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Contrasting Patterns of Business Organization in Silicon Valley

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This essay examines the politics of business organization in Silicon Valley. It contrasts two patterns of institution-building among the region's technology firms: one that seeks to ensure the competitive position of the industry's large producers by lobbying the federal government, and another which integrates small and medium-sized firms, enhancing their flexibility by providing services that foster the innovative recombination of resources.

Industry lobbies, such as the Semiconductor Industry Association (SIA) and the American Electronics Association (AEA), are nationally recognized as representatives of Silicon Valley because of their active presence in Washington. By contrast, integrative organizations such as the Semiconductor Equipment Manufacturers International (SEMI) and the Software Entrepreneurs Forum (SEF) operate primarily at the regional or sectoral level and remain largely outside of the public eye.

The literature of American social science provides little guidance in accounting for these contrasting patterns of business organization. Associations of business in the U.S. are typically studied in their role as pressure groups. However, some of Silicon Valley's most active business organizations operate at the local level and engage in little, if any, lobbying. Rather than attempting to shape legislation or influence elections, these associations foster information exchange and collaboration among specialist producers in highly fragmented industries.

These contrasting patterns of business organization reflect the hybrid character of the Silicon Valley economy, an industrial region in which large mass production corporations coexist with, and increasingly rely upon, dense networks of small and medium-sized producers. The region's technological dynamism derives from this agglomeration of sophisticated specialist producers

on one hand, and the rapid growth of some of the world's leading manufacturers of computers and semiconductors on the other.

Debates over technology policy in Washington and Silicon Valley reflect conflicting understandings of how to govern this decentralized system of production. The producers in externally-oriented associations regard support from the federal government as essential to the competitiveness of U.S. technology industry and seek to mobilize a broader constituency behind their agenda. The specialist producers in integrative associations, by contrast, remain deeply suspicious of the state and have entered formal politics only reactively. Their strategies are defined in relationship to other firms in the region or sector.

This essay begins by characterizing Silicon Valley as a decentralized industrial region which mixes the principles of mass production and flexible specialization. The second section describes the origins and activities of four of Silicon Valley's leading business organizations, locating them on a spectrum from externally-oriented lobby groups to regionally or sectorally-focused integrative associations. Section three suggests that the conflicts over trade and technology policy which have emerged in the region are not simply the politics of pressure group conflicts, but rather reflect deeper debates over the coordination and governance of production in a decentralized industrial system.

The concluding section suggests that the lack of a shared vision of the appropriate relationship between the region's technology enterprises, local institutions, and the state leaves the Silicon Valley economy vulnerable. While the political program of the lobbying associations overlooks (and threatens to undermine) the dynamism of the region's networks of specialist

producers, the anti-politics of the integrative associations is equally self-limiting in an era of intensifying international competition.

SILICON VALLEY AS A FLEXIBLE REGIONAL ECONOMY

Silicon Valley is an industrial hybrid, an intermediate form which mixes the principles of mass production and flexible specialization.¹ The region is home to some of the world's leading mass producers of computers and semiconductors -- such as Hewlett-Packard, Apple Computer, and Intel Semiconductor -- yet the preponderance of employment and economic activity in Silicon Valley is accounted for by small and medium-sized specialist firms. Ninety-six percent of the 4,000 technology establishments in the region employ fewer than 500 workers and employ close to 300,000 as a group.²

This decentralized productive structure fosters innovation and adaptation because it enables local enterprises to shift rapidly from declining markets to emerging ones in the same or related industries. The region's adaptive capacity was demonstrated during the 1980s by its successful adjustment to the crisis of the semiconductor industry. The 20,000 jobs which were lost due to the decline of the region's commodity producers were quickly replaced by the rise of a new wave of more flexible and specialized semiconductor, computer systems, and software firms.

This adaptation occurs in part through an ongoing process of new firm formation, in which local engineers leave established companies in order to pursue promising new technical and market opportunities. These entrepreneurs draw on the region's concentration of technical skill, its infrastructure of specialist service providers, suppliers, subcontractors, and venture capital, and a business culture which encourages informal exchange, risk-taking, and experimentation.³ During the 1980s, for example, more than 100 semiconductor

start-ups were formed, just as the region's established producers were falling into crisis. These new chipmakers learned from the experience of their predecessors: they avoided commodity production and pioneered a flexible model of specialty and semi-custom chipmaking which allowed them to remain profitable even during the industry's worst downturn in 1985-86.⁴

Adaptation also occurs within large firms which integrate into the regional infrastructure. While older firms like Hewlett-Packard are vertically integrated and less dependent upon from the local economy, the region's newer producers of computer systems such as Sun Microsystems and Tandem Computers have consciously avoided integration. Recognizing they cannot stay abreast of the rapid pace of technical change in the computer industry by themselves, these firms typically focus on system design, manufacture of select parts, and final assembly. They collaborate with suppliers of software, semiconductors, disk drives, power supplies, and other components and sub-systems both within and outside of the region. This network structure facilitates adaptation because it spreads the costs of developing new computer systems across networks of specialist firms and shrinks new product development times.⁵

