From *Keiretsu* to Startups: Japan's Push for High Tech Entrepreneurship

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Introduction

How much does it matter that Japan creates relatively few new high technology companies? Many observers estimate, or at least assume, that entrepreneurial dynamism and its associated innovations promote economic growth and in the long run are necessary for it. In recent years there has been much attention devoted to fostering such new firms in many countries, including Japan, with much of this interest derived from the example of Silicon Valley. Before the 1990s, after several decades of excellent performance by the Japanese industry, any observer noting that it had few new high tech companies would probably have met with indifference. Success spoke for itself. Now, after an economic plateau lasting over a decade, questions about the late and relatively small-scale emergence of high tech startups have become increasingly salient.

Specific questions are raised here about the institutional, legal, and social contexts in which startups are created, funded, and compete in the market. Japan's famed economic policies and institutions of the catch-up and high-growth eras have come under criticism for producing rigidities that undermine and delay the creation of high-risk, high-return startups. In this chapter, we consider functions of regulation, finance, and the national system of innovation, and how these factors affect entrepreneurship in high technology. Other factors, such as culturally mediated preferences, might also be important, but we do not address them here. We compare Japan's institutions with those found in the United States, where high tech entrepreneurship has flourished in many areas. We note significant changes made, or being planned, in the regulatory and financial spheres in Japan. We conclude that while

Japan still has much work ahead in dismantling the embedded barriers to high tech entrepreneurship, there is gradual convergence toward the mix of policy- and market-driven behavior that has enabled the rapid creation and rise of startups in the United States.

Benefits from New Firms in a Competitive Environment

How do startups benefit an economy? The effects of entrepreneurship on national economic growth are not well known. We know of no study to date that can point to a direct causal relationship with levels of entrepreneurship, however it is defined, or its rates of growth in different countries. One group of researchers has found interesting correlation between certain types of entrepreneurial activity and national economic growth in some countries, but their studies do not control for other factors affecting growth (Reynolds, Camp, et al. 2001).

New firms serve a first important purpose in that they reallocate resources, especially human ones, from old sectors to new ones. A competitive market causes the shrinkage and disappearance of existing firms and the creation and growth of new ones. Of course, established companies are often able to reinvent themselves, a mechanism that has been the dominant one in Japan. But the ability to start afresh arguably hastens the redeployment of assets.

A second function of startups is to speed the entry of new technologies to the market. This role is especially important in industries experiencing rapid technological change—so-called "high tech" sectors—such as information technology, biotechnology, medical devices, and new materials. Established firms have old physical and human capital on hand and their workers may lack the skills to take quick advantage of a new technology. According to one view, a large company's top management is typically rewarded for *past* achievements, not for conjectured future ones (Hobjin and Jovanovic 2001). While large firms remain the wellsprings of technological advance, they are often faced with more opportunities than they can or want to exploit. Since their management teams are often focused on meeting the understood needs of current customers, they usually select opportunities that fit those needs (Christensen 1997). Many startups find their beginnings by exploiting these large firms' unexploited ideas. Sometimes they are sponsored or founded by the originating large firm, but more often by people who leave to build new firms on their own. Firms that begin in this way—and despite the fact that many startups fail—become important conduits of innovation. Because there is always uncertainty about which ideas will be winners, one efficient way to select the best is for many firms to be started and for the market then to pick the winners and weed out the losers. Viewed more broadly, there is a two-way interaction between large and small firms: not only do small ones emerge from large ones but the latter sometimes acquire small ones to gain access to their technology and management teams.

A third function of new firms is motivational. They give people with entrepreneurial abilities an opportunity to demonstrate their skills, as well as the opportunity to get rich.

Related to the role of new firms are the rents gained through innovation, i.e., through the value of the intellectual property created. A crude measure of the rents that high tech firms in the United States gained from innovation, (through the value of intellectual property) during the 1990s is the rise in Tobin's *q,* the ratio of the stock market value of firms to the replacement cost of their physical assets, inventories, plant, and equipment. The difference lies in intangibles, with intellectual property arguably being a substantial proportion of them

(Hall 2001b). According to one researcher, in the United States the value of *q* increased by about 200 percent from 1990 through the end of 2000 (Hall 2000 and 2001a). (However, the bursting of the bubble in dotcom and telecommunications companies had by the end of 2000 substantially reduced market values from their peak.)

