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# Social Capital and Capital Gains in Silicon Valley



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It is difficult to imagine an example of regional economic development that is more successful, or more famous, than California's Silicon Valley. 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 come to the Valley 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*.<sup>1</sup> 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. They 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 reinforce trust by sanctioning against, in powerful and multidimensional ways, the breaking of trust. In Putnam's model, cooperation based on trust propels development.

It is rooted in complex and deep social ties and is an inherited historical characteristic.

Does the wave of regional development theory represented by Putnam's model of social capital apply to Silicon Valley? The answer is no, because 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 obscures the specific 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 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 its 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.<sup>2</sup> 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.



## Social Capital Networks in Silicon Valley

Silicon Valley is traditionally defined as an area beginning about 35 miles south of San Francisco, California, 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 (versus the \$29,000 U.S. average).<sup>3</sup> In 1997, venture capital invested into Silicon Valley amounted to \$2.7 billion, constituting about 21% of the national total.<sup>4</sup> About 3,575 new firms were incorporated in the Valley in 1997.<sup>5</sup>

The Silicon Valley economy is dominated by rapid innovation and commercialization in an expanding set of new technologies. Microelectronics, semiconductors (e.g., Intel, AMD, National Semiconductor), and later computers (e.g., Apple, Sun Microsystems, Hewlett-Packard) put the Valley on the world map and continue to be major activities. Computer networking, both hardware and software (e.g., Cisco, Netscape, Yahoo, Broadvision), has recently exploded as a shaping activity. Biotechnology along with medical devices and drug delivery systems constitutes the third major new technology in which the Valley is a national center, perhaps the world center. Along with these core industries, venture finance and intellectual property law have become significant activities in their own right. The Valley is an enormously prosperous region. Standard income data, which rely on wages and salaries (more than 150% of the national average), miss the critical turbocharger: 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, semiconductors, and semiconductor equipment firms hit \$85,500 in 1996) and congestion (average delays in auto traffic keep rising) 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, instruments, and entities:

- **The Great Research Universities**—Stanford, U.C. Berkeley, and U.C. San Francisco (U.C. Medical School) have an innovative approach that creates tight relationships to outside actors who commercialize applications of their research and researchers. They also recruit 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.<sup>6</sup>

- **U.S. Government Policy**—In the early phases of microelectronics and computer networking, it served both as a sponsor of University research and, critically, as the lead user.
- **Venture Capital Firms**—These firms have served not only as a home-grown source of early stage capital, but also as a 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, and links and leads to potential customers and partners).
- **Law Firms**—Law firms provide another source for locating key personnel, finance contacts, and corporate and intellectual property legal services. They often take payment in stock rather than cash.
- **Business Networks**—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)<sup>7</sup> provides an operational definition of the limited role of informal, familial, and communitarian trust. The opposite of trust is "accountability" and the arbiters of accountability are accountants and auditors (in Silicon Valley they outnumber the lawyers).<sup>8</sup> In sum, there is one lawyer or accountant per five engineers.
- **Stock Options**—Employees (not counting a firm's "founders" and CEO) often hold options and shares easily amounting to 10 to 15% (or more at the early stages) of a firm's capital value. These reward success with giant payoffs and also serve to extend the loyalty and employment tenure of key employees for the several years of the option-holding period. The amounts are non-trivial. For example, an extremely successful Valley firm, Cisco Systems, now has a capital value that exceeds that of the Ford Motor Company.
- **Labor Market**—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 in many leading companies in Europe—not to mention Japan. What also continues to differentiate the Valley is that even if such a start-up should fail, there are ample jobs awaiting entrepreneurs at large Valley firms as well as 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.
- ***The Nature of the Industry***—Industries differ. The industry that defines a region's specialization also defines its social structure and institutions more than any other single factor. Coal and steel districts in Wales, Wallonia, Asturias, and Pennsylvania had similar social structures. Industries define their regions in two ways.
  - First by the speed of their growth and transformation. The semiconductor industry, the initial shaper of Silicon Valley, has grown by about 3,000 per cent over the past twenty years.<sup>9</sup> Such growth makes small companies into big companies at amazing speed and accumulates capital into world historical piles.
  - Second, locally dominant industries shape their societies by valuing some kinds of social structures compared to others (e.g., unions and friendly societies in coal and steel communities, intellectual property and employment contract law in Silicon Valley). Automobile districts, regardless of where they are, differ more from footwear districts or software districts than from one another. In much of the recent literature that focuses on the social characteristics of specialized industrial districts and how those social structures propel or retard growth and transformation, too little attention has been paid to how substantively different kinds of industrial activities favor different industrial and social structures. This is true even when the industries are quite similar. For example, comparisons between Boston's high-tech industrial district and Silicon Valley vastly neglect the important differentiating characteristics of defense electronic systems and mini-computers (the defining activities on the Boston side) as compared with micro-electronics and computer networking (the defining activities in Silicon Valley). Similarly, research universities, abundant engineering talent, and venture capital play only a limited role, if that, in Milan's dynamic high-fashion district, 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 an ill-advised policy that strives to make electronics innovation into the new industrial standard bearer in the same social milieu as footwear, underwear, axles, 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 alleys) is, relative to other places, somewhat underdeveloped and ancillary. Unlike Putnam's vague, but radically deterministic concept of the historic formation of civic culture and social capital, 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.<sup>10</sup>

