovative owing to their small size and their resultant capacity to overcome the constraints of mass production. According to Piore and Sabel, such districts, based upon small, flexibly-specialized companies, had their origins in the craft production of the late nineteenth century.

This contemplation of the future in terms of the past by Piore and Sabel garnered further support in the research of historians such as Herbert Kisch (1989), Sidney Pollard (1973, 1981), and more recently by Gary Herrigel (1996). Kisch, Pollard and Herrigel all supplied potent historical justifications for the phenomenon of industrial districts in

[22] Michael Storper, "The Resurgence of Regional Economies, Ten Years Later: The Region as a Nexus of Untraded Interdependencies." *European Urban and Regional Studies*, Volume 2, no. 3, 1995: pp.191- 221.

Europe, arguing that such regional industrial economies, based upon smaller specialized firms, had far-reaching historical roots in the period of so-called "proto-industrialization" of the eighteenth century. These historical accounts provided additional evidence that the (re)discovery of localized industrial systems by Piore and Sabel was not something ephemeral or limited in scope. Economic development within vibrant regionally-based industrial districts had a strong historical basis.

Inspired by the historically-based thesis of Piore and Sabel, scholars searched for the secrets of what made these localized regional economies technologically dynamic and successful. In this search, the aim of theorists was not only to link the economic performance of successful regional economies to flexible networks of resource- and information-sharing among firms and adaptive local institutions. Instead, the research agenda of regional theorists focused on uncovering what was at the foundation of local networks and adaptive institutions. What was added to the framework established by Marshall and Veblen by theorists who, in attempting to explain the vibrancy of industrial districts, were inspired by *The Second Industrial Divide* was a critically important, albeit elusive concept—the concept of trust. It is this notion of trust that ultimately resurfaces as a key element in Putnam's theory of social capital and economic prosperity.[23]

Trust lies at the foundation of relationships between firms and individuals whose collective activity in competing and cooperating within a regional setting is a key aspect of innovative local economies. A broad literature has emerged dealing with this concept and how the presence or absence of an environment of trust among economic actors within a place helps explain regional economic performance and regional differentiation. According to Charles Sabel, trust refers to the mutual confidence that no party involved in an exchange transaction in the market will exploit the others' vulnerability.[24] For Sabel, such trust requires time to evolve. Where it does evolve, it makes possible an environment of cooperation existing alongside competition, that becomes a source of mutual benefit for firms and individuals, and helps explain how regional economies

[23] On trust, see D. Gambetta, ed., *Trust,* (Oxford; Basil Blackwell, 1988), p.32; and R. Mayntz, "Modernisation and the Logic of InterOrganizational Networks," *Knowledge and Policy*, Spring 1993, Volume 6, pp. 3-16.
[24] Charles F Sabel, "Studied Trust: Building New Forms of Cooperation in Volatile Economy." *Explorations in Economic Sociology*. (Richard Swedberg, ed., New York: Russell Sage Foundation, 1993) p. 104.

engendering such trust, are able to prosper.[25] According to Sabel, the creation of trust in certain localities is actually a process of learning—a process of determining how to create forms of consensus-building among economic actors with both competing and mutual interests. The associations of mutual confidence that emerge from this learning process result in what Sabel terms studied trust.[26] For Sabel, the fact that trust is learned provides cautious optimism that policymakers can actually play a role in promoting the creation of trust as a strategy for economic revitalization.[27]

Much of the debate about trust and cooperation among economic actors has focused on whether social networks—social and personal ties—or more formal, institutional hierarchies are the carriers of this learning process. In a much-cited contribution to this literature, Mark Granovetter accepts the premise (outside the assumptions of neoclassical economics) that trust is a necessary precondition in successful market relations but argues that formal institutions, as enforcers of rules and norms, are insufficient to explain why firms and individuals cooperate in the process of market exchange.[28] He insists instead that trust is "embedded in networks of interpersonal relations which avoid the extremes of both under-socialized [market-oriented, rational choice] and over-socialized [legal institutional] views of human action" –a definition that makes disagreement difficult.[29] For Granovetter, social relations developing in both work and non-work settings, and the process by which relationships become embedded over time, form the bonds through which human beings learn to cooperate. What results is the reciprocity that facilitates both idea-sharing and market exchange, the keys to growth and prosperity.