Industrial Structure, Inputs, and Innovation: Where Japan Leads and Lags

Structural changes in the computer industry since the mid-1980s illustrate the payoff in having an environment favorable to startups. Such changes centered on the shift from proprietary to open standards, especially the adoption of the Windows operating system–Intel microprocessor (Wintel) standard. This in turn led to major changes in the industrial landscape, followed closely by the emergence of network computing and an open worldwide system, the Internet. Open standards meant that the computer systems ("box") makers had far less scope to distinguish themselves through proprietary technologies. Instead, market advantages came through supply chain management, the creation of different business models, and a vast expansion in computer applications and associated software. In the United States, the large vertically integrated firm structure, exemplified by companies like IBM and DEC, gave way to a horizontally structured one in which many small firms took off (Grove 1996).

Japan's IT industry accommodated more slowly to these radical changes. Many Japanese firms (e.g., Sumitomo, Nissan, Mitsubishi) have historically benefited from the *keiretsu* system of interlocking relationships among suppliers, manufacturers, distributors, and financiers. Indeed, not long ago, observers in the rest of the world saw *keiretsu* as a major strength because they reduced transaction costs through stable relationships. Indeed, such relationships still seem to have major virtues in industries where change occurs slowly and there is a longer development time horizon, as in automobile manufacturing. In the IT sector, many companies have only recently been shedding noncore or unprofitable activities and outsourcing functions. In order to become more adaptable, they are making the transition to relationships that are more fluid than those in the traditional *keiretsu*.

A distinct but related argument concerns capital investments in the IT sector (i.e., in computers, telecommunications, software, and Internet services). According to a recent study by the Organization for Economic Development (OECD) (2001), these industries received 30 percent of U.S. investment in 1999, while the Japanese proportion was only 15 percent. Moreover, the study estimates that the cost of these capital goods in the early 1990s was 40 percent higher in Japan than in the United States (with the differential declining during the decade).[1] Thus, Japan was investing proportionately less and—evidently—getting less for the yen.

The high cost of IT goods helps to explain why there was lower demand and a smaller proportion of investment dedicated to IT in Japan, but why were these goods so costly in a country famous for efficient manufacturing? Part of the explanation may lie in the weakness of competition, especially in telecommunications. For instance, NTT charged telecom access fees far higher than the typical charges in the United States, thus discouraging the demand for computers and delaying the emergence of more efficient systems of distribution.

According to the OECD study, IT investments were responsible for an added 0.9 percent to GDP growth in 1980–95 and 1995–99 for the United States and 0.3 percent for Japan.[2]

This is a large difference and the estimate for the United States, at least might become lower as more data become available. Moreover, in hindsight, U.S. firms may have overinvested in IT and whether or not the resulting productivity gains were adequate compensation is not yet known. Still, the upshot will probably be a higher estimated increase in American productivity relative to that of Japan during the same period, attributable to greater IT investments.[3]

Yet, innovation, which is perhaps a more important factor than IT investment, remains high in Japan. For Japan, the problem does not lie in producing innovation (it leads the world in both patent growth and R&D spending). The problem seems to be how to unlock the huge potential of its innovative capacity. As one economist argues, Japan remains a technological powerhouse, but the structure of finance and legal barriers impede startups that could help unleash the economic gains from innovation (Posen 2001). In Japan, the largest source of funds for SMEs, apart from personal or family resources, is bank loans. However, one study finds that firms that rely on intangibles like intellectual property—such as many high tech firms—are handicapped by bank biases that favor firms that have more employees, that need loans for fixed assets, and that have existing and loyal main bank relationships (Kutsuna and Cowling 2001). At any rate, pure bank loans, with their collateral requirements and immediate payments of interest and principal are often not the appropriate type of funding for technology startups that have long lead times to profitability. We will turn to financing of startups in greater detail in a later section.