The flexibility of the regional economy thus derives from the specialization of its units of production on one hand, and their reliance on diverse external sources of information, services, and components on the other. As local firms rely increasingly on outside institutions for the provision of services such as market research, product design, and training, they become increasingly embedded in the infrastructure of the region. No single element of this infrastructure -- from educational institutions to venture capital, market research, and specialist consulting firms to the concentration of materials suppliers and contract manufacturers -- can be singled out to account for its dynamism. The essence of such a decentralized industrial system is the diffu-

sion of resources and skill and the blurring of the boundaries between the firms themselves as well as between firms and the regional environment.⁶

This is not to suggest that Silicon Valley is a self-contained economy. Local firms typically develop extensive linkages with customers and suppliers outside of the region and overseas, and foreign producers are a large and growing presence in the regional economy. The latter seek access to the dense social, professional, and commercial infrastructure which allows them to learn about and monitor changing markets and technologies (while the former, for similar reasons, rarely abandon them altogether.)

Silicon Valley is thus an industrial hybrid. It is the home of both relatively autonomous mass production corporations and of interdependent networks of flexible and specialized producers. These different productive strategies -- and a variety of intermediate ones -- have coexisted in the region for decades. They are complementary in many ways: flexible and specialized producers of computer systems, for example, depend on access to large quantities of low-cost memory chips, while mass producers of these commodity semiconductors themselves require customized manufacturing equipment.

CONTRASTING PATTERNS OF BUSINESS ORGANIZATION IN SILICON VALLEY

The patterns of business association which have emerged in Silicon Valley over the past several decades reflect the hybrid nature of the regional economy. The region's established mass producers of semiconductors, for example, formed the SIA, an externally-oriented trade association whose primary purpose is to lobby the federal government for favorable trade policy and legislation. Their suppliers, the manufacturers of semiconductor equipment, in turn belong to SEMI, an integrative organization which sets standards, sponsors trade shows, and fosters information exchange among small and medium-sized firms.

The SIA behaves as a classic pressure group, whose political stances and activities are easily accounted for by the traditional pluralist analyses or industrial sector studies which dominate scholarship on the politics of business organization. In this literature, the interests of businessmen are determined by the economic conditions or market position of their industry, and the primary task of business organizations is to advance those interests in the political arena. There are many studies analyzing the political stances, coalitions, and conflicts between industries on issues ranging from trade protection to taxation which derive their political interests from such factors as the industry's position in international markets, export dependence, and capital intensity.⁷

From both pluralist and industrial-sector perspectives, business organizations thus exist simply to aggregate and articulate these fixed interests in the political process. The range of business behaviors considered as political is thus restricted to pressure group activities. This is reinforced in the U.S. context by the relative weaknesses, and diminishing importance, of employer associations.⁸

The case of Silicon Valley suggests the need to recognize a greater diversity in the forms, strategies, and goals of business collective action. The archetypal American trade association reflects the structure of the traditional mass production corporation, with its limited relationship to its external environment.⁹ In the "modern business enterprise," production and administration are internalized in the structure of the vertically integrated firm, governance is achieved primarily by a corporate hierarchy, and firms (and industries) are autonomous units with clearly delineated boundaries. The role of business organizations is thus simply to insure the reproduction of a stable regulatory environment, primarily through lobbying at the national level.¹⁰

The integrative organizations which have emerged in Silicon Valley, by contrast, are creating a framework for competition and collaboration among the small and medium-sized specialist firms in a more flexible productive system. Production in Silicon Valley is increasingly the outcome of a decentralized series of information exchanges, subcontracting relations, and research projects which blur the boundaries of firms and industries. As extra-firm relationships have grown in importance, business organizations are serving a coordinating role at regional and/or sectoral level.

Organizations such as SEMI and the SEF play a central role in coordinating flows of information and technology and in establishing a framework for competition among the region's specialist producers. While historians of American industrialization have documented the efforts of business associations to govern such fragmented industries as textiles, these organizations have received far less scholarly attention than their lobbying counterparts.¹¹ In fact, efforts at industrial self-organization in the U.S. are typically associated with the violation of democratic principles, either by cartels or "private-interest governments."¹²

However, such activities need not be collusive. Business organizations play a central role in coordinating production in the industrial districts of Europe. The trade associations in Germany's Baden-Wurttemberg, for example, organize joint research projects, support industrial research in local universities, and provide a forum for negotiation and conflict resolution among the region's specialist firms.¹³ In such flexible regional economies, the activities of firms are thus not easily separable from those of the trade associations (or other regional institutions) which govern the flow of resources and relationships among producers.

Four Silicon Valley business organizations exemplify the differences and tensions between the region's lobbying and integrative associations. The SIA is a classic American trade association. It seeks to define its members' interests as those of the region and the nation in order to gain supportive trade policy and funding. The AEA is an intermediate case. It played an active integrative role in Silicon Valley during the 1960s and 1970s, but followed the lead of the SIA during the 1980s and redirected its resources almost entirely towards lobbying for national industrial policies.

SEMI and the SEF, by contrast, coordinate the activities of the region's small and medium-sized specialist firms in the semiconductor equipment and software sectors. They encourage innovation by setting standards and developing a common technical and commercial language which allows engineers to jointly solve problems in response to fast-changing markets. They provide collective services such as trade shows, market forecasts, applied research, management training, and technical seminars, and they organize forums which strengthen social and professional networks in Silicon Valley.