Granovetter's view of human action attempts to construct the missing link in Putnam's concept of social capital. Absent trust and the social interactions upon which trust is built, it is difficult to conceive how networks of civic engagement can be created. And without networks of civic engagement—the foundations of social capital—there is,

[25] Ibid., p. 105.
[26] Ibid., p. 130.
[27] Ibid., p. 131, 141.
[28] Mark Granovetter, "Economic Action and Social Structure: The Problem of Embeddedness." *American Journal of Sociology*. Volume 91, 1985.
[29] Ibid., p. 73.

for Putnam, little chance of economic prosperity since, in Putnam's view social capital is the precondition for economic prosperity, not the other way around.

There is a problem, however, in assigning a causal link between this particular kind of social capital and economic prosperity, and using such a connection to build a policy program for regional economic development. This problem stems from the way that Putnam specifies how networks of civic engagement, built upon trust, reciprocity, and social interaction, are created historically and how these elements interact to produce the phenomenon of social capital. Putnam *insists* that those regions in Italy endowed with social capital have been built upon traditions of civic involvement with roots in the Middle Ages. He traces the origins of social capital networks on the Italian Peninsula to the medieval communes of the eleventh century! Does this mean that absent such historical experience and the exceedingly long period of gestation seemingly required for networks of civic engagement to flourish, social capital networks cannot take root? If the phenomenon of social capital, as Putnam suggests, is contingent upon a particular historical experience, how then in a policy sense, short of altering history, can social capital networks be created? Such questions raise the disquieting possibility that the connections between social capital and economic outcomes, if such connections even exist, are in some way historically predetermined. Putnam is well aware of this dilemma, but his argument that uncivic regions can "learn by doing" amplifies, rather than resolves, the paradox of his historical approach.[30] If, in effect, it is the past that establishes a certain pathway for the creation of social capital networks, and if, by definition, the past is basically fixed, how then can social capital networks be created? The result of this historical puzzle is that while the concept of social capital provides an imaginative insight for explaining economic outcomes, it is limited as a concept for framing policy choices.[31]

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[30] Robert D. Putnam, *Making Democracy Work: Civic Traditions in Modern Italy*. (Princeton: Princeton University Press, 1993a) pp. 183-184.

[31] Henri Pirenne's celebrated thesis of an eleventh-century trade revival, when placed alongside Putnam's account of social capital's eleventh century origins, raises several engaging questions about whether prosperity follows or acts as the catalyst for a vibrant civil society. According to Pirenne, the eleventh-century commercial revolution, occurring in Flanders and Italy, ignited the process of European urbanization leading to "a new era in the internal history of Western Europe" (Pirenne, 1925: 213). From Pirenne's story, supported by numerous other historical accounts, there is a suggestion that the origins of the communes themselves lie in an economic phenomenon as centers of trade and market activity. Presumably, from these economic origins, civic life in Italy began to flourish paving the way for the traditions that are of paramount interest to Putnam. Nevertheless, if the origins of the communes are to be found in the prosperity associated with the rise of commerce, and if as Putnam suggests, the origins of the civic networks in

One effect to resolve this dilemma appears in the work of AnnaLee Saxenian who borrows aspects of Putnam's thesis on social capital and economic life, but uses Putnam in connection with ideas from Marshall and Veblen to develop a much broader explanation for regional economic competitiveness. In her account of the Silicon Valley economy, Saxenian develops the concept of a localized "industrial system" (adapted from Gary Herrigel's notion of "industrial order") to account for the region's competitive advantages. According to Saxenian, industrial systems vary from one locality to another and consist of three primary characteristics: 1) local institutions; 2) a local industry structure based upon relationships among firms; and 3) a dominant organizational structure within firms. What differentiates regional economies such as the Silicon Valley and helps explain why some regions are able to prosper, is the capacity of regional industrial systems for adaptation and change—the capacity to become what Saxenian calls, "Protean Places."[32] Where Saxenian borrows from social capital theorists is in her effort to account for the differences within regional industrial systems. Aspects of social capital such as trust may help explain what makes industrial systems flexible or rigid. Saxenian's work, however, aims not at any definitive link of social capital to economic prosperity. Instead, she is interested in revealing how—but not how much—actual social capital networks, verifiable in an ethnographic sense, contribute to the formation of institutions and industrial structures which are taken to account for competitive performance.

