

**New Economy, Old Politics:
The Evolving Role of the High-Technology Industry in Washington, D.C.**

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Politically attentive Americans surely noticed something new in the coverage of elections and policy-making during the past two or three years: an explosion of stories about high-technology² companies and issues. Led by the legal travails of Microsoft, the high-tech policy agenda encompasses concerns about privacy, the effect of the Internet on China, taxation of e-commerce, and much more. Presidential candidates and Congressional leaders are regularly photographed hobnobbing with computer executives at fund-raisers and media events. Suddenly, it seems, there is a whole “new politics” that parallels the so-called “new economy.”

[Note to editors: I had a cartoon from *Roll Call* here. Should we look into reprint rights or omit? It’s largely for entertainment, although it makes a relevant point.]

¹ The author thanks the participants in the 2000 Bretton Woods conference (particularly Graham Allison) and the members of the Harvard American Politics workshop (particularly John Gerring and Burt Johnson) for their helpful comments.

² In this paper, I generally use the terms “high-technology” and “high-tech” industry to mean computer hardware, software, and networking. This usage is colloquial and admittedly imprecise. Below, I supply a more precise definition, which was used to assemble statistics. Economists often use “high-technology” to mean a firm or industry with a high ratio of R&D spending to sales. This definition lumps together industries with very different policy interests and political histories, such as pharmaceuticals, aircraft, and “high-technology” as I have defined it. Deborah Hurley, in her contribution to this volume, includes media and communication firms along with my “high-technology” firms under the rubric “information industries.” Again, such a definition lumps together firms and sectors with very different historical relationships to government. For purposes of political analysis, I believe these industries are most usefully treated separately. Occasionally in this paper, I use the term “innovative industry” to denote “high technology” in a more generic sense, that is, an industry offering important technological innovations at any time in history.

The journalists are undoubtedly right that there are new players on the Washington scene whose interests derive in one way or another from the deployment of new information technologies in society. As I describe below, firms like Microsoft, Cisco, and America Online (AOL) took an interest in public policy only in the second half of the 1990s and seem to have made a big impression on elected officials and policy outcomes during that period.³ Their involvement is an important development in American politics, with consequences that can only dimly be foreseen. The media buzz, however, exaggerates the novelty of high-tech's presence in Washington. The attention paid to a few prominent newcomers leads readers and viewers to overlook the many high-tech firms and associations that have established themselves in the nation's capital over the past quarter-century or more. There is a larger and longer political learning process in progress within this industry, and the last few years represent but the latest stage of it.

Moreover, viewed in the broadest context, the "new politics"⁴ represented by the high-tech industry is as old as the marriage of capitalism and democracy that has distinguished the United States since its founding. Market economies like ours must continually generate and diffuse innovations in production and distribution to remain healthy. Efforts to innovate inevitably generate tensions that find expression in our pluralistic politics. While the specific forms and outcomes of innovation-related political conflicts are historically contingent, the presence of a new economy and a new politics in contention with the old ones is, paradoxically, not new at all.

In this chapter, I attempt to put the political development of the contemporary high-tech industry in perspective in the ways sketched above. I provide a typology of generic processes that draw technologically innovative industries into American politics. I illustrate this typology with examples drawn from the contemporary high-tech industry. I then make a more systematic empirical reconnaissance of this industry, showing that its political development does not follow the contours that a casual reading of the press

³ The reader should bear in mind that these firms, particularly AOL (founded 1991) and Cisco (founded 1984), were relatively small before the second half of the 1990s. Microsoft was founded in 1975, but even it remained in the shadow of IBM until the early 1990s.

⁴ The reader should note here that I am opining about only one of many hypotheses that might link a "new politics" to the "new economy." This paper does not touch on, for instance, the rise of mass shareholding, the emergence of a putatively libertarian high-technology workforce, or new modes of political communication.

would lead one to expect. I conclude with some speculations about the political future of this industry and others like it that will surely emerge in the coming century.

Premises: Pluralism, Instrumentalism, and Bounded Rationality

Before turning to the meat of my analysis, I want to make some of its key premises explicit. These premises situate my views with respect to several major debates in the study of American politics and frame my data collection and interpretation. One premise is that political power in the U.S. is divided in significant ways among a variety of institutions and actors. Elected officials, bureaucrats, and interest groups of various sorts, including businesses, jostle for control of governmental authority and resources. Any emerging industry takes its place on an already crowded stage, rather than being invited to join a power elite (as some theorists of American politics would have it) or securing official representation in decision-making processes (as might be the case in a corporatist system). That is not to say that power is divided equally or fairly; one needs resources to participate. But there are many kinds of resources, including some (such as the right to vote in an election or on the floor of Congress) that cannot be held by any business.⁵

Another premise is that influence in Washington is exercised, at least in important part, overtly. People meet, presentations and appeals are made, pressure is mobilized, contributions are given. To get their way on issues that they care about, high-tech businesses have to do the things that other interest groups do, which means that they must invest in specialized organizational capabilities. They cannot simply assume that they are so important that governmental actors will look out for their interests (as a structural power perspective would suggest) nor rely entirely on their symbolic authority to overcome any resistance to their wishes (as theorists of cultural hegemony might claim). Some of these investments in politics and public policy can be observed, such as when a firm opens a Washington office or makes campaign contributions, and so can some of their immediate results, like invitations to appear before Congressional committees. That

⁵ Virginia Gray and David Lowery, "A Neopluralist Perspective on Research on Organized Interests," paper presented to the Midwestern Political Science Association Annual Meeting, Chicago, April 27, 2000. In her chapter, Deborah Hurley notes that businesses are seeking voting privileges in international policy-making fora.

is not to say that the system is perfectly transparent; much goes on behind the scenes. But such observations, I assume, can serve as the basis for making inferences about the overall process of an industry's political development.

In addition to pluralism and instrumentalism (as I would characterize the previous two paragraphs), I also take bounded rationality as a premise; it applies to all of the actors in the policy process, including high-tech firms. Attention is a scarce commodity, and the capacity to collect, process, and act on relevant information is limited. Uncertainty is common with regard to likely outcomes of policy debates and implementation, others' intentions and actions, and even one's own (or one's organization's) best interests. (Indeed, if some recent accounts of interest group politics in the U.S. are to be believed, uncertainty in such matters has become pervasive.⁶) Institutionalized relationships resolve uncertainty by shaping beliefs and thereby drive action.⁷ Of course, change is nonetheless possible. It's just that something (like a threat to a critical resource) has to get the attention of those in control for change to occur, and the outcomes may not correspond to the intentions.