The Semiconductor Industry Association

The Semiconductor Industry Association is the most prominent business organization in Silicon Valley. To many outsiders it embodies the interests of Silicon Valley, if not all of American high-technology industry, even though only 13 of the region's technology firms are members.

The SIA was founded in 1977 by the chief executives of Silicon Valley's four largest semiconductor firms, all friends who had worked together at Fairchild Semiconductor. While the initial aim of the SIA was to provide a voice for the region's new merchant semiconductor firms against established and politically active firms from outside the region (particularly Texas Instru-

ments), it quickly shifted its attention to the threat of foreign competition.¹⁴ Frustrated with the perceived ineffectiveness of existing electronics associations such as the more broadly-based AEA, SIA founders developed a more focused agenda.

Executives from SIA companies travelled to Washington regularly during the late 1970s to lobby for favorable government policies and to testify concerning Japanese trade practices and policies which they regarded as unfair.¹⁵ These initial efforts had little impact, but the association quickly gained political sophistication. They began to identify the interests of the SIA with those of the nation by linking the health of the semiconductor industry with national competitiveness and security concerns. By the mid-1980s, the SIA had built a powerful political presence in Washington.¹⁶

With this single-minded focus on lobbying, the SIA behaves more like a traditional American pressure group than any other business organization in Silicon Valley. It has clearly had the greatest influence on policy. Within less than a decade from its formation, the SIA had achieved the passage of the bilateral trade agreement with Japan (which reflected virtually all of the SIA demands) and gained a commitment of \$500 million in support from the Department of Defense for the collaborative manufacturing consortium, Sematech.¹⁷

The SIA demands, particularly the trade accord, reflect the agenda of a mass production sector in crisis. Faced with massive losses in commodity semiconductors during the early 1980s due to Japanese competition, the established chipmakers sought a political response. The SIA mounted an extensive lobbying campaign, and six member firms filed legal actions for trade relief. The resulting trade agreement was designed to shore up demand for the commodity memory products of the SIA's large chip-makers.¹⁸ Price floors were designed to eliminate alleged Japanese dumping, while guarantees of market share in Japan were

intended to expand demand for the output of U.S. producers. In short, the agreement sought to stabilize the mass market for U.S. commodity chip manufacturers.

Since that time, SIA policy has sought to ensure that the conditions of the trade agreement are enforced and to extend federal support for Sematech. The SIA experienced its only major failure in 1989 with the folding of the proposed memory chip consortium, U.S. Memories, which it actively supported. The SIA also lobbies on related issues such as anti-trust reform, tax policy, and intellectual property rights, and compiles and disseminates semiconductor trade statistics and forecasts.

The SIA's successes are typically explained by its ability to speak efficiently and quickly, without the dissensus of a large organization. The association currently has only 37 members, and is dominated by a small group of activist firms. Indeed, there are more than 250 specialist semiconductor producers in the U.S. which do not belong to the SIA. In short, while the SIA represents the interests of a small group of U.S. producers of commodity semiconductors, it has succeeded in positioning itself as the voice of Silicon Valley to the outside world.

The American Electronics Association

The AEA is the nation's most broadly based electronics industry association because it has continually expanded to include new sectors as they emerge. It thus represents all companies that design, manufacture, or conduct research in electronics, components, and related information-technology products. AEA membership exceeds 3,500 firms nationwide, more than one-third of which are located in California. The AEA is headquartered in Silicon Valley, also the home of the largest and most active of its 21 regional councils.

When the AEA (then the West Coast Electronics Manufacturers Association, WEMA) moved its headquarters to Silicon Valley from Southern California in the early 1960s, it identified itself with the region's fast-growing new technology firms.¹⁹ Unlike the older Electronic Industries of America which represented established East Coast electronics firms and was based in Washington, D.C., the AEA made an explicit commitment to "be where the new companies are" and to build a solid base there before expanding elsewhere. The AEA thus consciously forged an independent identity among Silicon Valley technology companies distinct from the "old-line" electronics businesses of the East. (By 1980, the AEA had greatly surpassed the EIA in membership, with close to 3,000 member firms compared to the EIA's 300.)

The AEA's focus during the 1960s and early 1970s was almost exclusively on fostering the development of the local electronics community by the assisting management of emerging firms, rather than on lobbying on behalf of established corporations.²⁰ It sponsored seminars and management training sessions on subjects ranging from finance and high-tech marketing to production and export assistance. These activities were welcomed by the managers of Silicon Valley firms, who typically had technical rather than managerial backgrounds.

The AEA also encouraged the growth of the social and professional networks which bind Silicon Valley firms together by hosting frequent meetings for local CEOs and managers. In the words of a local newspaper:

Perhaps the AEA's most significant contribution to the electronics industry is what it did to foster networking. Most top executives of young, fast-growing electronics companies are relatively inexperienced in some important management areas. The AEA, with its frequent seminars and monthly meetings of company presidents, provided an excellent opportunity for those executives to meet and learn from their peers.²¹

The article points out the crucial role the AEA played in integrating the specialized firms in a highly fragmented industrial structure:

. . . electronics companies are uniquely systems-oriented. Almost no firm manufactures from the ground up a stand-alone product. A company either draws on other people's components or makes products that fit with other people's products into a system. Friendships made through the AEA help the companies develop products that work together.²²

This integrative role is confirmed repeatedly in interviews with Silicon Valley managers: one CEO reports that she finds most of her customers through AEA functions, others value the opportunity to stay in touch with old friends and colleagues from prior employers, still others see it as a source of market information, customers, or partners.²³ In fact, when the AEA expanded beyond Silicon Valley, its leaders recognized the importance of these networks. They developed regional councils which replicated the original Silicon Valley structure.