The concept of competitiveness is what has provided the Berkeley Roundtable on the International Economy (BRIE), a research group at the University of California, Berkeley with deep roots in Silicon Valley, with its starting point for critiquing social capital as a theory of economic development and as a policy platform for regional economies. The approach to economic development and policymaking at BRIE begins from the premise that competitiveness is not necessarily a function of natural endowments but is instead something that can be created. Underlying this view are three important

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Italy are to be found in the communes, then it seems difficult to conclude, as Putnam concludes, that civics is a precondition for prosperity. Instead, the history of the Italian medieval communes suggests that civic engagement is not the cause, but the outcome of economic advance. Henri Pirenne (1925), *Medieval Cities: Their Origins and the Revival of Trade*. (Princeton: Princeton University Press, 1969).

[32] Annalee Saxenian (1994), *Regional Advantage: Culture and Competition in Silicon Valley and Route 128.* (Cambridge: Harvard University Press, 1996) p. 161.

arguments. One argument insists upon the idea that markets and the market process are products of politics and institutions. At the core of the second argument is the idea that institutions and institutional frameworks play a key role in the performance of economies. In the third argument, institutions can be transformed through policy choices in order to affect market outcomes. These three arguments, embedded in a substantial literature, create the basis for a theory of economic development that more accurately depicts how the networks of innovation in Silicon Valley emerged, and how policy can be used to affect economic outcomes in other regions.[33]

In an exceptionally thought-provoking classic exposition of the first argument, Karl Polanyi shows how political authorities throughout history have shaped the formation of markets by creating the institutions and the rules that govern the process of market accumulation.[34] By comparing the formation of markets during periods of feudalism, mercantilism, and industrial capitalism, and by uncovering a common political and institutional theme in this story, Polanyi's work shows clearly that markets—not the markets of economists but those in the real world—do not exist independently or operate spontaneously as in neoclassical models of rational choice. They are the products of institutional, political and legal frameworks that structure how buying and selling and the very organization of production takes place.[35]

From this historical observation of the role played by institutions and politics in the creation of markets, it is but a small step to the idea in the second argument, that "institutional frameworks are the key to the relative success of economies."[36] This idea, elaborated during the last quarter century by North and adherents of the new institutionalism, actually derives from Veblen and his contention that economic development is a function of institutional adaptation. In addition to influencing North's institutionalist economic history, insights from Veblen have resurfaced as part of a literature known as "late development" to explain how nations in a condition of relative

[33] See http://brie.berkeley.edu/BRIE/
[34] Karl Polanyi (1944), *The Great Transformation.* (Boston: Beacon Press, 1957).
[35] John Zysman (1994: 1), "How Institutions Create Historically Rooted Trajectories of Growth," *Industrial and Corporate Change.* Volume 3, no 1, pp.243-283.
[36] Douglass C. North, *Institutions, Institutional Change and Economic Performance.* (Cambridge: Cambridge University Press 1990), p.69.

backwardness, have successfully industrialized.[37] In recent contributions to the literature in this lineage, the ascendancy of postwar Japan as a system with characteristics distinct from both liberal market economies and centrally planned economies, and later Korea, have provided compelling examples of how economic performance (current difficulties notwithstanding) is linked to unique institutional settings.[38]

When Polanyi's observation of institutional embeddedness in markets is added to Veblen's notion of institutional adaptation and economic development, the result is a powerful policy prescription for creating competitive advantage. In this framework, competitiveness is a function of the way politics and institutions imbue markets with certain attributes. These attributes are the result of the choices made by economic and political actors to shape institutions for the purpose of achieving desired economic outcomes.[39] If one economy is more competitive than another, it is due to the capacity of institutions to shape the market process in a way that generates risk-taking, innovation-creating behavior by economic actors, and the capacity of economic and political actors to frame policies that shape the structure of institutions. From this perspective, competitiveness is a function of policy choices in which institutions can be adapted to achieve economic outcomes.