The policy-related activities of high-tech firms are particularly subject to these constraints. Washington is usually peripheral to the main objectives of these firms; senior managers tend to worry more about customers and suppliers than Congresspersons and Senators. Indeed, if they are lacking a dedicated government affairs function, these managers may receive very little information about public policy at all. Moreover, they may not have the knowledge and skills to react effectively when they begin to pay attention. On top of these internal difficulties in addressing public policy issues, high-tech firms face the collective action costs that all unorganized groups face without much in the way of an institutional infrastructure that might reduce these costs.⁸

The first two premises, pluralism and instrumentalism, lead me in the next section to define two processes of political engagement that characterize innovative industries. The third, bounded rationality, helps me in the section after the next to explain why these

⁶ John P. Heinz et al., *The Hollow Core: Private Interests in National Policy Making* (Cambridge: Harvard University Press, 1993); Rogan Kersh, "Washington Lobbyists as (Semi-)Autonomous Actors," paper presented to the Midwestern Political Science Association Annual Meeting, Chicago, April 27, 2000.

⁷ Cathie Jo Martin, "Nature or Nurture? Sources of Firm Preferences for National Health Reform," *American Political Science Review* 89:898-913 (1995); Douglas A. Schuler, "Corporate Political Action: Rethinking the Economic and Organizational Influences," *Business and Politics* 1:83-97 (1999).

processes have played out the way they have in the specific case of the high-tech industry.

The Politics of "Creative Destruction"

The motivations for firms in innovative industries to get involved in electoral politics and public policy-making flow from their role in the larger process of economic growth that Joseph A. Schumpeter famously characterized as "creative destruction." The motor of the economy, in Schumpeter's view, is entrepreneurship based on innovation, particularly the development of new products and services. Entrepreneurial creativity is stimulated by the possibility of windfall profits, reaped by a fortunate few. The destruction the fortunate few wreak is on those whose livelihoods are tied to the existing ways of doing things. Henry Ford's automobiles, for instance, crippled the railroad industry; corporate empires evaporated and whole occupations virtually disappeared. Schumpeter's ideas have attained a new respectability in the past couple of decades, but their political implications have yet to be explored the way that those of Adam Smith, Karl Marx, or John Maynard Keynes have been.⁹

In this section, I describe two sets of processes that stimulate the political development of innovative firms and industries. The first derives from entrepreneurial creativity, which is not necessarily restricted to building organizations and products, but may also extend to mobilizing public resources to secure new markets. I label these "offensive processes," since the innovating industry takes the initiative to influence public policy. The second has its roots in the destruction wrought by entrepreneurs, as the "old economy" seeks to deploy governmental authority to strike back at the "new economy." These are "defensive processes," which have been well-characterized by the great American political scientist E.E. Schattschneider. I illustrate both sets of processes with examples from the high-tech industry, but I believe they are more general phenomena of capitalism and democracy that can and should be explored in the development of other high-tech sectors in other places and at other times.

⁸ Mancur Olson, *The Logic of Collective Action* (Cambridge: Harvard University Press, 1965).

⁹ Schumpeter himself attempted to work through some of the issues in his *Capitalism, Socialism, and Democracy* (New York: Harper & Bros., 1942), but (viewed with more than a half-century's hindsight) got it all wrong.

Offensive Processes

Entrepreneurs assemble and deploy resources, especially money, knowledge, and people.¹⁰ While we tend to think of them spending their time persuading venture capitalists, technical experts, and managers to work with them, they may also recruit the state to put its resources behind their efforts. If entrepreneurs are entering areas in which government has an established interest, new enterprises (as in the contemporary biotechnology-pharmaceutical industry) may be "born political." Indeed, in a few cases, like MCI in the 1960s, political action is an essential component of the entrepreneurial business plan.¹¹ The entrepreneurs who built the contemporary high-tech industry have occasionally but not systematically relied upon state-supplied or state-subsidized resources.

Public money, for instance, was a key determinant of the fate of early American high-tech entrepreneurs. From the late 1940s until well into the 1960s, U.S. government agencies were the main buyers of computers and the dominant funders of computer-related R&D. Government support was particularly critical at the cutting edge of technology, where firms honed products and services that were often incorporated later into commercial products. Not surprisingly, some of the oldest high-tech industry public policy offices in Washington, such as IBM's, began as adjuncts to or spinoffs from Federal sales divisions. Keeping public money flowing was a vital task. Tax breaks can be as valuable as direct subsidies, at least for firms with revenues or the near-term prospect of them. High-tech executives have been prominent among those who have made the case in Washington that the market provides inadequate incentives for private R&D and investment spending and that the public ought to enhance these incentives with tax credits. Hewlett-Packard's public policy program, for example, emerged in the early 1980s in part as a response to this opportunity.

Mobilizing government assistance to secure knowledge for entrepreneurial gain is a somewhat more subtle process than mobilizing government subsidies. The same market failure that justifies a tax subsidy for R&D, however, justifies intellectual

¹⁰ Nicolai J. Foss, ed., *Resources, Firms, and Strategies* (New York: Oxford University Press, 1997).

¹¹ David B. Yoffie and Sigrid Bergenstein, "Creating Political Advantage: The Rise of the Corporate Political Entrepreneur," *California Management Review* 28(1):124-139 (Fall, 1985).

property rights, which invest private knowledge with public protection (as Jean Camp discusses elsewhere in this volume). Entrepreneurs typically employ lawyers to pursue and defend these rights, but occasionally technological innovations pose such a challenge to the established jurisprudence that entrepreneurs seek legislative or other policy actions to buttress their legal positions.¹² Ebay and Amazon.com, for instance, have invested in public policy capabilities with specific intellectual property objectives in mind. Another important source of knowledge for high-tech firms is academia. Publicly-supported scientists can contribute ideas to such firms in a variety of ways, including through the granting of licenses to university-held intellectual property. But, because the benefits of academic research funding are diffuse and take a long time to materialize, most entrepreneurs have difficulty recognizing and acting on an interest in it. Not surprisingly, the high-tech industry has until recently done relatively little to advocate for public funding of academic R&D. This reticence stemmed in part from the fact that the defense establishment has been intensely interested in computer science and related disciplines and served as a surrogate advocate for the industry. With the end of the Cold War, though, industrial interest in non-defense academic R&D has grown to the point that the issue engages high-tech executives who in an earlier era would have had little or nothing to do with Washington.