Japanese leaders in government and industry say that entrepreneurship in high technology, especially IT, is their best long-term hope for pulling out of the economic doldrums, and many changes have been made in regulations over the past five years to reduce barriers to entrepreneurship (see below). Among the most-publicized initiatives was the Obuchi cabinet's 1999 effort to strengthen industrial competitiveness and boost employment through various schemes. The Keidanren, Japan's largest big business federation, responded by announcing a "Digital New Deal" project to strengthen ties among industry, academe, and government and to promote the use of information technology in the schools. The Ministry of Economy, Trade, and Industry (METI) lobbied other ministries for regulatory changes to increase incentives for entrepreneurship. Japan's municipalities and prefectural governments drew up plans to create high tech industrial "clusters," sometimes in isolated and unlikely places. These efforts so far have met with only modest success, although there is growing optimism about a take-off in demand, led by telecommunications and mobile computing products. For example, the success and ubiquity of the NTT DoCoMo's i-mode, introduced in 1999, gave rise to several successful ventures, such as Rakuten and Access, that provide content, applications, and services through cell phones using the system. The proliferation of i-mode startups has been facilitated in part by DoCoMo's business strategy of billing for "official" third-party content partners in exchange for a commission, while not excluding unofficial content providers, who do not have access to the billing service. In the year 2000, nearly half of all people using the Internet in Japan (a total of 47 million) gained access through cell phones (MPHPT 2001). DoCoMo aspires to have a similar impact internationally.

High Tech Startups in Japan: A Slow Takeoff

Advances in technology, a sharp decline in the costs of computing and telecommunications, and the aforementioned structural changes opened a wealth of opportunities to those who

could move fast with new products. Many new firms emerged outside of the United States, notably in Taiwan, Israel, India, and Scandinavia. In a few other places, such as Cambridge, England and Munich, Germany, small clusters of high tech firms have developed.

Each region has distinctive characteristics. Firms in the main Taiwanese cluster (the Hsinchu Science-based Industrial Park) for instance, specialized in adaptable, cost-efficient original equipment manufacturing (OEM) for foreign firms. Indian entrepreneurs, beginning in Bangalore, began to do routine software tasks for foreign firms based on the advantages of mathematically talented, English-speaking, and low-cost university graduates. Israeli entrepreneurs drew on young people trained in relevant skills during military service, an influx of technologists from Russia, excellent universities, and close ties with the United States, to become an idea generator with a specialty in computer security systems. Ireland became a country of entry for (mainly) U.S. software firms into the European market by offering a well-educated workforce and low taxes. All of these places seek to move up the value chain toward making more advanced products. At the top of this chain are centers whose firms not only generate ideas that sell in the world market, but also collect the rents from these ideas. As competition grows, especially from China, Japan will have to rely increasingly on innovation to maintain its place at the top of the value chain.

Japanese firms do not lack ideas. Japan was the world leader in the growth in absolute numbers of patents from 1992 to 1999 (with the United States coming second), and was among the top countries in IT patents (OECD 2001). The ratio of R&D expenditures to GDP has consistently been higher than in the United States or Germany. But in the IT sector, and despite the country's strengths in physical capital, educated workforce, and deep reservoir of technology, this has not translated into global market share or into many valuable, new products. As Posen (2001) notes, Japan's technological and innovative capacity has changed little from the pre- to post-bubble economy—it remains very strong. But now, there is greater competition.

A recent report comparing twenty countries ranked Japan second to last (just ahead of Ireland) in total entrepreneurial activity in 1999 (Reynolds, et al. 2000).[4] Fewer than one in one hundred adults were involved in entrepreneurship in Japan, compared to one in ten in the United States. The report also ranked Japan lowest in the amount of venture capital invested (0.02 percent of GDP versus 0.5 percent of GDP in the U.S.).[5] Another recent survey showed low levels of entrepreneurial motivation among the Japanese when compared to Americans, Britons, French, Germans, and Koreans (Japan Inc. Communications 2001). In the same study, fewer than 30 percent of the under-25 Japanese respondents said they would be supportive of a family member who wished to become an entrepreneur (compared to over 80 percent in the United States and close to 70 percent in France). The overall rate of business starts (as a percentage of all businesses) in Japan lags far behind that of the United States. Business closures began to outnumber starts in the mid-1980s (MPHPT, *Japan Statistical Yearbook*, various years).