At the core of this view of competitiveness, embraced by BRIE, is a far different picture of what makes Silicon Valley successful than what is suggested by the literature on social capital. In the view of BRIE, the competitiveness of Silicon Valley is less a function of trust, reciprocity, and networks of civic engagement than it is the outcome of real historical events, and the partnerships, business culture, organizations, and institutions resulting from this history. While the broad outlines of this story are well-known, they are worth recounting in order to identify how the region's networks of innovation have

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[37] Alexander Gerschenkron, *Economic Backwardness in Historical Perspective.* (Cambridge: Harvard University Press, 1962).
[38] Chalmers Johnson, *MITI and the Japanese Miracle,* (Stanford, Stanford University Press, 1982); Alice Amsden, *Asia's Next Giant: South Korea and Late Industrialization.* (Oxford: Oxford University Press, 1989).
[39] Stephen S. Cohen (1969), *Modern Capitalist Planning: The French Model.* (Berkeley: University of California Press, 1977); John Zysman, *Government, Markets, and Growth.* (Ithaca: Cornell University Press, 1983); Stephen S. Cohen and John Zysman, *Manufacturing Matters: The Myth of the Post-Industrial Society.* (New York: Basic Books, 1987).

emerged from specific historical and institutional settings.[40] It is this history and the culture of innovation stemming from this history to which this essay now turns.

The Non-Gemutlichkeit Society of Silicon Valley

The story of the Silicon Valley economy is dominated by a single overriding theme: innovation/commercialization. While the folklore of innovation in Silicon Valley tends to elevate the role of the individual inventor or entrepreneur—and there are indeed numerous examples of how such individuals have affected technological outcomes in the region—the history of the region reveals innovation to be the result of a collaborative process. At the center of this process in Silicon Valley is a dense concentration of high technology companies with individual entrepreneurs and highly-skilled workers recruited from nationalities all over the world. This international community of firms is supported by three of the world's foremost research institutions—Stanford University, the University of California at Berkeley, and the University of California at San Francisco

(Medical School)—along with a broad range of service providers unique to the region including an indigenously-created venture capital industry, a legal community specializing in issues related to high technology, and "headhunter" firms that help find and supply high technology firms with talent. In its composition and in the way it engenders collaboration, this community is, literally and metaphorically, both local and global.

In the collaborative process leading to innovation in Silicon Valley, these actors generate and refine what is essentially the intangible raw material of technological change—ideas. The pathway from ideas to innovation occurs in Silicon Valley along networks of communication in which the region's economic and institutional actors engage in relationships to solve problems the solution to which become the raw material for technological transformation. Where these networks proliferate, as is the case in Silicon

[40] Michael Borrus, *Competing for Control: America's Stake in Microelectronics*, (Cambridge, MA: Ballinger Publishing Co., 1988); M. Malone, *The Big Score*, (Garden City, NY: Doubleday, 1985); and some easy to read books include: E. Rogers and J. Larsen, *Silicon Valley Fever*, (New York, NY: Basic Books, 1984); Tim J. Sturgeon, *The Origins of Silicon Valley: The Development of the Electronics Industry in the San Francisco Bay Area*, MA Thesis Paper in Geography, University of California at Berkeley, 1988; A. Saxenian, op. cit.; M. Wilson, *The Difference between God and Larry Ellison*, (New York, 1997); also see San Francisco Chronicle, *Networking Industry and Reshaping the Valley*, March 26, 1996.

Valley, the capacity for transforming ideas into innovation and innovation into commercial advantage increases. It is these innovation networks that constitute the region's resource base of social capital. Despite the case made by social capital theorists on the link between a vibrant civil society and an innovative local economy, it would be difficult to establish such a connection in the case of Silicon Valley. Instead, the puzzle posed by the Silicon Valley is how the networks of innovation that have made the region one of the world's most technologically dynamic economies, emerged from a combination of local historical chance, national historical trends, specialized locally-based “borderless” institutions, and competitive choices exercised by economic and institutional actors. It is this question that is the subject of this section and it is from this question that a picture of social capital specific to Silicon Valley emerges.

One of the most important historical attributes of the Silicon Valley, in comparison to other regional economies in the United States, is its status as a relative industrial "latecomer." As an industrial economy, or as much of anything else, The Valley, after all, has zero 18th century or even 19th century or early 20th century beginnings. This characteristic, while posing a challenge for industrial development, actually conferred certain advantages upon the region. In the absence of an existing industrial structure, and unencumbered by an established local business culture tied to a specific set of institutions or industrial practices, economic actors in Silicon Valley were able to create an economic environment more conducive to risk-taking, innovation, and growth. From the favorable conditions offered by this economic environment emerged the partnerships between individuals, firms, and institutions that would evolve into the networks of innovation at the foundation of the Silicon Valley.