The AEA abstained from national politics throughout most of the 1970s. It did not open an office in Washington, D.C., until 1980. When the association finally hired a Washington lobbyist in 1975, he was relocated to Silicon Valley for five years to gain first-hand understanding of the industry.

The organization's first major policy victory came in 1978 when CEOs of AEA companies travelled to Washington, D.C., to lobby for a reduction in the capital gains tax. But it was only after 1984, when the U.S. electronics industry recorded its first-ever trade deficit, that the AEA increasingly directed its attention toward the federal government. Following the lead of the SIA, and championing the cause of international competitiveness in electronics, the AEA began lobbying for federal policies to reduce the cost of capital, increase investment tax credits, increase funding for R&D, and improve engineering education.

This decision to engage actively in lobbying reflected a decisive shift in AEA policy. During the 1980s, funding for education and management training programs was cut dramatically, while the public affairs budget tripled. In 1987, the AEA Public Affairs Office was moved from Silicon Valley to Washington, D.C. The association now supports three full-time staff members in Washington, D.C., and four more in its Tokyo office. While its 21 regional councils continue to organize activities for local communities, the central focus of AEA efforts has clearly shifted to lobbying for national policies to improve the competitiveness of the electronics industry.

Despite the potential advantages of its broad membership base, the AEA is often criticized for being ineffective.²⁴ It has repeatedly failed to take decisive stands because of the conflicting political agendas of its member firms, particularly between commodity semiconductor firms and computer makers. This diverse membership, which makes the AEA the sole organization which could represent the shared interests of technology firms in Silicon Valley, has thus undermined its effectiveness as a political lobby.

The Semiconductor Equipment and Materials International

The Semiconductor Equipment and Materials International (SEMI) serves the specialist firms in the semiconductor equipment and materials industry, an industry which, even by the standards of Silicon Valley, is highly fragmented and technologically sophisticated.²⁵ Many of its members produce equipment for only one specific step in the exacting process of semiconductor manufacturing, and many have only one or a handful of products. This specialization means that the top 14 U.S. semiconductor equipment companies account for only 55 percent of total industry sales.²⁶

SEMI has more than 1,750 corporate members. It is dominated by small entrepreneurial firms: two-thirds of SEMI members have fewer than 100 employees and annual revenues of less than \$10 million, and only 5 percent have more than 500 employees or over \$50 million in sales.²⁷ And while its membership is concentrated in Silicon Valley, SEMI has diverged from the SIA and AEA by opening itself up to foreign members in recognition of the international nature of its industry.

SEMI was founded as the Semiconductor Equipment and Materials Institute in 1970 by three Silicon Valley-based semiconductor equipment vendors who were dissatisfied with the minimal attention they were receiving at WESCON, the regional electronics trade show.²⁸ The newly formed organization conducted its first trade show, called SEMICON, in 1971, to promote semiconductor processing equipment, materials, and services. Today, SEMICON shows are held not only in California but also in several other U.S. regions as well as in Europe and Japan. Many of the industry's small equipment ventures depend on the trade shows for their survival.²⁹

In addition to conducting trade shows, SEMI sets standards, promotes technical exchange, and provides education programs for firms in the industry. Establishing standards and solving shared technical problems is especially important in a highly fragmented, technically complex, and rapidly evolving industry. In 1973, for example, there were close to 2,000 specifications for silicon wafers in use by scores of U.S. silicon vendors, and the wafers were manufactured in a variety of different shapes. This lack of uniformity created problems of wastage, inventory, and planning for both vendors and customers. Despite skepticism from semiconductor manufacturers, a standards committee defined and publicized specifications for emerging 3-inch wafer lines. By 1975 over 80 percent of all new wafers met SEMI specifications.

SEMI's Standards Committee now oversees the definition of specifications for the materials, equipment, and processes used in semiconductor manufacturing. Standards setting is a strictly voluntary process of defining consensus specifications, and the use of all SEMI standards is voluntary. More than 3,000 engineers from the equipment industry and their customers work on the standards-setting process, which is coordinated by more than 100 international committees, subcommittees, and task forces. According to many engineers, the process of standard setting is at least as important as the standards themselves, because it helps to forge close understandings and working relationships between suppliers and end-users and enhances industry cooperation.