## **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 of "social capital."

According to Putnam, social capital is akin to a "moral resource."<sup>11</sup> It refers to the features of social organization that facilitate coordination and cooperation for mutual benefit.<sup>12</sup> Social capital is embodied in what Putnam calls "networks of civic engagement" that evolve over time owing to the 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 as well as 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.<sup>13</sup> "The social capital embodied in networks of civic engagement seems to be a precondition for economic development."<sup>14</sup> 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 framework for understanding the dynamism within certain localized regions through his concept of external scale economies.<sup>15</sup> 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 they helped explain the phenomenon behind the agglomerations of firms from the same industry that he 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."<sup>16</sup> 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. However, Marshall's magisterial 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.<sup>17</sup> Veblen likened the economy to an evolutionary phenomenon of disequilibrium in which competition and natural selection prevailed.<sup>18</sup> In this evolutionary process, industrial structures and institutions develop in an interlocking embrace. Once established within the context of this interactive evolution, institutions play a fundamental role in shaping the 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)<sup>19</sup> 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 caused 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. These debates 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:

- 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;<sup>20</sup>
- the apparently disproportionate contribution to economic growth and development made by smaller firms in the context of this crisis;<sup>21</sup> and
- 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.<sup>22</sup>

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 giants—such as GE, Boeing, Coca-Cola, Hewlett Packard, Nestlé, Merck, Monsanto, Unilever, ATT (now Lucent), Ford, Volkswagen, 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.

James Coleman, another social capital theorist, provides a romantic, and telling, analysis of New York's diamond district. There, trust is total. Sacks of diamonds worth thousands are taken without signatures or serious control. This highly functioning trust is built on the deepest of civic engagements and hugged by the sinews of a totally closed society. However, Coleman never extends his admiring analysis upstream to mention the name De Beers, the giant multinational that completely controls the diamond industry.<sup>23</sup> It is likely that many of the "deep trust" industrial districts exist in relation to major multinational corporations the way the New York diamond district lives in relation to De Beers: total dependency with ties of civic engagement serving to exclude outsiders and thereby both improve efficiency and capture rents that would ordinarily be competed away. Silicon Valley is the exact opposite. The society is open and so is the market. Silicon Valley is not an ecology of small and dependent companies holding on to a small rent in a larger revenue stream. Valley companies sell to a broad universe of clients, and sometimes grow to be very large indeed. The small companies harbor big ambitions and see themselves as young, not permanently small.

Nonetheless, theorists working within this particular approach began to reassess what drives the process of economic development within regions. They began 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."<sup>24</sup>

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—that 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 and 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 Gary Herrigel (1996). Kisch, Pollard, and Herrigel all supplied potent historical justifications for the phenomenon of industrial districts in 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 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.<sup>25</sup>

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.<sup>26</sup> 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. This helps explain how regional economies engendering such trust are able to prosper.<sup>27</sup> 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."<sup>28</sup> 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.<sup>29</sup>

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.<sup>30</sup> He insists instead that trust is "embedded in networks of interpersonal relations which avoids 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.<sup>31</sup> 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. Without networks of civic engagement (the foundations of social capital) there is, for Putnam, little chance of economic prosperity since 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 in 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 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.<sup>32</sup> 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.<sup>33</sup>

One effort 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: local institutions; a local industry structure based upon relationships among firms; and 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."<sup>34</sup> 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 that are taken to account for competitive performance.