The origins of innovation networks in the Silicon Valley are to be found in the relationships between Stanford University and a small group of entrepreneurs during the late 1930s from which emerged the region's first high technology companies. The most famous firm spawned from this relationship was the Hewlett-Packard Company founded in 1937. Fredrick Termin, an electrical engineering professor who moved to Stanford from MIT, encouraged and financially supported his two graduate students, William Hewlett and David Packard to commercialize an invention known as an audio oscillator. After the

initial prototype development, Termin helped arrange additional financing with a Palo Alto Bank that enabled them to begin commercial production of the invention. During this same period, Stanford also helped support Charles Litton as well as Sigurd and Russell Varian whose efforts would result in the founding of Litton Industries and Varian Associates. This activity foreshadowed Stanford's role in what was to become the Silicon Valley, and the role of that economy in making Stanford one of the world's premier universities. Perhaps more importantly, however, this collaboration signaled how major research institutions, and far-sighted individuals within such institutions, could provide the catalyst for entrepreneurship. What resulted from the role played by Stanford in the formation of these firms was the blurring of boundaries between individual entrepreneurialism and large institutions in the pursuit of common technologically-oriented objectives. It was this blurring of boundaries between entrepreneurial and institutional actors during the formative years of the region's high-tech development, that provided the initial threads of Silicon Valley's networks of innovation. Forged on the basis of linkages, these networks of innovation lie at the foundation of the region's broader social structure of economic development the goal of which is seemingly incessant technological change. Relationships between The Valley and the three great research Universities, Stanford, U.C. Berkeley and UCSF (Medical School) remains at the heart of the Valley's continuing success.

If the relationship between Stanford and some of its most enterprising engineering students provided the initial stimulus for Silicon Valley, an equally important catalyst for the region occurred in the form of military contracts during the Second World War and the Cold War. The fortunes of Hewlett Packard, for example, increased roughly twentyfold from 1941-45, with sales expanding from $37,000 to over $750,000 as a result of military contracts for the Company's electronic measuring devices and receivers. The klystron microwave tube, invented by the Varians with the support of Stanford, was also an integral component in radar systems used during the war, resulting in big benefits to both the Company and the University. Military funding also helped support other start-ups in the Silicon Valley during their formative years. Nevertheless, it is important to recognize that while the Valley's fledgling companies benefited from the War, East Coast

high technology companies—firms such as RCA, Philco, GE, and Westinghouse which dwarfed in size the Northern California firms—profited from the wartime situation to a hugely greater extent than their tiny brethren in Northern California. And they have all since failed in advanced electronics! More research and development for the war effort took place in Universities on the East Coast and even Termin himself left Stanford for the Defense Department's major effort at Harvard during the war years.

Owing to this disparity, it became the goal of the high technology community in Silicon Valley to strengthen the Valley's attractiveness as a research center and to identify ways that Silicon Valley firms could secure a greater share of government contracts. After the war, Termin returned to Stanford to become the Dean of the Engineering School and dedicated himself precisely to these goals by strengthening Stanford as a center for research that would support a technologically-advanced industrial base in the region. His idea was to use the engineering program at Stanford to build a "community of technical scholars." This community would be the foundation for the networks of innovation upon which the regional economy of Silicon Valley would develop and thrive.

Three institutional innovations initiated by Stanford reflect the relationships between research institutions, entrepreneurs, and firms that Terman pioneered in the region. The first innovation was the creation of the Stanford Research Institute (SRI) to conduct government-supported research, and to assist West Coast high technology firms in securing government contracts. Initially dedicated to military-related research, SRI for a while became an important conduit for solidifying the relationships between private sector high technology firms, government, and university research establishments. Secondly, Stanford opened its engineering classrooms to local companies through its Honors Cooperative Program where employees could enroll in graduate courses. This program had no parallels elsewhere. Thirdly, Stanford promoted the creation of the Stanford Industrial Park, one of the first in the country, which reinforced the emerging pattern of cooperation between the University and electronics firms in the area to the long term prosperity of both. In effect, these institutional arrangements encouraged the types of public/private partnerships and collaborations between Universities, government, and firms that made possible the networks of innovation in Silicon Valley.