SEMI also organizes education programs for its members. Volunteer committees of SEMI members organize symposia, dinner meetings, information seminars, and conferences. Technical symposia at SEMICON keep members informed of research and technological advances in the industry. These forums also foster technical interchange between customers, academics, capital providers, and SEMI members, and are widely credited with helping diffuse technology and know-how between firms in the industry. Finally, SEMI's annual three-day Information Services Seminar (ISS) provides market forecasts for the equipment and materials businesses and the overall semiconductor industry. This provides a vital service to small firms because, as SEMI describes it:

The vast majority of SEMI member companies are very small, with annual sales of less than \$10 million, making them too small to support any kind of ongoing market research judgments on the condition of our rapidly changing industry. (SEMI, 1990)

SEMI's style thus differs greatly from the SIA. It is a highly participatory organization that allows small groups of engineers to work behind the scenes to set standards and organize trade shows and technical seminars, rather than in the public eye.

SEMI abstained from involvement in public policy throughout the 1970s. It initiated a government relations program in 1984 in order to keep its members informed about federal government activities which directly affected them. However, the organization consciously maintains a low profile in Washington, D.C., lobbying solely about immediate concerns such as export licensing regulations. SEMI did not support the SIA's trade demands, although when SEMI/Sematech was formed as a chapter of the semiconductor manufacturing consortium, 84 companies joined as individual members (rather than through SEMI at large) in order to qualify as potential recipients of Sematech contracts.

Through its trade shows, standard setting, and education programs, SEMI enables its member firms to remain specialized and to survive in a technologically sophisticated and fast-changing industry. By setting standards that build a common framework for competition, organizing trade shows to help underwrite marketing costs, establishing programs which spread market and technical information, and promoting networking and interchange with customers, SEMI enables its member firms to remain specialized and to innovate in a technologically complex and rapidly evolving industry.

The Software Entrepreneurs' Forum

The Software Entrepreneurs' Forum (SEF) is an association of software developers, consultants, and software service providers that supports the thousands of small software firms in Silicon Valley.³⁰ Explicitly regional in focus, it plays only a minimal role in formal politics. The organization is best seen as an attempt to institutionalize the social networks and the culture of information sharing and collaboration which characterized Silicon Valley during the 1960s and 1970s. If anything, it more clearly resembles Silicon Valley's earlier "hacker" organizations, such as the Homebrew Computer Club.³¹

The SEF was founded in 1983 by a group of 14 software "hackers" who recognized that more than programming talent was needed to publish and sell software. While they knew how to design and develop a product, they lacked the good documentation, packaging, production, advertising, financing, and legal advice needed to get programs to market. The founders established the SEF to provide the software entrepreneur with the resources needed to sell products and services. According to one member:

SEF is a group of entrepreneurs who have learned that by working together to network and build their business and technical skill base they can preserve their fierce independence ... and create software on their own terms.³²

With 600 individual members, the SEF is the largest regionally-based organization of its type in the nation, and has spawned at least five similar organizations in other states. It sponsors monthly members' dinner meetings, special interest groups, and week-long skills seminars. These forums enable members to meet with industry leaders, share technical information, develop business skills, establish commercial relationships, and learn about new opportunities. The SEF also publishes a monthly newsletter which keeps members abreast of meeting and seminar highlights and reports on new product releases and other significant news announced by members.

SEF dinner meetings are a Silicon Valley institution. They typically feature industry leaders speaking on topics such as industry trends and business strategies, or offering legal or financial advice. These meetings not only provide information, they also help to create a shared language among the members of a highly fragmented industry. Special interest groups organized around particular functions or operating systems (such as Marketing, Networking, Hypermedia, Windows, or Macintosh), offer an opportunity to obtain technical information and business skills first-hand from prominent professionals in the

field.³³ Entrepreneurs in the region also report finding business partners or new product ideas through SEF activities.³⁴

The SEF is a non-profit organization run by a Board of Directors, a Board of Advisors, and a paid executive director. The Board of Directors supports and develops relationships with other state and national organizations that affect software entrepreneurship. There is a legislative representative and liaison to the Software Services Association (SSA), which maintains a lobbyist to monitor state legislation that affects the software industry. For example, the SEF recently undertook a write-in campaign to protest a bill that would penalize software companies which did not display support information at the point of sale. But such political activity is distinctly secondary to SEF's primary agenda of providing technical, professional, and social support for local software developers and entrepreneurs.

Other Silicon Valley Business Associations

While these four groups are not the only business organizations representing Silicon Valley's technology firms, the other associations in the region all follow a similar pattern. The Computer and Business Equipment Manufacturers Association, for example, is a classic Washington, D.C.-based trade association which represents established computer firms, and the recently formed Computer Systems Policy Project, a pressure group for 11 of the nation's leading computer firms, was explicitly modelled after the SIA.

The Silicon Valley-based International Disk Equipment Manufacturers Association (IDEMA), by contrast, was modelled after SEMI and provides integrative services for the hundreds of specialist firms which supply materials and equipment to the highly fragmented disk drive industry. Finally, the Santa Clara County Manufacturing Group is an explicitly regional-based association dedicated

to working with local government to preserve the physical infrastructure of the region for technology producers.³⁵

THE POLITICS OF BUSINESS ORGANIZATION IN SILICON VALLEY

The coexistence of these contrasting forms of business organization -- and their differing strategies -- generated a series of political tensions in Silicon Valley during the 1980s. While integrative organizations have played an important role in the region for decades, lobbying associations only mobilized during the late 1970s and early 1980s as Silicon Valley's producers faced intensifying competitive pressures. As the semiconductor industry began to lose market share to Japan, however, the region's established chipmakers turned to the federal government to advance their trade grievances.³⁶

The SIA quickly became the only organization in the region with an explicit policy agenda, and it in turn shaped the political debates in Silicon Valley during the 1980s. The AEA eventually followed the lead of the SIA, focusing on lobbying for national policy, while the region's integrative organizations repeatedly opposed SIA initiatives. They failed, however, to define an independent policy vision, typically rejecting any role for the state in governance of the region or its industry.