Academic R&D also produces well-trained and creative people, a third important resource for high-tech entrepreneurs. Since the U.S. university system draws talent from around the world, often subsidized by foreign governments, the high-tech industry has been able to recruit a multi-national workforce rather easily. In recent years, this recruitment has been so intense that the industry has bumped up against limits on immigration of highly-trained workers, and this restriction has prompted a collective political response by the industry. Immigration and, to a lesser extent, improvement of American education, are now high priority agenda items for such organizations as the Information Technology Association of America (ITAA).

¹² I distinguish here between legal and policy processes, although admittedly the boundaries are fuzzy.

Defensive Processes

Schumpeterian entrepreneurs seize opportunities, but in doing so they may pose threats to established interests. Such threats prompt a characteristic response, which was described by Schattschneider, albeit in a different context.¹³ A fight is never over, Schattschneider argues, until the entire audience has been drawn in. An interest imperiled by a technological innovation, Schattschneider leads us to believe, is likely to try to expand the scope of conflict, to capture the attention and support of previously unengaged parties. What would otherwise be lost as a result of market competition may be salvaged through political appeals. Such appeals provoke a countervailing response, drawing high-tech companies into a political arms race. Several sorts of arms races can be observed in high-tech's political history.

The most obvious of these dynamics pits older industries against newer ones. As new technologies bite into existing businesses, those businesses, which are typically experienced in Washington politics, may fight back by seeking to impose barriers to entry or to raise their new opponents' costs. The long-running skirmish between the computer and telephone industries illustrates the point. In the 1960s and 1970s, AT&T sought to classify as much computer equipment as possible as communications equipment, so that it would be subject to Federal Communications Commission oversight, an arena in which it held a substantial advantage. IBM (among others) objected vehemently, and the success of the deregulatory coalition of which IBM was a part contributed substantially to the conditions that have allowed the Internet to grow so rapidly in the past decade. More recently, Internet applications have sparked a new round of conflict over the boundaries of communications regulation, such as the debate over open access by on-line service providers to high-speed Internet customers. Indeed, the commercialization of the Internet has broadened substantially the scope of inter-industry conflict in Washington. Broadcasters, for instance, have come into conflict with the high-technology sector in the debate over high-definition television. Electronic commerce threatens distributors of many types of goods; the recent effort to limit interstate wine sales over the Internet reveal the political power of one such distribution network. Some of these conflicts will undoubtedly be resolved in the marketplace (the AOL-Time Warner merger, for instance,

¹³ E.E. Schattschneider, *The Semi-Sovereign People* (New York: Holt, Rinehart and Winston, 1960).

brings together Internet and broadcasting interests), but just as certainly, others will play out on the political stage.

Creative destruction occurs within as well as across industry boundaries and so do efforts to expand the scope of conflict. In IBM's heyday, for instance, its competitors lobbied to make it hard for government agencies to buy IBM products, and they egged on the antitrust suit that the Department of Justice filed against IBM in 1969. Novell and Netscape (among others) are said to have played similar roles in the antitrust cases filed against Microsoft in the 1990s.¹⁴ U.S. semiconductor firms engaged the U.S. government in their struggle with Japanese competitors in the 1980s (competitors, it should be noted, which had access to important Japanese government resources that their U.S. competitors lacked, but which also had made important technological innovations that threatened U.S. firms). Ironically, the 1986 U.S.-Japan Semiconductor Trade Arrangement (STA), which granted a measure of protection to the U.S. semiconductor industry, provoked a defensive domestic reaction of its own. U.S. computer manufacturers, who faced higher prices in the STA's aftermath, established the Computer Systems Policy Project (CSPP) to counter the Semiconductor Industry Association (SIA), and CSPP lobbied to remove the most objectionable conditions when the agreement was renewed in 1991. Intra-industry conflicts like these may make it difficult for the industry to work together to fight inter-industry conflicts or broader social conflicts.

Such broader social conflicts may ensue when technological change threatens economic interests, such as those of workers who might be displaced, and when non-economic values are challenged as well. Interestingly, the high-tech industry has been relatively immune through much of its history from the most powerful opponents of business in American society, such as labor unions and environmental and consumer activists. As early as 1974, for instance, IBM CEO Frank Cary feared that a Nader-like movement would emerge around privacy concerns, but the rumblings tailed off. This immunity seems to be eroding in recent years; again, privacy provides an indicator. A number of new advocacy groups have joined the venerable American Civil Liberties Union to build public interest in and political support for privacy protection legislation.

¹⁴ John Heilemann, "The Truth, the Whole Truth, and Nothing But the Truth," *Wired*, November, 2000, 261-311.

Privacy advocates are particularly well-equipped to take advantage of the general lowering of the transactions costs of aggregating diffuse societal interests caused by the Internet. Hence, Intel, for instance, faced a massive and nearly instantaneous backlash in 1999 when critics revealed that one of its chips made it much easier to identify and monitor individuals in cyberspace. Whether this issue or another (like investor protection) will trigger a full-scale political arms race remains to be seen.

The issue of privacy also illustrates a fourth defensive dynamic, one in which the threatened interest is an element of the state, rather than society. In a pluralistic system, state agencies have to mobilize support, much as private interests do. Entrepreneurial firms may undermine the established capabilities of state agencies or even their reason for being, and the agencies may fight back, as national security, intelligence, and law enforcement agencies have done in the case of encryption software. These agencies are among the most powerful in the U.S., and they have provoked a more vigorous arms race response from the high-tech sector than any non-business societal interest. Some firms and industry associations have attempted to mediate the dispute, with little success, while others have done their best to strike down controls that restrict exports of encryption software and to head off domestic encryption regulations. A similar snarl has pitted the high-tech industry against state and local governments over the applicability of sales tax to e-commerce purchases.

From Typology to History: An Empirical Reconnaissance of High-Tech Politics

To this point, I have established that innovative industries in general, and the high-tech industry in particular, have been drawn into politics and policy-making for two broad sets of reasons. In the offensive mode of action, they seek to use the state to help them assemble the resources they need to be successful entrepreneurs, including money, knowledge, and people. In the defensive mode of action, they get involved in order to fend off efforts by market competitors and critics in society and government to use the state to hamstring them. This typology does not necessarily lead to predictions about what might happen in any particular case of the political development of an innovative industry. One might think, for instance, that offensive motivations would dominate the early political development of an innovative industry and that defensive processes would

kick in later. However, in a period in which entrepreneurial resources are plentiful and the dominant ideology among entrepreneurs denigrates state intervention, the sequence might be reversed, particularly if the opponents of the industry were successful in their policy advocacy.