This model of collaboration between a university research institution and high technology firms spread beyond Stanford to nearby Berkeley and later to the University of California Medical School in San Francisco. During the 1960s, owing to the example of Stanford, the University of California at Berkeley rapidly expanded its programs in electrical engineering and encouraged the outreach of its university environment to firms in the Silicon Valley. By the mid-1970s Berkeley was training more engineers than Stanford and had become a premier research center in its own right for firms in Silicon Valley. Programs for technology transfer and professorships endowed by Silicon Valley firms were the hallmarks of this growing partnership between Berkeley and the Silicon Valley. In addition, the University of California at San Francisco was, and continues to be, one of the nation's preeminent medical research establishments with vital links to another emerging high technology industry in which the Bay Area is the world's leading center, the bio-tech industry (with about 168 bio-tech firms).[41] In effect, the presence of three world class scientific, medical, and engineering research institutions that were actively involved in Silicon Valley industry, created the most formidable university-industry partnerships in the world, its only rival being MIT.

Owing to innovations at Stanford that institutionalized and promoted the expansion of links between the world of university research and high tech entrepreneurialism, the cluster of electronics firms in Silicon Valley grew rapidly during the 1960s and 1970s. This growth involved not only new start-ups but also older established firms interested in taking advantage of the collaboration between Stanford and the high technology community. Lockheed Aerospace, for example, set up a research lab for its Missiles and Space Division in the Stanford Industrial Park in 1956, attracted by its partnership with the University—one in which Stanford agreed to train Lockheed employees while Lockheed in turn would help rebuild Stanford's aeronautical engineering department. Westinghouse, Ford Aerospace, Sylvania, Raytheon, ITT, and IBM would follow. Perhaps the most celebrated example of an older established firm coming to the Stanford/Silicon Valley research complex is XEROX, which in 1970 setup its storied Palo

[41] President's Industry-University Cooperative Research Initiative, *The BioSTAR Project: Critical Linkages Project*, 1998.

Alto Research Center. From XEROX PARC emerged such technologies as the computer operating system that was first successfully used by Apple and then even more successfully by Windows; laser-printing, the computer mouse, and computer networking, among others (most of which served to enrich neighboring companies rather than XEROX headquartered 'back East" and preoccupied by "its core business").

By 1975 the region's high technology enterprises employed over 100,000 workers. Fueled by the links between industry and preeminent research and educational establishments, this growth, in turn, compelled similar types of partnerships to develop between Silicon Valley firms and the system of local community colleges, along with institutions such as San Jose State University. By the 1970s San Jose State University was actually training as many engineers as either Stanford or Berkeley while the region's six community colleges offered specialized technical programs oriented specifically to the needs of the area's firms. The latter followed a familiar and successful model. Community colleges contracted with local companies to teach their employees while companies provided consultants to the colleges to help develop curricula along with part-time teachers. Firms also donated equipment to area schools and allowed students to use equipment during evening hours. After Tandem Computers donated more than $1 million in computer equipment to Foothill College, for example, the school was able to triple (to over 5000) the number of students in its computer course.

While firms and supporting institutions in Silicon Valley expanded together, the region also grew as a result of an entirely new industry, the semiconductor industry, which fundamentally transformed the economic landscape and provided the region with its name, Silicon Valley, after the silicon strata on which both semiconductors and the Valley were built.

The semiconductor industry had taken root in the area with the location of Shockley Transistor in Palo Alto in 1955. Founded by William Shockly (a Stanford graduate and at Bell Labs in Pennsylvania, one of the inventors of the transistor), the firm was the first in a lineage of spinoffs and competing ventures that led first to Fairchild Semiconductor and eventually to the spin-off of Intel, AMD and National Semiconductor among others (The "Fairchildren," as they were called, constituted after the very small

generation of Messrs. Hewlett, Packard and Varian, the senior generation of the Valley).[42] Between 1966-76, a total of thirty semiconductor firms were founded in the United States. Of these thirty-six firms, thirty-one were located in the Silicon Valley.[43] The semiconductor industry and the Silicon Valley had effectively become synonymous.