A low level of entrepreneurship was not always a part of Japan's business culture, however. It displayed much entrepreneurial activity from at least the Meiji era and then in the immediate post-World War II years, when many important companies were established. In short, limited entrepreneurial activity seems to be a phenomenon of the past several decades. Figure 1 shows the business start dates of firms listed on the Tokyo Stock Exchange (TSE). The TSE opened in 1949 as a successor to the original exchange established in the 1870s, and typically represents the largest companies in Japan. The figure shows that, before World War II, there were several periods of new business creation, associated first with

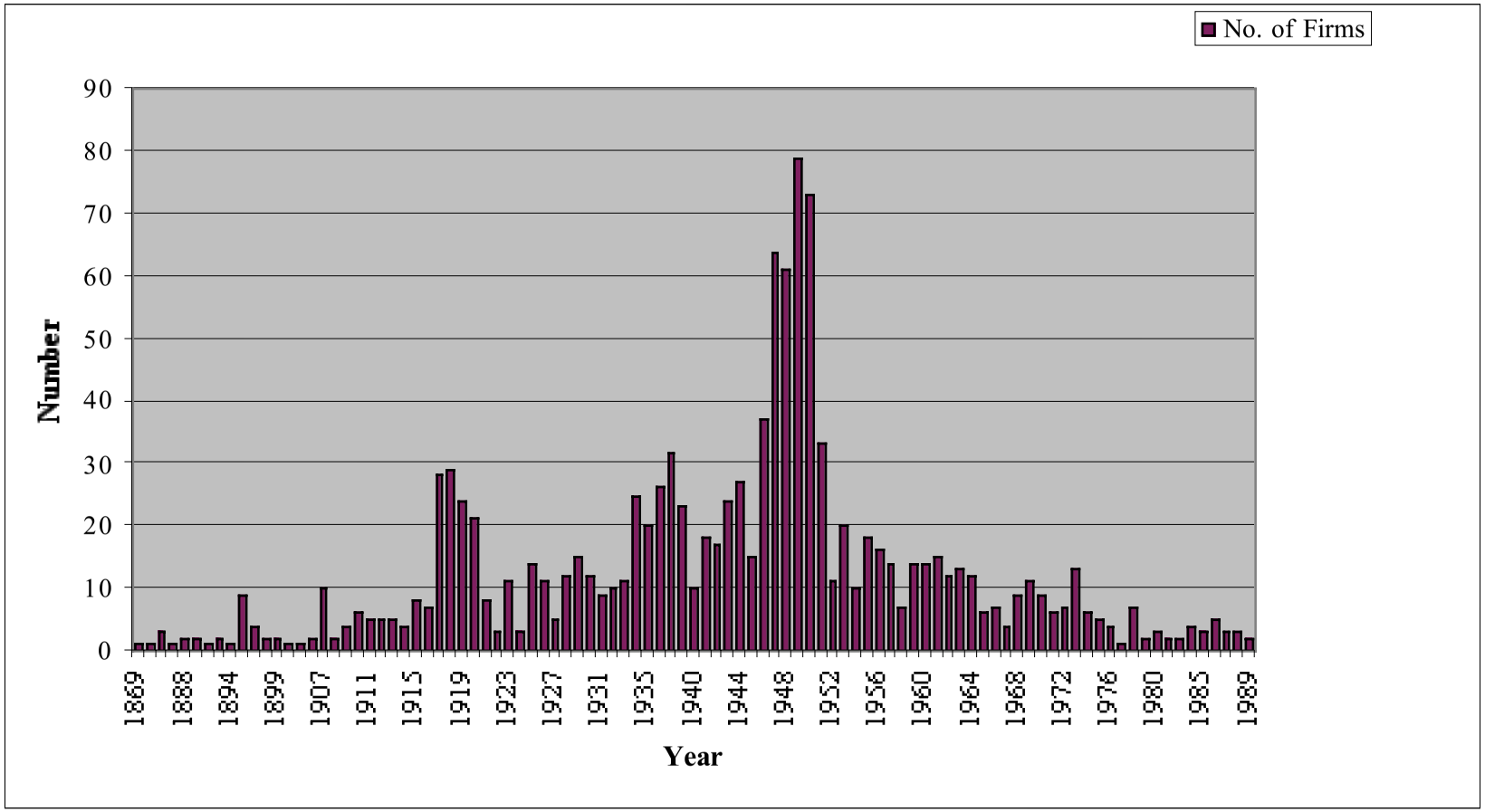
industrial catch-up and then later with the arms buildup of the 1930s. As expected, there is a sharp peak in new companies listed on the Tokyo Stock Exchange in the immediate postwar years of reconstruction, but this is followed by a steep, then steady decline.