The conflicts among the Silicon Valley business community became most apparent with passage of the Semiconductor Trade Accord. The agreement was intended to insure stable and profitable markets for commodity chipmakers by eliminating the price collapses they experienced as a result of recurrent cycles of overproduction.³⁷ However, it had immediate adverse impacts on other sectors of the regional economy. Computer systems firms, in particular, were directly damaged both by increases in memory chip prices and subsequent shortages of computer memory after U.S. producers backed out of the business. Other local firms

which rely on commodity semiconductors, from disk drive makers to contract manufacturers, were similarly hurt.

Not surprisingly, no other business associations in the region supported the SIA's trade policy demands. Executives from local computer companies accused the U.S. government of being prepared to sacrifice one industry for another. One claimed: "We have twelve companies that benefit from this. We have about 5,000 losers."³⁸

Even the region's specialty semiconductor producers shared the systems firms' view of the trade agreement as a protectionist measure aimed at supporting a handful of uncompetitive firms. The SIA was thus increasingly isolated from the wider electronics community in Silicon Valley during the 1980s, just at the moment when it was gaining widespread attention and national support.

Trade protection was not the only conceivable response for commodity chipmakers. They might have learned from the strategies of the region's specialist chipmakers, which remained profitable even during the industry's worst downturn in 1984-86 and introduced innovative, higher value-added products and processes; or they could have learned from Japan to interact closely with their suppliers to improve their manufacturing processes. Either strategy would have allowed them to collaborate with -- rather than alienate -- their customers and suppliers.

Sematech reinforced the antagonisms in Silicon Valley. While Sematech was hailed nationwide as a pathbreaking form of industrial cooperation, the consortium received mixed reviews at home. None of the region's specialist semiconductor firms joined Sematech, largely because its prohibitive fees exclude all but the largest firms.³⁹ In fact, only 14 of the 293 semiconductor producers in the U.S. are members. And while 84 semiconductor equipment firms were belatedly included as individual members of SEMI/Sematech, computer and soft-

ware firms are still excluded.⁴⁰ Even the AEA did not support federal funding for Sematech.

Some critics approve of the goal of Sematech, which is to jointly improve semiconductor manufacturing processes, but criticize its prohibitive fee structure and narrow membership as problematic in a highly fragmented industry. In the words of one small semiconductor equipment manufacturer (who is not a member of Sematech and has watched its lucrative contracts go to competitors):

Sematech ought to support entrepreneurs by creating and strengthening a common infrastructure for the entire industry; instead they are trying to be kingmakers.⁴¹

Others view Sematech simply as the vehicle for a handful of aging firms with the political influence to attract public resources to shore up their market positions. In the words of the CEO of a local semiconductor firm: "Sematech is a carefully constructed lobby effort [of the large producers] to deliberately and systematically exclude smaller companies."⁴² Or, more colorfully:

The Sematech Club is primarily a group of dinosaurs . . . large powerful companies with shrinking market shares. To a company, they have banded together to gather government subsidies -- subsidies gained by screaming "Jap".⁴³

These critics have not, however, mobilized to promote an alternative policy for the industry; rather, they view individual entrepreneurs and small firms as the source of the region's dynamism. Articulating the laissez-faire views common among American business, they claim that the way to insure a healthy technology industry is to foster entrepreneurship and to avoid government intervention in the workings of the free market.⁴⁴

Debates over trade policy and Sematech reflect conflicting visions of the appropriate mechanisms for governing production in Silicon Valley. The SIA and the AEA regard the involvement of the national government as essential to the sur-

vival of U.S. technology industry, and Sematech represents their model of the appropriate relationship between industry and the state. Despite its innovations in inter-firm collaboration, however, Sematech is based on a privileged relationship between a small number of large producers and the Defense Department.

The integrative activities of SEMI and the SEF, by contrast, help coordinate a decentralized economic system at the regional or sectoral level without public involvement. These organizations support the small and medium-sized firms in Silicon Valley's fragmented industries by providing technical and market information, promoting the recombination of skill and know-how between and across sectors, and developing a framework of standards and a common language for collaboration.

CONCLUSION: BUSINESS INTERESTS AND THE FUTURE OF SILICON VALLEY

These divergent patterns of business organization reflect the hybrid nature of the Silicon Valley economy. While some of the region's producers have responded to the challenges of intensifying competition by pursuing the traditional lobbying strategies characteristic of American industry, others have mobilized to develop integrative institutions which enhance the flexibility of small and medium-sized producers.

Silicon Valley's lobbyists articulate a program which serves the needs of established producers, but often at the expense of their customers and suppliers. SIA policies thus mirror the autarchy inherent in an approach to mass production which keeps producers at arms' length from customers and their suppliers.⁴⁵ The AEA and the SIA lobby for trade and industrial policy in the name of national competitiveness, yet such measures are likely to strengthen the relationship between the state and a group of large producers, while marginalizing the region's small and medium-sized producers.