Indeed, my guess (which is all that I can offer in the absence of a larger set of case histories) is that there is no simple pattern that describes the political development of innovative industries. Whether entrepreneurs in any particular circumstance recognize political opportunities (as is required to act in the offensive mode) or political threats (which is vital for the defensive mode) depends on their capacities for gathering and processing policy-relevant information. These capacities, the reader will recall, are presumed to be bounded, sometimes severely so. While I cannot claim to have identified all the factors that determine the boundaries of rationality in high-tech politics, I can point to three important factors suggested by the literature in this area and by my empirical research to date.

One factor is the focusing event, to use the term of political scientist John Kingdon.¹⁵ Such an event breaks through the routines and pressures of daily life that dominate the attention of corporate executives. The Department of Justice, for instance, got the attention of IBM's top brass with its antitrust lawsuit in 1969 and did the same with Microsoft in 1998; both of these events were turning points in the political histories of these firms. A second factor is leadership. AOL, for example, is based near Washington D.C. in northern Virginia and was founded by a person with a strong interest in public policy, Steve Case. AOL was therefore quick to recognize the threat posed by the Communications Decency Act in 1995 (which might have made the firm liable for content that passed over its network), even though it was still a relatively small firm at the time.¹⁶ A third factor is policy-related organizational investment. The formation of a trade association, for instance, can lower the costs and increase the benefits of policy involvement. The Semiconductor Industry Association (SIA), for example, changed the

¹⁵ John W. Kingdon, *Agendas, Alternatives, and Public Policy*, second ed. (New York: HarperCollins, 1995), 94.

¹⁶ "I've met a lot of the Silicon Valley boys," Congressman Billy Tauzin stated last year, "They're fascinating people, but they are not Washington-savvy. Case is ahead of them." Neil Munro, "Building a Case," *National Journal*, July 31, 1999, 2219.

mindset of leading high-tech entrepreneurs in the late 1970s and facilitated their effective engagement in the trade policy debates of the 1980s.

In the rest of this section, I use these ideas to help interpret a suggestive set of time series data. These data describe the policy involvement of a universe of 120 firms that at one time or another have been included in the *Fortune* 1000 in a computer or information-related category. (The firms are listed in Appendix A.) Although this list does not encompass the entire high-tech industry and one might quibble with some of the inclusions, it provides an excellent starting point for systematically analyzing the industry.¹⁷

Corporate Representation in Washington

Perhaps the most commonly-used indicator of interest in and capacity to influence public policy is Washington representation. Some firms open offices in Washington to manage their affairs there, while others retain a Washington law or lobbying firm to do the job. Some do both. *The Washington Representatives (WR)* is the most complete compendium of offices and representatives, and Figure 1 displays the number of high-tech firms found in it. In *WR*'s 1980 edition, 17 high-tech firms were listed as having a public policy office and 23 as having hired outside counsel to represent them on policy issues. (Only 58 of the 120 firms were in business in that year.) By 1988, the number of offices reached 28, which is roughly where it stayed through 1998 (out of a total of just over 100 firms). (The total number of professional staff members in these offices, which is not shown here, seems to have followed a roughly similar trend.) The number of firms that retained outside counsel in the capital levelled off at 40 between 1986 and 1988, but then rose slowly to 50 in 1996 before dropping off slightly in 1998.

¹⁷ Of course, diversification, technological innovation, mergers, and acquisitions limit the validity of any classification scheme of this type, particularly over a long stretch of time. A particular weakness of this selection method is that it excludes firms that never became large. (In the late 1990s, a firm needed approximately \$1 billion in sales to make the *Fortune* 1000.) However, this threshold does not seem too high; firm size has such a strong effect on Washington involvement that casting a broader net would be unlikely to capture many additional corporate high-tech policy players. Moreover, the data include firms that were small for part of the period, but grew rapidly enough to make the *Fortune* 1000 later. These data cannot be directly compared to those generated by the Center for Responsive Politics, which tracks campaign contributions and lobbying expenditures by industry. Their list of firms in the computer industry is broader than the one I use here, and they also include contributions by individuals associated with firms in their data.

[Figure 1: High-Tech Corporate Representation in Washington]

This measure has its weaknesses. *WR*'s coverage of Washington is imperfect. More importantly, it does not capture government affairs investments made at the headquarters office, where some high-tech firms choose to locate much or all of this function. Nonetheless, the picture is worth studying. The aggregate high-tech investment in Washington appears to have leveled off in or, at the very least, grown considerably more slowly after the mid-1980s. However, these figures conceal a certain amount of churning. Between 1980 and 1982, for instance, although the net change in the number of Washington offices was three, six high-tech firms opened such offices, while three closed them. That cycle marked the peak of turnover until the two most recent cycles. Between 1994 and 1996, five offices opened and six closed, for a net loss of one; in the next two years, ten opened and eight closed, for a net gain of two. It may be that increasing volatility is being mistaken for an increased presence by casual observers.

To get some purchase on the motivations that lead high-tech firms to make the investment in a Washington office, I have gathered additional quantitative data, conducted interviews, and collected press coverage. (The reader should be aware, however, that these sources do not provide systematic information on all 120 firms.) The list of high-tech firms already entrenched in Washington in 1980, as one might expect, was dominated by defense contractors; 11 of the 17 firms with their own offices there appeared on the Defense Department's list of the top 100 contractors.¹⁸ This offensive motivation waned as the civilian market grew ever more important; one might say that the end of the Cold War was an event that focused high-tech attention away from Washington. By 1989, fewer than half of the high-tech firms with Washington offices appeared on the DOD list. Moreover, of the original 11, four relied on DOD for less than 10% of their total sales. Among these was IBM (for which the DOD share of sales was less than 2%); it opened its government programs office in Washington in 1975 primarily

¹⁸ In fact, the only firm in the high-tech group that appeared on the DOD list that did not have a Washington office in 1980 was ITT, which was involved in a major corruption scandal during the Nixon Administration.

for defensive reasons, such as opposition to the union-inspired Hartke-Burke bill, which would have imposed a large additional tax on the company's foreign operations.¹⁹

Defensive concerns also brought Intel to Washington in September, 1985, AOL in February, 1995, and Microsoft in May, 1995. Intel's main objective was to bring U.S. Government pressure to bear on the Japanese chip industry, which it succeeded in doing. To "finish the job" once a managed trade regime had been imposed, the company turned to the offensive task of winning Federal funding for Sematech, an industrywide R&D consortium. Its involvement in this task was facilitated by the existence of the SIA and the historically close links among Silicon Valley firms, which made it easier for the industry to put forward a united front. AOL's public policy office was established to fight the Communications Decency Act (CDA), which aimed to limit Internet access to content deemed offensive; AOL feared the CDA would slow its growth. Steve Case's leadership seems to have been an essential element in AOL's recognition of the threat. Microsoft provides a different sort of example with regard to the importance of leadership. From 1995, when it first opened, until 1998, Microsoft's Washington policy office contained only two professional staff and was co-located with its Federal sales group. "I'm sorry we have to have a Washington presence," Microsoft CEO Bill Gates told *The Washington Post* in 1995.²⁰ Not until a series of antitrust actions crested in the suit currently being contested (and Gates brought himself to testify for the first time before a Congressional committee), did Microsoft expand this office and move it to a separate site. A very powerful focusing event had to occur before public policy issues got Gates's attention.