The Berkeley Roundtable on the International Economy (BRIE)—a research group at the University of California, Berkeley, that has deep roots in Silicon Valley—developed the concept of competitiveness and has used it to formulate an approach to economic development policy that is substantively different from that derived from civic engagement.<sup>35</sup> The BRIE approach begins

from the premise that competitiveness is not necessarily a function of natural endowments but is instead something that can be created over time. Underlying this view are three important 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.<sup>36</sup>

In a 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.<sup>37</sup> 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.

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, namely, that "institutional frameworks are the key to the relative success of economies."<sup>38</sup> 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 backwardness have successfully industrialized.<sup>39</sup> Recent contributions to the literature in this lineage on the ascendancy of postwar Japan (and later Korea) have provided compelling examples of how economic performance (current difficulties notwithstanding) is linked to unique institutional settings.<sup>40</sup>

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. 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.

In this view, Silicon Valley is built of social capital, but it is the interaction of the economic and institutional actors in pursuit of explicitly competitive aims, not dense networks of civic engagement, that structures the region's innovation networks. The choices that configured and continuously reconfigure these networks are shaped by a specific environment of local and national history in which institutional decisions, policy programs, and industrial trajectories play leading roles. The fact that government policy and decisions by major institutions play such a critical role provides encouragement for efforts to create innovative milieus elsewhere. This is very different from Putnam's vague, but radically deterministic concept of historically framed civic cultures—a concept that seems so inaccessible to development policy initiatives.

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 emerged from specific historical and institutional settings.<sup>41</sup>

### **There Is No *Gemütlichkeit* in 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. This collaborative process generates and refines 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 through which the region's economic and institutional actors engage in relationships to solve problems.

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 these networks emerged instead from a combination of local historical chance, national historical trends, specialized locally based "borderless" institutions, and competitive choices.

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 "latecomer." As an industrial economy, the Valley has no 18th century or 19th century or even 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 unen-

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cumbered 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 environment emerged the partnerships between individuals, firms, and institutions that would evolve into the networks of innovation at the foundation of the Silicon Valley.

These networks' origins are to be found in the relationship between Stanford University and a small group of entrepreneurs during the late 1930s. From this 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 early activity demonstrated how major research institutions and farsighted individuals within such institutions could provide the catalyst for entrepreneurship. The role played by Stanford in the formation of these firms blurred the boundaries between individual entrepreneurialism and large institutions and 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. Relationships between the Valley and Stanford, U.C. Berkeley, and U.C.S.F. remain at the heart of the Valley's continuing success.

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 1941-1945, 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 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 (huge firms such as RCA, Philco, GE, and Westinghouse) profited from the wartime situation to a much greater extent than their tiny brethren in Northern California. However, 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 to 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 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. Second, Stanford opened its engineering classrooms to local companies through its Honors Cooperative Program so that employees could enroll in graduate courses. This program had no parallels elsewhere. Third, 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, namely, the biotech industry (with about 168 biotech firms).<sup>42</sup> 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 these innovations and collaborations, 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. 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 Alto Research Center (PARC). 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. Most of these technologies served to enrich neighboring companies rather than Xerox headquarters back East, which was preoccupied by "its core business."

By 1975, the region's high-technology enterprises employed over 100,000 workers. This growth, in turn, compelled similar types of partnerships to develop between Silicon Valley firms and the local community colleges and a nearby state university. By the 1970s, the region's six community colleges offered specialized technical programs oriented specifically to the needs of the area's firms, while San Jose State University was actually training as many engineers as either Stanford or Berkeley. Following the familiar and successful model, the community colleges made contracts with local companies to teach their employees while the companies provided the colleges with part-time teachers and consultants to help develop curricula. Firms also donated equipment to area schools. After Tandem Computers donated more than \$1 million in computer equipment to Foothill College, for example, the school was able to triple (to over 5,000) 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. This fundamentally transformed the economic landscape and provided the region with its name (after the silicon strata on which both semiconductors and the Valley were built).

The semiconductor industry took root in the area when Shockley Transistor located in Palo Alto in 1955. Founded by William Shockley (a Stanford graduate and one of the inventors of the transistor at Bell Labs in Pennsylvania), the firm was the first in a line of spin-offs and competing ventures that led first to Fairchild Semiconductor and eventually to Intel, AMD, and National Semiconductor (among others).<sup>43</sup> Between 1966-1976, a total of thirty-six semiconductor firms were founded in the United States. Of these thirty-six firms, thirty-one



were located in the Silicon Valley.<sup>44</sup> 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.<sup>45</sup> However, as the computer industry itself gradually expanded, the government accounted for a diminishing share of the semiconductor business. By 1978, the government accounted for only a 10% market share for semiconductors.<sup>46</sup> While this diffusion is impressive, the Department of Defense and NASA nevertheless played a crucial role as "creative first users" of the new technology.<sup>47</sup> A key element in the formative years of Silicon Valley's industrial structure and business culture was the Defense Department's insistence on "dual sourcing." It diffused technology and helped to proliferate competing—and cooperating—firms.