Silicon Valley's integrative organizations, by contrast, are creating a supportive infrastructure for specialist firms, but have failed to articulate the importance of the region and its networks to their continued dynamism. Viewing their successes as the result of individual efforts and market competition, they reject efforts to systematically involve the public sector in enhancing the regional infrastructure. Silicon Valley's specialist producers thus celebrate entrepreneurship without recognizing that individual achievement would be impossible without the collective services and relationships provided by integrative institutions.⁴⁶

Just as a range of productive strategies coexist in Silicon Valley, so lobbying and integrative institutions need not be at odds. The challenge for those seeking to enhance the position of U.S. technology producers will be to create a political vision which recognizes the importance of the region's decentralized industrial structure to their technological dynamism, while creating institutions which allow them to respond systematically to shared competitive challenges.

ENDNOTES

- ¹For more detailed discussions of the industrial structure of Silicon Valley, see Scott and Angel (1987), Gordon (1989), and Gordon, Dilts, and Kimball (1988).
- ²Over 85 percent of the 4,800 technology manufacturing and software firms in the region employ less than 100 workers; only 5 percent percent employ more than 500 (U.S. Bureau of the Census, 1987).
- ³For more elaboration on how Silicon Valley's networks and culture support new firm formation, see Delbecq and Weiss (1988), Angel (1989), Gordon, Dilts, and Kimball (1988), Saxenian (1989b).
- ⁴For a more extensive discussion of the strategies of Silicon Valley semiconductor producers, see Saxenian (1990a).
- ⁵For elaboration on the strategies of Silicon Valley's computer systems firms, see Gordon (1989) and Saxenian (1990).
- ⁶For discussions of the organization of production in other flexible industrial regions, see Herrigel (1988, 1990), Sabel (1988), Storper (1989), and Scott and Storper (1988).
- ⁷For examples of industrial sector studies, see Milner (1988), Ferguson (1984), Gourevitch (1977), and Kurth (1979). For critiques of this approach to business interests and political organization, see Tolliday and Zeitlin (1991), Saxenian (1989a).
- ⁸See Derber (1984) for a discussion of employers associations (established to collectively respond to the initiatives of labor unions) in the U.S., and see Tolliday and Zeitlin (1991) for a comparative and historical perspective on employers' associations.
- ⁹The classic description of the "modern business enterprise" which has been hegemonic in the U.S. for much of the 20th century is Chandler (1977). See also Sabel (1988) and Herrigel (1990).
- ¹⁰This helps account for the often observed fact that business associations are far less important in governing the American economy than in European nations, where mass production was never as dominant. See, for example, Hollingsworth and Lindberg (1985).
- ¹¹On the role of trade associations in the textile industry, see Galambos (1966) and Scranton (1983, 1989). In a striking parallel to this case, Scranton (1983) contrasts the development of local industry associations by the flexible and specialized enterprises in the textile district of Philadelphia with the national trade associations established by the mass producers of Lowell to lobby for protection.
- ¹²Excepting "neo-corporatism" in agriculture, business associations in the U.S. which provide sectoral coordination are rare, as are region-based business interest associations -- particularly in comparison with Europe. See Hollingsworth and Lindberg (1985) and Coleman and Jacek, eds. (1989).
- ¹³On Baden-Wurttemberg, see Herrigel (1988, 1989), and on the role of producer associations in the Third Italy, see Brusco and Righi (1989). Scholars are only now recovering the histories of American's 19th c. industrial districts, so we know little about their institutional foundations, but see Scranton (1983, 1989).

¹⁴SIA founders were W.J. Sanders III of Advanced Micro Devices, Charles Sporck of National Semiconductor, Robert Noyce of Intel Corporation, and Wilf Corrigan of Fairchild. Motorola joined the SIA very soon thereafter. TI did not join until the early 1980s.

¹⁵The SIA's sought action on two claims: first that Japanese firms were engaging in unfair trade practices in the U.S. by dumping chips below the cost of production, and second that they were denying U.S. firms access to the domestic Japanese market.

Their policy agenda also included a call for more favorable tax treatment, intellectual property rights for chip designs, and changes in anti-trust legislation to allow cooperative R&D -- most of which was achieved.

¹⁶Clyde Prestowitz Jr., the former chief U.S. trade negotiator with Japan, claimed that the SIA was "the most effective lobbying group that I've seen." Cited in A. Pollack "A Small Lobby's Large Voice," The New York Times, September 7, 1989

¹⁷The trade agreement, passed in 1986, established a system whereby the U.S. Commerce Department monitors production costs and prices for Japanese memory chips and sets fair market values -- minimum floor prices -- for several commodity chips. The agreement prohibits dumping in third-country markets as well as the U.S.

The agreement also formally acknowledges the problem of market access and commits the Japanese government to assisting in opening up markets to U.S. producers. There is some controversy over whether the agreement set an explicit target for U.S. market share in Japan: U.S. firms claiming that Japan agreed to a doubling of their market share to 20 percent by 1991, while Japanese firms deny any such numerical targets. See Borrus (1988) for more detail on both the trade agreement and Sematech.