Industry Associations

Industry associations provide another mechanism through which firms may attempt to influence the policy process. Participation in such associations represents the most significant policy-related investment of nearly all small firms and many large ones

¹⁹ Although the antitrust suits brought by the Department of Justice and IBM's competitors in the late 1960s and early 1970s focused the attention of the firm's senior management on Washington, it decided that the legal battle could only be won in court. A rigid separation was therefore imposed between IBM's Washington office and the legal staff contesting these cases.

²⁰ "Mind Behind the Microsoft Miracle; Gates Reflects on the Future of Software, Money and the World of Washington," *The Washington Post*, December 3, 1995, H1.

as well. Politically sophisticated large firms are less dependent upon associations and utilize them more strategically, in conjunction with narrower corporate and broader coalition efforts, but associations nonetheless play an essential part in their policy and political strategies.

“High-tech industry association” is inevitably a fuzzy category. In Figure 2, I have listed about twenty permanent public policy-oriented organizations that draw corporate members from the computer hardware, software, and networking industries.²¹ Clearly, the number of associations is growing steadily over time. The number of professional staff of these associations, as listed in *WR*, has also grown, although more slowly in the 1990s than in the 1980s; it is about half the total number of staff working in the corporate offices described above.

[Figure 2: High-Tech Industry Associations]

The dates and names in Figure 2 suggest the variety of pathways into the high-tech industry and the industry's increasing complexity. The two oldest associations trace their roots to the office machine and radio industries of the 1910s and 1920s. The youngest one was formed in 1999 and includes Internet giants AOL, Amazon.com, and Yahoo! In between, one sees the emergence of software, computer components, and information services as distinct interests, particularly after IBM unbundled these products (which it originally sold almost entirely in packages) in the late 1960s. The associations vary in breadth, from umbrella groups representing the entire high-tech “food chain” to one-person shops that embrace narrow slices of it.

A more detailed history of these organizations provides insights into the forces that brought them into being, although it is not possible at this point for me to do more than supply illustrative examples. The West Coast Electronics Manufacturers Association was founded in 1943 for the offensive purpose of securing more defense contracts for California-based firms; the western tail of the industry eventually wagged

²¹ My universe of high-tech associations has not been compiled systematically; this research is in progress. I have attempted to exclude temporary *ad hoc* coalitions (although many of these survive for a long time) and think-tanks or public policy research organizations (even though many of these receive support from high-tech corporations and engage in advocacy).

the eastern dog, and WEMA became the American Electronics Association. IBM's opponents banded together to form the Computer Industry Association in 1972, which helped to broaden of the scope of conflict within the high-tech industry by supporting antitrust litigation. Adding "communications" to its name in 1976, the CCIA sided with IBM in the industry's defensive conflict with AT&T. Both the antitrust litigation and the so-called "Bell bill" served as focusing events for the CCIA's founders and members. (Interestingly, the CCIA's historical focus on antitrust issues has left enough of a legacy that it is a prominent public opponent of Microsoft today.) The CCIA's 1970s antagonist, the Computer and Business Equipment Manufacturers Association (CBEMA), was widely perceived as an IBM front group and ultimately changed its name in 1994 to reposition itself in the eyes of potential members and interlocutors in government.

TechNet, which has gotten an inordinate amount of media coverage, is the most prominent new entrant to this organizational field. In this case, the focusing event was a 1996 California state ballot initiative (Prop 211) that would have made it easier for high-tech companies to be sued by disgruntled investors. John Doerr, a venture capitalist with Kleiner Perkins Caufield and Byers, who had earlier forged links with Vice-President Al Gore, is usually given the lion's share of the credit as the leader of this effort. The hastily-assembled group Taxpayers Against Frivolous Lawsuits handily defeated Prop 211, raising and spending some \$35 million to do so. The organizational infrastructure constructed during by the fight against Prop 211 became the basis for TechNet, which was founded in 1997 at the instigation of Doerr and his Republican colleague Floyd Kvamme. Although its mission and structure are evolving, TechNet to date has served mainly as a sponsor of fund-raising visits by prominent politicians, at which high-tech CEOs could "educate" their visitors about the industry, while making individual contributions to their campaigns.

Campaign Contributions

The TechNet story provides an entry point for consideration of the relationship of the high-tech industry to political parties and candidates. The main quantitative indicators that I will rely on are campaign contributions. Ideally, one would like to know about in-kind support (including site visits), endorsements, advisory relationships, and

even the backgrounds of candidates themselves, but these are difficult data to assemble. Like the other indicators, campaign contribution figures should be seen as noisy measures of corporate interest and effort.

Figure 3 shows the total contributions to Congressional candidates made by PACs sponsored by high-tech firms. These contributions rose from about a quarter million dollars in the 1977-78 election cycle to about \$2.2 million in 1987-88 and stayed around that level for the following decade. (Only a quarter to a third of the firms in my sample maintain PACs, a fraction that has risen only slightly over time.) Surprisingly, given the overall growth in campaign contributions and the dramatic growth of high-tech firms' resources, the high-tech line in Figure 3 mirrors Figure 1, leveling off over a decade ago.

[Figure 3: High-Tech PAC Contributions to Congressional Candidates]

Figure 4 traces "soft money"²² contributions made by high-tech firms to the major political parties. Adding these contributions (which have only been disclosed in recent cycles) to those of high-tech PACs brings us closer to the popular notion of a burst of high-tech interest in Washington. From about \$350,000 in 1991-92, the high-tech soft money total rose to surpass the PAC total in the 1997-98 cycle. Nonetheless, these figures taken together still seem modest in comparison with other industries, tracking the overall growth of the campaign finance system, but not reflecting the rapid growth of the high-tech industry relative to the rest of the economy.