By the early 1970s, 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 endowment in venture activities. By 1988, Silicon Valley was attracting 40% of the national total of venture capital investment.<sup>48</sup>

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 East Coast 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 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.<sup>49</sup> As a result of this unique relationship, 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. In effect, venture capitalists in Silicon Valley created a new and different kind of financial institution. They became central actors in the establishment of networks in the region, incorporating finance, entrepreneurship, innovation, customer and partner identification, and troubleshooting.

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 intellectual property rights, technology licensing, encryption law, and immigration. The lawyers know the venture capitalists; and both of these groups know large numbers of experienced technology executives who can be called in to help deal with an organizational

or strategic problem or opportunity. 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 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, from one company to another. The geographic proximity of so many firms within the same industry undoubtedly contributes to this fluidity. Two other explanations, each 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.<sup>50</sup> The result of such commitment is a rapid turnover of employees. As individuals move 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. 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. 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.<sup>51</sup> 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 result of labor mobility is still the same—networks that support and fuel innovation and its rapid commercialization.

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 and legal firms, headhunters supply high-technology companies with its most essential resource. Without the highly skilled "think" workers provided by headhunters, 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 labor mobility and the efforts of headhunter firms is the truly international character of the high-technology community. Aspiring entrepreneurs and ambitious engineers from all over the world come to Silicon Valley. 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.

The value of this diversity is not limited to the Silicon Valley community. It is a key, enabling asset for other regions with aspirations to high-tech specialization. There are, for example, perhaps as many as 10,000 French in the Valley, at least twice as many Taiwanese, growing thousands of Indians, and a few thousand Israelis.<sup>52</sup> The data is inherently imprecise. People come and go. Some pass through quickly, but many work for years and years. Many become citizens and return "home" much later. They are a vital transmission belt, diffusing technology and market knowledge, sometimes establishing offshore facilities that seed new districts and serve as connectors into the Valley. They have been a key factor in developing successful (sometimes very successful) high-tech districts "back home." As a development policy, few investments have paid off so well for the "brain drain" nations.

## Conclusions

A particular industry defines a region's specialization and industries differ in growth potential, in their capacity to generate new activities and new industries, and in the kinds of social structures they breed. High-fashion districts, coal and steel districts, and mass production textile districts typically resemble one another independent of nation or ethnicity. The recent literature, especially the profuse literature stemming from Sabel's work on Italian districts, pays too much attention to the social characteristics of specialized industrial districts and consequently too little to the relatively more technical issues surrounding the specific nature of the industries. For example, comparisons between the Boston high-tech industrial district and Silicon Valley overstate the weight of "Boston Brahmin" culture. However, Brahmin culture never defined or even penetrated MIT, the fountainhead of Boston high-tech. A more useful comparison would focus on the structural differences between Boston's dominant activities (defense electronics systems and then mini-computers) and Silicon Valley's (semiconductors and then micro-computers and computer networking). Similarly, Silicon Valley is not to be distinguished by the mild California climate 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. 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.

Of course, there is trust in Silicon Valley; there is no such thing as a productive milieu, or even a functioning society, where there is no trust. At issue is the specific nature of that trust. What kind is it? What does it do and not do? Where does it originate—that is, where are its social foundations? 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. Such specific, performance generated trust is the building block of Silicon Valley’s particular brand of social capital. The sequence runs from performance to trust, not from community. Perhaps policy would be well advised to aim for that trajectory, even if it entails loosening some deep and exclusionary civic engagements. All the rest (such as informal conversations in bars or bowling alleys) is, relative to many other places, somewhat underdeveloped and ancillary. It exists, it matters, but it is second in sequence and importance. It is not the defining or distinguishing element.

The performance-focused trust in Silicon Valley is different in kind from the trust engendered by deep civic engagement that makes for economic success in some regions. It is more than just an easily assembled substitute. It might be a superior form. It is open to outsiders. Trust can be extended, rather quickly, to people from other places and other cultures, and even to people with different ideas.

## Notes

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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." Henri Pirenne, *Medieval Cities: Their Origins and the Revival of Trade*. (Princeton, NJ: Princeton University Press, 1969 [1925]), p. 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 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.

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