¹⁸Although ironically, by the time of its passage, only two U.S. firms remained in the DRAM business.

¹⁹WEMA was founded in Southern California in 1943 by a small group of California electronics manufacturers seeking to gain a greater share of the nation's defense contracts.

²⁰Interview, E. Ferrey, ex-president of the AEA, July 31, 1986.

²¹From an article on the retirement of E. E. Ferrey, AEA president from 1960 to 1985. J. Mitchell "A valley hero readies to retire," San Jose Mercury News, January 20, 1985.

²²Mitchell, ibid. One of the most successful of early AEA activities was the 1971 Monterey Conference. The conference brought together financial investors and presidents of small "emerging" companies to interact face-to-face for a weekend -- an explicit forum for deal making and networking. Investors had a chance to survey new firms while entrepreneurs courted potential investors. The annual Monterey Conference is still one of the most popular of AEA activities.

²³Granovetter (1973) discusses the role of such activities as conferences in building the weak ties that integrate communities.

²⁴See, for example, James S. Goldman "Pressures mount on AEA," The San Jose Business Journal, June 25, 1990.

²⁵The firms in the semiconductor equipment and materials industry make the equipment needed to create and prepare wafers, to lay down and process microcircuitry, and to package the final chips and perform final testing.

²⁶Congressional Budget Office (1987)

- ²⁷Semiconductor Equipment and Materials International (1990).
- ²⁸Its name changed from the Semiconductor Equipment and Materials Institute to the Semiconductor Equipment and Materials International in 1988 to reflect the fact that close to 30 percent of its membership was non-U.S.-based firms.
- ²⁹Trade shows are really networks compressed in time and space: they are very efficient sources of contacts with customers and suppliers, and of information on technology and (especially) on competitors. Thanks to Marty Manley for this insight.
- ³⁰In 1987 there were 2,429 software establishments in the region, and they employed a total of 43,636 workers. Fewer than 10 percent of these establishments employed more than 100 workers. U.S. Bureau of the Census (1987b).
- ³¹For discussion of the Homebrew Computer Club and the informal collaboration in Silicon Valley during the 1960s and early 1970s, see Freiburger and Swaine (1984) and Saxenian (1989b).
- ³²Priscilla Rowe, "SEF Breeds Software Success," Bay Area Computer Currents, July 3-16, 1990.
- ³³The Marketing Special Interest Group, for example, has organized meetings and seminars on issues such as Dealing and Negotiating with Publishers, How to Write a Press Release, Direct Marketing, Marketing without Money, etc.
- ³⁴See, for example, the stories reported in M. Krey "Software Entrepreneurs' Forum Keeps on Growing," San Jose Business Journal, October 8, 1990.
- ³⁵For a discussion of the role of the Santa Clara County Manufacturing Group, see Saxenian (1989a).
- ³⁶The SIA began lobbying for trade relief in the late 1970s. The AEA made its initial foray to Washington to fight for reduction of the capital gains tax at the same time. Prior to that, the region's entrepreneurs remained totally apolitical.
- ³⁷In reality the trade agreement simply provided Japanese semiconductor producers with windfall profits which they used to finance a subsequent round of investment in new products and processes.
- ³⁸Cited in E. Richards, "U.S. Computer Firms Attack Japan Trade Pact," San Jose Mercury News, August 7, 1986.
- ³⁹Total entrance fees total about \$2 million. Sematech requires a \$1 million entry fee, and member firms must also join the Semiconductor Research Consortium for a \$62,000 entry fee plus annual dues ranging from \$65 million to \$2.4 million (depending on firm size). In addition, a minimum of 5 engineers must be sent to participate in Sematech activities in Austin, Texas.
- These fees are high even for established companies (equalling about 10 percent of their R&D budgets), but they are prohibitive for small firms; moreover, most start-ups can't afford to be without five of their best people.
- ⁴⁰Only 84 SEMI members initially joined SEMI/Sematech, and several small Silicon Valley equipment producers have since discontinued their participation, claiming that it favors large firms over small and is too expensive.
- ⁴¹Interview, Robert Graham, President and CEO, Novellus Corporation, July 10, 1990.
- ⁴²Cited in S. Moran, "Sematech's hefty fees may bar small chip makers," San Jose Business Journal, May 30, 1988. See also T. J. Rogers, "Landmark Messages from the Microcosm," The Harvard Business Review, January/February, 1990, and "Return to the Microcosm," The Harvard Business Review, July-August, 1988.

⁴³Cited in R. Karlgaard, "An Interview with T.J. Rogers," Upside, December 1990.

⁴⁴Vogel (1978) attributes this distrust of the state among American business to the lack of public intervention during early industrialization. See Gilder (1989) for the classic statement of the free market, entrepreneurial position in Silicon Valley.

⁴⁵Isolation from customers and suppliers is not unique to the semiconductor industry, but rather reflects the traditional U.S. approach to mass production. Conflicts between mass producers and their suppliers and customers are common in U.S. industries -- from textiles to autos to steel. See Dertouzos et al. (1989).

⁴⁶Scott and Paul (1990) note similar tensions between laissez-faire ideology and the need for institutional coordination in the technology regions of Southern California.

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