[Figure 4: High-Tech "Soft Money" Contributions]

Like those of most firms, high-tech PAC and soft money contributions tend to go to Republicans and incumbents. Although the Democrats narrowed the gap between 1986 and 1994, the Republican takeover of Congress boosted the GOP share of high-tech contributions back over 70%. Nearly 90% of high-tech PAC contributions accrued to

²² My definition of "soft money" includes contributions to either major party's national committee, Senatorial campaign committee, or Congressional campaign committee. These contributions can be made directly from corporate funds, unlike PACs, which must raise the money that they contribute from

incumbents in 1998, a figure which has increased steadily since 1980, when support provided to challengers and contestants for open seats exceeded that given to incumbents. High-tech business as a whole seems to have learned what the rest of American business has learned as the modern campaign finance system has matured over the past quarter-century: contributions mainly provide access to like-minded incumbents. The old politics trumps anything new on this dimension of political “participation.” High-tech's relatively small role in the system to date may reflect a distaste for or lack of interest in electoral politics. It may also reflect high-tech's cultural cache; the industry does not necessarily need to contribute as much as other industries to get access to influential policy-makers.

The aggregate picture belies "the conventional wisdom that Silicon Valley is Democratic" (as *Fortune* put it in 1998).²³ The perception that the high-tech industry is Democratic goes back to the Tom Watson, Sr., the founder of IBM (who was a supporter of Franklin D. Roosevelt) and his namesake and successor, Tom, Jr. (who was close to John F. Kennedy). (Dick Watson, Tom Watson, Jr.'s brother and a high-ranking IBM executive in his own right, however, was a prominent Republican.) The Watsons' imprint on the firm demonstrates the importance of leadership in this context. Larry Ellison, the CEO of Oracle and the chief challenger to Bill Gates for the title of world's richest person, also illustrates this phenomenon. It may be that Oracle's large soft money contributions to the Democratic Party are a product of Ellison's fierce personal competition with Gates, whose own firm has ramped up substantially its contributions to the GOP recently.²⁴

The Democrats have made a concerted bid for high-tech support since the mid-1980s, when some Democratic members of Congress and presidential candidates strongly backed "competitiveness" policies (particularly aimed against Japanese competitors) that were rejected by the Reagan Administration. Hewlett-Packard CEO John Young, for instance, led the formation of the Council on Competitiveness in 1986 to push this

individual managers and shareholders. Soft money made its first appearance in the 1991-92 election cycle, whereas PACs were first established widely by firms in 1975-76.

²³ *Fortune*, September 7, 1998.

²⁴ See also John Markoff and Matt Richtel, "Oracle Hired a Detective Agency to Investigate Microsoft's Allies," *New York Times*, June 28, 2000, A1; Ted Bridis, Glenn Simpson, and Mylene Mangalindan,

agenda. Young's activism led to his recruitment as a supporter by candidate Bill Clinton in 1992, while President George Bush's campaign ignored the high-tech industry. President Clinton's 1995 veto of the Federal equivalent of "frivolous lawsuits" legislation angered many of his high-tech backers, opening the door for the Administration's opponents to make inroads in the high-tech community. Thus, in the 2000 campaign, George W. Bush (and other candidates) paid close attention to high-tech issues, companies, and people. The Republican members of TechNet, for instance, have worked hard to counter the perception that the high-tech sector is in Al Gore's pocket; as early as April, 1999, they placed an advertisement in the *San Jose Mercury News* urging George W. Bush to run for the presidency.²⁵

Congressional Testimony

Congressional testimony is best seen as an intermediate output of investment in corporate public policy capacity. In other words, an invitation to testify is the result of a firm making an effort to make its interest in a policy issue known, but does not necessarily mean that its policy objectives have been achieved.²⁶ Figure 5 shows the number of appearances before Congressional committees by witnesses from the high-tech sector over the past thirty years, 1861 in all. In the 91st Congress (1969-70), for instance, about 40 witnesses from the the high-tech sector (much of which, of course, did not exist yet) gave Congressional testimony. By the 98th Congress (1983-84), the total had risen to a peak of 173, and it stayed near that figure through the 104th Congress (1995-96), before dropping in the most recent sessions for which complete data are available.²⁷

[Figure 5: Testimony by Executives of High-Tech Firms Before Congressional Committees]

"Search Engine: How Piles of Trash Became Latest Focus in Bitter Software Feud," *Wall Street Journal*, June 29, 2000, A1.

²⁵ Ceci Connelly, "High-Tech Outreach to Bush," *Washington Post*, April 4, 1999, A5.

²⁶ Other intermediate outputs might include meetings with legislators and attention paid by staff to written communication, but these are difficult data to gather.

²⁷ One problem with these data that needs to be mentioned is that the *Fortune* list goes back only to 1979; firms that were important in the computer industry but whose fortunes had fallen dramatically by the time *Fortune* compiled its first 500 are not included. Thus, the numbers for the 1970s may be understated.

Figure 5 provides only a very rough measure of the success of high-tech firms in getting their voices heard in Washington. These appearances relate exclusively to legislative matters, depend on the initiative of members of Congress as well as of firms, and are subject to the whims of personality and timing. Nonetheless, like the other figures, they suggest that the high-tech presence in Washington grew steadily in the 1970s, leveled off in the 1980s, and stayed stable through 1998. High-tech firms, as a group, were not strangers to politics; indeed, they seem to have matured politically some time ago, or at least reached a sort of equilibrium, especially after the high-tech trade conflict with Japan.

[Table 1: 100 Randomly Selected High-Tech Congressional Testimonies: 1990s]

In order to get an idea of the content of these appearances, I drew a random sample of one hundred of them. Combining what I know about the firm represented, the timing of the hearing, and its title, I drew up Table 1, which tries to classify (again, in a very rough fashion) the 39 appearances in my sample from the 1990s as offensive, defensive, or other. Offensive issues, such as appropriations and intellectual property, account for just over half of the appearances, while defensive issues, like export controls and high-definition television, make up a fifth of the sample. Another quarter relate to general business issues, including health care reform. The data are not displayed here, but the full 100 appearances suggest that the offensive share seems to be rising slightly over time. Clearly, though, one should not make too much of this trend, given the weaknesses of the underlying classification process.

New Economy + Old Politics = New Policies?

The empirical reconnaissance of the preceding section suggests that there are no offensive and defensive phases in the politics of creative destruction, but rather that the two intersect and intermingle. Entrepreneurial policy offensives, as one might have expected, figured prominently in early political history of the high-tech industry, but they have not disappeared as it has matured. If high-tech pressure for public money has abated somewhat in recent years, the industry's demands for a government role in the

provision of knowledge and people have grown somewhat stronger. Defensive conflicts naturally came to the fore later in development, since only the most far-sighted opponents recognized the high-tech industry (or particular firms in it) as threats before the danger actually materialized. These conflicts have been sporadic to date, and I suspect that the most contested phases of high-tech's political development may still lie in front of it. As information technology transforms more and more production processes and experiences of daily life, it seems likely that more and more aggrieved parties will appeal to the government for protection.