Table 1 lists some of the largest high tech companies in Japan and the United States (by market capitalization, according to a recent survey by the *Financial Times* (2001)), together with their founding dates. Apart from a few major firms like Sony, Softbank, and Kyocera,

Table 1. Founding dates for the largest high tech firms in Japan and the United States

Founding dates of Japan's largest high tech firms	**Founding dates of the United States' largest high tech firms**
Mitsubishi Electric 1870 (established as a shipping company, Tsukumo Shokai)	IBM 1896 (established as of The Tabulating Machine Co.)
NEC 1899	Lucent 1869 (founded as Western Electric Manufacturing Company)
Hitachi 1910	Motorola 1928
Sharp 1912	Hewlett-Packard 1939
Matsushita Electric Industrial 1918 (established as Matsushita Electric Devices Manufacturing Works)	Intel 1968
Canon 1933	Microsoft 1975
Fujitsu 1935	Oracle 1977
Ricoh Company, Ltd. 1938 (established as Riken Optical Ltd.)	EMC 1979
Toshiba 1939 (established as Tokyo Shibaura Denki)	Compaq 1982
Sony 1946 (established as Tokyo Telecommunications Engineering Corporation)	Sun Microsystems 1982
Sanyo 1947	Dell 1984
Kyocera 1959	Cisco 1984
Fanuc 1973	Qualcomm 1985
Softbank 1981	AOL Time Warner 1989 (founding date for AOL)
NTT DoCoMo 1991 (sales activities transferred from NTT)	Verizon Communications 2000 (created by merger between Bell Atlantic and GTE)

Figure 1: Business Starting Dates for TSE-listed Nonfinancial Companies*



Source: Tokyo Stock Exchange, Ministry of Finance (Japan) and Mizuho Securities, Co., Ltd.
http://www.mizuho-sc.com/english/ebond/companies/list.html
*Of the 1353 non-financial companies listed on the first section of the TSE, we obtained data for all but 84.

the Japanese firms listed here were all established prior to World War II, with many dating back to the Meiji and Taisho eras. In contrast, the dominant U.S. firms were established at relatively even intervals, with many emerging in the 1980s. Not surprisingly, the largest sectors listed on the TSE are electronic manufacturing and financial services.All but the strongest and best-established firms are barred from raising money through the TSE. Smaller and newer firms only recently have gained improved access to capital markets. Two early channels, the Tokyo Stock Exchange's Second Section, established in 1961, and the JASDAQ over-the-counter market (started by the Japan Securities Dealers Association in 1976) both had less demanding listing requirements than the TSE First Section. But even in the TSE Second Section, the barriers for startups were considerable, with a capital requirement of 1 billion yen and at least 400 million yen in profits in the year before application.