The impetus for the early growth of this industry came almost exclusively from the military. Virtually no other customers existed for semiconductors when they were initially developed. In 1962 the government was the sole market for semiconductor devices.[44] Gradually however, as the computer industry itself expanded, the government in the form of the military and its prime contractors accounted for a diminishing share of the semiconductor business. By 1978 the government accounted for only a 10% market share for semiconductors.[45] This diffusion is indeed impressive but in the early development of the semiconductor, the Department of Defense and NASA played a crucial role as "creative first users" of the new technology.[46] What this suggests is that the innovative trajectory of the semiconductor industry in Silicon Valley was forged upon the partnership between government, in the form of the military establishment, firms and research universities. A key element in the creation of the Valley's industrial structure and business culture was the Defense Department's insistence in the early formative years of "dual sourcing" for its orders of critical electronics from these young untried firms. It diffused technology and helped to proliferate competing—and cooperating—firms.

By the early 1970s, the military's role in the development and purchase of semiconductors diminished, venture capital, specifically venture capital limited partnerships, came to replace the military as the lead source of financing for Silicon Valley start-ups. The explosive growth of venture capitalists in the region paralleled the growth of the local semiconductor industry itself. By 1974 over 150 venture capital firms operated in Silicon Valley, with Stanford University investing a portion of its own

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[42] Sturgeon, op. cit.
[43] Michael Borrus, James Millstein, and John Zysman, *U.S.- Japanese Competition in the Semiconductor Industry.* (Berkeley: Institute of International Studies, 1982), pp. 26-27.
[44] Ibid., p. 18.
[45] Ibid., p. 18.
[46] Ibid., p. 17.

endowment in venture activities. By 1988 Silicon Valley was attracting 40% of the national total of venture capital investment.[47]

What distinguished this industry from venture capital in other parts of the country was the fact that venture capitalists in Silicon Valley invariably had prior careers with technology firms in the region. As a result, Silicon Valley venture capitalists understood the technical dimensions of the business far better than their Eastern counterparts. Perhaps more importantly, the personal connections of Silicon Valley venture capitalists to colleagues in local firms forged the personal knowledge and shared business and technological outlook, if not deep trust, upon which relationships between entrepreneurialism, innovation, and financial backing flourished. Venture capitalists in the Valley are "hands-on" investors heavily involved in the strategic and managerial decisions of the companies they back.[48] As a result of the unique relationships between venture firms and technology firms, Silicon Valley venture firms are embedded within the broader fabric of high technology development and are an integral part of the social structures that facilitate the process of innovation characterizing this region. In effect, venture capitalists in Silicon Valley created a new and different kind of financial institution in which technological and business expertise, equity stakes and direct involvement in the firms being financed became the hallmark. They became central actors in the establishment of networks in the region incorporating finance, entrepreneurship, innovation, customer and partner identification and trouble shooting.

Alongside the venture capitalists, local law firms function as important actors within the region's networks of entrepreneurship and innovation. The Valley's leading law firms have grown to specialize in areas important to high tech companies such as intellectual property rights, technology licensing, and now increasingly encryption law as well as tax and corporate matters. Immigration is rapidly becoming an in-house specialty or is out-sourced in a tight relationship. The lawyers know the venture capitalists; they both know large numbers of experienced technology executives who can be called in to help deal with an organizational or strategic problem or opportunity facing rapidly

[47] Richard Florida and Martin Kenney, *The Breakthrough Illusion: Corporate America's Failure to Move from Innovation to Mass Production*. (New York: Basic Books, 1990), p. 68.
[48] Ibid., p 69.

growing young firms. They sit on boards of companies that can be key customers or partners for new firms. The networks of overlapping board memberships could be considered another element of social capital, but cannot be considered deep civic engagement—except of course the boards of non-profit institutions, where many of the same players are to be found.

An absolutely defining element of the networks of innovation of Silicon Valley is the character of the labor market. One word perhaps best distinguishes how this labor market functions: mobility. From the early 1970s, Silicon Valley has been differentiated from other regional economies by the unusually high number of employees moving from one job to another, one company to another. The geographic proximity of so many firms within the same industry undoubtedly contributes to this fluidity. Two other explanations, however, quite different in tone, lie at the core of how the extremely mobile job market in Silicon Valley operates.

The first explanation focuses on how Valley employees' loyalty is greater to the craft of innovation than to any particular company.[49] The result of such commitment to the cause of innovation over company loyalty is rapid turnover of employees from one company to the next. As individuals move, however, from one project and one firm to another, their paths overlap and create networks of information-sharing that accelerate the diffusion of technological capabilities and know-how within the region. It is in these pathways of labor mobility that networks of innovation get created.