The political mobilization of the high-tech industry, whether for offensive or defensive purposes, does not occur automatically; someone in the industry has to recognize an opportunity or threat and develop the capabilities to act on it. Focusing events play an important role in this process. These events were generally threatening, including the "Bell bill" of 1976, the Japanese semiconductor "invasion" of the late 1970s, the Communications Decency Act of 1994 and Proposition 211 in 1996, all bookended by the IBM and Microsoft antitrust suits of 1969 and 1998. Some firms and segments of the industry perceived the importance of policy-related events and trends more quickly than others. The qualities of leadership seem to be important determinants in this regard. The now well-worn contrast between AOL's Steve Case and Microsoft's Bill Gates provides the clearest example of this factor. Organizational factors also shape the pattern of development. For all its vaunted distance from Washington, for instance, Silicon Valley proved quick to perceive threats and mobilize to counter them, whether in the heyday of Japanese competition or in the battle against Prop 211. A key reason is that the existing networks of relationships in the Valley allowed firms there to coordinate expectations and activities at relatively low cost. The personal computer industry, by contrast, which was spread more widely across the country and lacked such dense networks, was relatively slow to find its voice.

My primary research focuses on understanding and explaining the high-tech industry's interest in and efforts to influence Washington. Whether these efforts have been the key causes of changes in policy outcomes is a different and more difficult question to answer. On most issues, there are so many forces at play in so many policy-making venues that attributing causal significance to any one factor is a tricky business.

A convincing analysis would need to get beyond the instant assignment of credit and blame that passes for news; it would also need to overcome the bias of sources anxious to take credit for any outcome that redounds to their benefit and to avoid discussion of those that do not. Not having made such a study, I can only offer impressions that require further research to be substantiated.

I believe that spokespeople for the industry are correct in asserting that it has won more of the fights it has engaged in than it has lost (putting aside, of course, intra-industry fights). On relatively narrow issues, such as semiconductor trade sanctions in the mid-1980s and shareholder suits in the mid-1990s, its influence has been substantial. It should be noted, though, that few of these victories have been entirely straightforward. Semiconductor users later mobilized against the trade sanctions, for instance. Similarly, even though the high-tech industry handily defeated Prop 211 governing shareholder suits in California, it was stunned by the President's veto of favorable legislation at the Federal level the year before. On broader issues, such as the deregulation of the telephone industry in the late 1970s, the passage of R&D tax credits in the early 1980s, and the major trade bills of the 1990s (culminating in the establishment of permanent normal trade relations with China), the industry has usually been on the winning side as well, although whether it was the difference-maker in any of these massive battles is debatable.

The win-loss record is not unblemished. On encryption and export controls, for example, the industry's opponents have given ground grudgingly and have mounted occasional counterattacks. The gradual loosening of restrictions over time may have more to do with the relentless pace of technological innovation at home and abroad than with the campaign for policy change mounted by high-tech. One observes a similar tug and pull on such issues as R&D tax credits, which have lapsed a number of times over the past two decades, and on taxation of e-commerce by states and localities, which remains unresolved. Even the industry's most celebrated victory of the 106th Congress, the expansion of the number of visas to be granted to highly-skilled workers, probably owed as much to the easing of opposition from minority and labor groups benefiting from the strong labor market as it did to the industry's efforts.

As my theme of old politics suggests, these victories have generally advanced a vision of the industry's interest that is narrowly conceived, much like that of any other industry. The leaders of the high-tech sector have usually been either unable, unwilling, or uninterested in taking a longer-term, broader perspective. Considering its reliance on knowledge and trained people, for instance, the high-tech industry (with important exceptions) has been conspicuous by its absence on issues related to research and education. There is an unfortunate, if understandable, tendency to opt for the quick fix in advancing policies related to knowledge and people. On the other hand, the industry's pursuit of narrow self-interest has paid substantial dividends for society as a whole, most notably in the development of a booming market, which now provides a third or more of aggregate economic growth. Its aggressive support for free trade in the 1990s, for example, has been an important factor enabling growth.

As the boom subsides, the industry is likely to face substantial new political challenges. Any perception that it is somehow “new” and therefore speaks in the common interest is likely to be a passing phenomenon. Indeed, if the economy goes into a stock market-led tailspin, the backlash could be rapid and intense. In pursuing self-interest narrowly conceived, some high-tech firms are pushing the boundaries of public values. Perhaps, for instance, Doubleclick has woken the sleeping giant of public concern about privacy through its now-abandoned plan to merge data about consumers gathered off-line with that gathered on-line. The next phase of high-tech's political development, like phases in the development of other cutting-edge industries that have gone before it, from railroads to automobiles to chemicals, may well be troubled.

The politics of creative destruction, like the process of technological innovation itself, is messy, not linear. As long as entrepreneurs are creatively destroying anything that stands between them and a fortune, democracy is likely to force them to learn something about politics. The ultimate balance, so to speak, between creativity and destruction in any particular case is a matter of historical contingency, depending on imperfect and idiosyncratic decision-makers. As markets grow bigger and, one hopes, better, the politics of creative destruction will loom larger on the policy-making landscape.

Epilogue: The 2000 Campaign and the Transition

Media interest in the role of the high-technology sector in American politics did not abate during the 2000 campaign. And, at first glance, the available figures for the sector's "participation" suggest that this attention was warranted. High-tech PAC contributions jumped by 40% in 1999-2000, compared to 1997-98, while soft money contributions rose about 55%. The growth in the industry's PAC contributions stands in stark contrast to the surprising 18% decline in such contributions from all businesses. On the other hand, soft money contributions from all businesses grew by 50%, and high-tech was only slightly ahead of this pace. Given the extraordinary growth in the sector's revenue and market capitalization over the past two years (though much of the latter was given up during the campaign itself) and the rising importance of soft money relative to PACs in the campaign finance system, a strong case can be made that the high-tech sector's political development still lags well behind its economic development.²⁸