The JASDAQ market had similarly stringent requirements, though in recent years, with the relaxation of some of its rules, most of Japan's IPOs have occurred there: 49 percent or 24 out of a total of 49 IPOs in 2001 (JASDAQ 2002). Since the launch of its online trading system, JASDAQ has attracted more high-tech firms (e.g., in telecommunications and IT-related services) than in the past. Even so, while some analysts consider JASDAQ a "high tech" market, it is still dominated by retail, wholesale, real estate, and financial services. By comparison, the types of firms typically represented in the TSE Second Section are food-related or retail.

In response to the excitement created by the arrival of the Internet, two other markets were created to encourage new firms, particularly those that could be considered high tech. First, Mothers was created in 1999 as a new market within the TSE. Second, NASDAQ Japan—funded by the U.S. NASDAQ and Softbank among other firms—was launched in June 2000 as a section on the Osaka Stock Exchange, to accommodate firms that could not meet TSE requirements. NASDAQ Japan's listing requirements were more difficult to meet than those of Mothers, which has no financial requirements. Firms applying to NASDAQ Japan had to show an income of ¥75 million, tangible assets of ¥400 million, or a market capitalization of at least ¥5 billion. However, a significant percentage of the firms are listed under the "growth" category, allowing them to qualify under slightly less stringent rules.

Table 2. Comparison of Major U.S. and Japanese Stock Exchanges

Exchange	No. of firms listed	Trading Volume (x 1000 shares)	Trading Value (x 1000 U.S. Dollars)	Market Capitalization (in U.S. Dollars)
NYSE	2784	26,742,310	857,131,300	12 trillion
NASDAQ (US)	3994	35,136,003	689,742,032	2.7 trillion
TSE	1501	20,601,060	162,865,000	2.3 trillion
TSE 2nd Section	576	617,570	1,303,874	41.9 billion
Mothers	36	740	170,482	5.6 billion
NASDAQ Japan	91	7,082	733,524	11.5 billion
JASDAQ	925	226,853	2,414,701	68.1 billion

Figures are from March 2002 except for JASDAQ, which is reported for February 2002. Yen values converted at 130 yen to one U.S. dollar.

Both the Mothers and NASDAQ sections attracted more high tech, or high tech-related companies, as a percentage of their listings, than did the more established markets. Mothers is a predominantly high tech market, but it has been slow to get off the ground, with only thirty-six listings and market capitalization of about $5 billion as of this writing. NASDAQ Japan initially seemed to fare somewhat better with ninety-one firms. About half of the firms listed there were focused on IT-related services like consulting and entertainment, as well as some high tech products. The other listed firms were largely in financial, retail, wholesale, and other service sectors. But these markets have faced considerable challenges in attracting new listings. Table 2 offers a comparison of several markets in Japan and the United States. By 2002, about four firms a month were newly listed on NASDAQ Japan. This is about the same rate as the major U.S. exchanges (NASDAQ and NYSE) during the recession following the dotcom bubble, but miniscule compared with the offering rates in the years prior to its bursting. NASDAQ Japan struggled, losing nearly $45 million by the end of 2001 (*Nikkei Weekly* 2002a).[6] The U.S. NASDAQ market ended its involvement, and NASDAQ Japan ceased to function in August 2002.[7]

On the upside, however, the newer Japanese markets created opportunities for younger companies and Japanese entrepreneurs. The average age for firms listing for the first time on NASDAQ Japan was fifteen years, while for Mothers it is only eight years. This is a clear improvement over the average age of twenty-eight for JASDAQ firms (Sako 2001). Despite these positive signs, other signals indicate that is still too early to conclude whether these developments have sparked lasting changes. First, Japan, like the United States, has experienced a slowdown in IPOs following the dotcom crash experienced by both countries. In the year 2001, 169 Japanese companies held IPOs, down from 203 in 2000. Most of these were listed on both JASDAQ—which had 97 and 98 IPOs respectively in 2000 and 2001—and NASDAQ Japan. In the United States, the number of IPOs slid from 486 in 1999 to 406 in 2000, and then dropped sharply in to just 98 in 2001. Second, although Japan's IPO slowdown has been less dramatic than that of the United States, the total amount of money raised through U.S. IPOs in 2001—$39 billion—still dwarfs Japan's total of $5.8 billion during the same period. Third, Japan has apparently not experienced an unusual level of entrepreneurial activity in recent years. Historical data on IPOs on JASDAQ, for example, show that the total number of IPOs has varied widely over time. In 1995 there were 138, in 1998 only 62, and in 1999 there were 73, with an increase again in 2000 and 2001 (JASDAQ 2002). No steady trend can yet be observed.