The second explanation depicts a much darker image of this mobility process. In this picture, employees in Silicon Valley work under exceedingly high levels of pressure to produce the types of technological breakthroughs characteristic of the region. With pay linked to performance and management techniques that push workers to the limit, employees put in superhuman work hours.[50] Owing to the strain, they eventually "burn out" and consequently move to other firms, enticed by the recruitment efforts of competitors. Nevertheless, while this picture is of a much more Hobbesian world, the end

[49] Annalee Saxenian (1994), *Regional Advantage: Culture and Competition in Silicon Valley and Route 128.* (Cambridge: Harvard University Press, 1996) p. 36.
[50] Richard Florida and Martin Kenney, *The Breakthrough Illusion: Corporate America's Failure to Move from Innovation to Mass Production.* (New York: Basic Books, 1990), p. 44.

result of labor mobility in this interpretation of Silicon Valley is still the same—networks that support and fuel breakthrough innovation. Despite the differences in interpretation of what causes the phenomenon of job mobility in Silicon Valley, both explanations admit to a similar innovative environment as the outcome.

Regardless of whether labor mobility in Silicon Valley reflects a sinister state of nature, or a process that benefits individuals, firms, and the region as a whole, labor turnover and the competition for workers has created a market niche for another entity that participates in the creation of innovation networks—headhunter companies. Like the venture capital firms and the local legal profession, headhunters supply high technology companies with perhaps its most essential resource. Without its highly-skilled "think" workers, high tech companies would be without the source of ideas lying at the foundation of the innovation process in Silicon Valley.

Perhaps the most striking consequence of the mobile labor market and the efforts of headhunter firms to supply the region with talent, is the truly international character of the high technology community. Aspiring entrepreneurs and ambitious engineers from all over the world come to Silicon Valley to start companies. At the same time engineering talent in the region reflects an enormous diversity of nationalities. Many of these overseas individuals remain in the area after attending one of the local universities. Others come from abroad, attracted by the open hiring gates of both established firms and start-ups. The openness of the labor market to foreigners is one of the region's most valuable assets.

Finally, there is the nature of the industry itself. In our view, in the recent literature, especially the profuse literature stemming from Sabel's work on Italian districts, too much attention is paid to the social characteristics of vital, specialized industrial districts and consequently far too little attention is paid to the relatively more technical issues surrounding the specific nature of the industries (or industrial trajectories) that define the region's specialization and shape its social character. For example, comparisons between the Boston high tech industrial district and Silicon Valley overstate the weight of "Boston Brahmin" culture. But Brahmin culture never defined MIT, the fountainhead of Boston high tech. It never even penetrated the Institute. Whatever be the culture of "The Toot," it ain't Brahmin. A more useful comparison would focus on the structural

differences between, on the one hand Boston's dominant activities—defense electronics systems and then mini-computers vs. Silicon Valley's in semiconductors and then micro computers and computer networking. Similarly, it is not the California air, or the absence of neckties. Southern California's massive aerospace industry in no way resembles Northern California's electronics cluster: not in industrial structure, not in forms of payment, not in rates of new company formation, not in the proliferation of intermediating *metiers* and not, ultimately in flexibility. Great research universities play a limited role, if that, in Milan's dynamic "Marshallian district" of high fashion; venture firms, laws firms, and graduate students occupy little space in the much studied Italian tile district, or in Antwerp's diamond center, or in Detroit's—and now Kentucky's—auto districts, or in Georgia's carpet and towel belt. Ultimately what you do shapes how you do it—all the way back up the value chain, all the way out into forms of social organization.

Silicon Valley, like other specialized industrial districts, is built of social capital. But it is the interaction of the particular elements of social capital analyzed above, and not dense networks of civic engagements, that structures the Silicon Valley system of innovation, commercialization and prosperity. All the rest, such as informal conversations in bars or bowling teams or, more plausibly, children's soccer leagues is, relative to other places, somewhat underdeveloped and ancillary. Unlike Putnam's vague, but radically deterministic concept of the historic formation of civic culture which seems so inaccessible to development policy initiatives, our definition of social capital is both more accurate in depicting the reality of Silicon Valley and far more amenable to shaping by policy.

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