Despite this apparent lag (or perhaps because of it), the high-technology industry has been courted intensely by the incoming Bush Administration. On January 4, 2001, the President-elect met exclusively with a group of seventeen high-tech CEOs, a lobbying opportunity offered to no other economic interest. According to the *Wall Street Journal*, Mr. Bush "endorsed the high-tech industry's political agenda," while its representatives, in turn, endorsed the President-elect's agenda, including his tax cut proposal. The President-elect was also said to be pondering a White House position to oversee policy development on issues of interest to the high-tech industry, even as the new Administration's allies called upon it to defend the nomination of former Missouri Senator John Ashcroft for Attorney General.²⁹

²⁸ The definition of the high-tech industry is the same in the epilogue as in the main body of the text. These figures do not represent the final accounting for the cycle, but only disclosures through October 1, 2000. One important weakness is that new entrants to the Fortune 1000 list during the 1999-2000 cycle have not been added, since the list had not been published when this manuscript was completed. The figures for all business are drawn from the Center for Responsive Politics web site <<<http://www.opensecrets.org/pubs/bigpicture2000/bli/index.html>>> (1997-98) and <<http://www.opensecrets.org/2000elect/storysofar/blio.asp>> (1999-2000). These figures are published in CRP's biannual report *The Big Picture*. The conclusion drawn in the text is necessarily tentative, since the campaign finance indicators are only partially complete for the most recent cycle and the other indicators have not yet been compiled.

²⁹ Jim VandeHei, "Bush Backs Agenda of Tech Executives, Reassures Investors," *Wall Street Journal*, January 5, 2001, A12; Lisa Bowman, "Tech Lobby Supports Bush's Pick for Top Cop," CNET news.com,

It is, of course, too soon to interpret whether these signals are of long-term significance. However, the development of a widespread perception that the high-tech industry is a core constituency of the new Administration would have profound consequences for the industry's political development. If such a perception took hold, Democrats might move to represent the industry's opponents more vehemently than in the past, stimulating a more aggressive arms race response. Republicans might call upon the industry to range far beyond the policy territory with which it has been comfortable in the past. A firm coalition between the purported libertarians of the high-tech industry and the cultural conservatives who anchor the Republican right wing would be an impressive political achievement for the new Bush Administration.

January 4, 2001 << <http://news.cnet.com/news/0-1005-201-4376193-0.html>>>. Ten of the seventeen at the meeting with the President-elect were CEOs of companies in my data set.

APPENDIX A: COMPANIES IN DATASET

1. 3COM CORP
2. ACNIELSEN CORP
3. ADC TELECOMMUNICATIONS
4. ADVANCED MICRO
5. AFFILIATED COMPUTER SERVICES
6. AMDAHL
7. AMERICA ONLINE INC
8. AMP INC
9. ANALOG DEVICES
10. APOLLO COMPUTERS
11. APPLE COMPUTER INC
12. APPLIED MATERIALS INC
13. ASCEND COMMUNICATIONS INC
14. AST RESEARCH
15. ATARI
16. ATMEL CORP
17. AUTOMATIC DATA PROCESSING
18. BAY NETWORKS INC
19. BDM INTERNATIONAL
20. BELL & HOWELL
21. CABLETRON SYSTEMS
22. CADENCE DESIGN SYS INC
23. CERIDIAN CORP
24. CHS ELECTRONICS INC
25. CIRRUS LOGIC INC
26. CISCO SYSTEMS INC
27. COGNIZANT TECH SOLUTIONS
28. COMDISCO INC
29. COMPAQ COMPUTER
30. COMPUTER ASSOCIATES INTL INC
31. COMPUTER SCIENCES CORP
32. CONTROL DATA CORPORATION
33. COOPER INDUSTRIES INC
34. CRAY RESEARCH INC
35. DATA GENERAL CORP
36. DATAPOINT CORP
37. DELL COMPUTER CORP
38. DIGITAL EQUIPMENT CORPORATION
39. DR HOLDINGS
40. DSC COMMUNICATIONS CORP
41. DUN & BRADSTREET CORP
42. E-SYSTEMS
43. EATON CORP
44. ELECTRONIC DATA SYSTEMS CORP

45. EMC CORP
46. EQUIFAX INC
47. FIRST DATA CORP
48. FIRST FINANCIAL MANAGEMENT
49. FISERV INC
50. FUTURE NOW
51. GALILEO INTERNATIONAL INC
52. GATEWAY 2000 INC
53. GENERAL INSTRUMENT CORP
54. GENERAL SIGNAL CORP
55. GOULD INC.
56. HARRIS CORP
57. HBO & CO
58. HEWLETT-PACKARD CO
59. HUBBELL INC
60. IMATION CORP
61. IMS HEALTH INC
62. INTEL CORP
63. INTERGRAPH CORP
64. INTL BUSINESS MACHINES CORP
65. IOMEGA CORP
66. ITT
67. JABIL CIRCUIT INC
68. LEXMARK INTL GRP INC
69. LOTUS DEVELOPMENT
70. LSI LOGIC CORP
71. LUCENT TECHNOLOGIES INC
72. MAGNETEK INC
73. MAXTOR CORPORATION
74. MEMOREX TELEX
75. MICRO WAREHOUSE INC
76. MICRON TECHNOLOGY INC
77. MICROSOFT CORP
78. MINISCRIBE
79. MOLEX INC
80. MOTOROLA INC
81. NATIONAL SEMICONDUCTOR CORP
82. NCR CORP
83. NOVELL INC
84. OAK INDUSTRIES INC
85. ORACLE CORP
86. PEOPLESOFT INC
87. PITNEY BOWES INC
88. QUALCOMM INC
89. QUANTUM CORP
90. RAYCHEM CORP

91. READ-RITE CORP
92. ROCKWELL INTL CORP
93. SANDERS ASSOCIATES
94. SCI SYSTEMS INC
95. SCIENCE APPLCTNS INTL
96. SCIENTIFIC-ATLANTA INC
97. SEAGATE TECHNOLOGY
98. SENSORMATIC ELECTRONICS
99. SILICON GRAPHICS INC
100. SOLECTRON CORP
101. SPERRY
102. STORAGE TECHNOLOGY CP
103. SUN MICROSYSTEMS INC
104. SUNGARD DATA SYSTEMS INC
105. SYBASE INC
106. TANDEM COMPUTERS
107. TELEX
108. TELLABS INC
109. TEXAS INSTRUMENTS INC
110. THOMAS & BETTS CORP
111. UCAR INTERNATIONAL INC
112. UNISYS CORP
113. US ROBOTICS
114. VARIAN ASSOCIATES INC
115. VISHAY INTRTECHNOLOGY
116. WANG LABS INC
117. WESTERN DIGITAL CORP
118. XEROX CORP
119. XIDEX
120. ZENITH ELECTRONICS CORP