Differences between the incentives and constraints faced by incumbent firms and by potential entrepreneurs in the United States and in Japan offer other explanations for the divergent startup rates. These include the technical labor market, the venture capital market, modes of corporate governance, and cross-firm relations between buyers and suppliers. Startups in the United States often arise in response to constraints on developing new products and technologies within an existing firm. Similar restrictions exist in Japanese companies, but exit by individuals is a less preferred option because of the country's labor market rigidities. Conversely, Japanese companies' well-established cross-firm linkages can advance new technologies through the complementary assets, R&D, and marketing activities of affiliated firms. To some extent—just how much is unclear—such connections serve as the functional equivalent of new firms. Does it make a difference, then, where innovation and entrepreneurship come from? We address this question in the next section.

Alfred Chandler's Case for the Vitality of Established Firms in Japan

Alfred D. Chandler, the eminent economic historian, disagrees with the findings of this paper about the potential importance of new firms in the Japanese high tech economy. Chandler contends that large, long-established Japanese companies continue to dominate the markets in consumer electronics and computing. He argues that it is these very attributes that are responsible for their successes (Chandler, et al. 2001), and makes the following arguments about first-mover and established firm advantages:

> • "The creation of … an integrated learning base in a technologically new industry, together with the resulting continuing flow of funds, creates a powerful *barrier to entry*"(Chandler, 4)
> • "To bring to market the products of different technologies … required not only highly specialized knowledge embedded in an integrated learning base, but also extended time of concentrated study before new products reached world markets" (Chandler, 243).

In Chandler's view, established Japanese firms' advantages in organizational learning and networking allow them to develop new technologies, turn them into products, and market them faster and more effectively than firms elsewhere. These attributes override the advantages of startups' agility of , both in Japan and elsewhere.

Chandler further observes that established Japanese companies came to dominate the consumer electronics industry worldwide after World War II, thoroughly beating their European and American counterparts. He emphasizes the roles of four leaders in this sector: Matsushita, Sony, Sharp, and Sanyo. With the exception of Sony, these firms were founded before World War II, with Sanyo incorporated in 1947, and separated from Matsushita in 1950. Chandler's data stop in the mid-1990s, but as of 2000 Japanese firms remained strong in consumer electronics. Five of the top ten firms, ranked by sales, were Japanese; four were American and one was Dutch. Japanese firms also continued to dominate the components sector, particularly in the production of batteries, capacitors, and oscillators (EBN 2000).

Firm networks and the structure and organization of Japan's large companies, Chandler asserts, give them abilities that American or European firms lack. They have the capacity, and the history, for evolutionary learning and the accumulation of technical or functional knowledge, together with strong links to partners (e.g., suppliers, customers, co-developers). Other scholars have advanced similar arguments about the importance of tacit knowledge shared within networks of individuals and firms in Japan.[8] Though Chandler does not mention it, this advantage can be clearly seen in the digital photography sector. Well-established Japanese print photo companies, such as Fujifilm, Canon, Olympus, and Nikon, have successfully moved into digital photography. By contrast, the leading American firms, Kodak and Polaroid, are struggling; the Belgian company, Agfa, has backed out of the digital imaging market altogether.

Chandler also applies his argument to the computer industry, where he sees four leading firms—Fujitsu, NEC, Hitachi, and Toshiba—as challenging the American leaders, including IBM, Compaq, Sun, Microsoft, and Intel. Here he is on questionable ground. His data predate the Internet era and the rapid movement toward networked and distributed computing that has taken place in recent years.[9] Moreover, he omits the semiconductor and telecommunications sectors. With a few exceptions, Japanese firms are not among the world

leaders in these fields, and in some cases—most notably in semiconductor memories—and some of them are in particular trouble.[10]

A recent *Business Week Online* report ranked "The Information Technology 100" in terms of shareholder return, return on equity, revenue growth and total revenue (2001). No Japanese firm was in the top ten. Only six Japanese firms made the top 100, though seven Taiwanese firms made the list. Japanese firms, once dominant in semiconductors, have lost significant market share to American, Korean, and Taiwanese companies. Some firms, such as Fujitsu and NEC, have temporarily closed select manufacturing plants. Japanese firms are strong in games, in some laptops, in peripherals, and in networked appliances, but are weak in software (apart from gaming), services, and the Internet.

Chandler shows no interest in the clustering of startup companies in Japan, perhaps because there are so few of them. He does, however, point to the clustering of *established* firms in two regions: the consumer electronics industry in Osaka and the computer one in Tokyo.

An alternate view to Chandler's is that the performance of Japanese firms is closely associated with their specific attributes. These attributes, albeit stylized, can help explain why they succeed at certain types of innovation but not necessarily at others. Economist Masahiko Aoki (Aoki 2001) suggests that one might consider different industries along a spectrum of technological innovation. At one end, there is great technological stability. In the middle, changes occur at a moderate rate. At the other end, changes are rapid. Japanese firms generally do poorly at the stable, commoditized end, where competition ≠mainly takes place over prices. At the opposite end, they do not respond quickly to rapid changes. They excel, however, in the middle range. There, changes occur at a rate that enables them to exercise their formidable capacities for efficient manufacturing and high quality through incremental process improvement, highly trained work forces, and mechanization. The IT industry, especially over the past fifteen years, has been at the rapid-change end of the spectrum.

Japanese firms do relatively well in areas where they have traditionally performed well, such as consumer electronics and hardware production. This should not be surprising, since the success of many of these products depends on high quality, efficient production, and incremental improvements—all hallmarks of the Japanese economy. The design, production, and marketing skills of firms such as Sony and Toshiba are superb for many products. But these sectors are being eroded by competitors, notably in Taiwan, Korea, and China, whose firms are improving in quality and have lower production costs. In semiconductors, Japan is losing market share rapidly. Overall, Japanese companies have played only a modest role in the global IT industry. They were not innovators in the major technological developments of the past twenty years, which encompassed the PC revolution, networking, software, and the Internet. The exception, as noted above, is in the development of wireless communications.

The key point of this paper lies not in comparing established Japanese and established American firms, but in measuring the agility of established Japanese firms against startups anywhere. While Japan's established firms may turn new technologies into products faster than American established firms, they are still no match for the combined forces of established U.S. companies and fledgling startup firms.

Factors that Favor Entrepreneurship

In the following sections, we examine six major factors that affect the emergence of high tech startups in Japan. The national factor is (1) the "rules of the game" that help establish the background for entrepreneurial activity. The others, derived from an examination of Silicon Valley and elsewhere in the United States, include (2) the creation of a high knowledge intensity and knowledge-sharing environment; (3) the high value placed on merit—with the valuable contribution of immigrants as a major consequence; (4) a social climate that rewards rather than punishes risk-taking; (5) cooperative institutional relations among business, academe, and government that encourage knowledge transfer; and (6) an infrastructure and environment that nurtures newly emerging firms, especially in finance.

These variables are not introduced within an explicit theoretical framework. The conditions and interactions that lead to the successful formation of high tech clusters are still not well understood. We settle, instead, on listing parameters that seem to us to be important, based on observations in the United States (see, e.g., Lee, Miller, et al. 2000). As we mentioned above, successful clusters elsewhere in the world point to a variety of models and pathways. What works well in the United States will not necessarily translate to other environments. For that reason, we cannot objectively rank the relative importance of these factors: they are embedded in national systems of innovation that mediate their effects.

We do argue, however, that the formation of high tech clusters in the United States owes much to government as well as private initiative. The mix of public and private market responses there has led to a dynamic high tech economy where startups play a significant role. Japan's current initiatives seem to have been influenced by places like Silicon Valley, Austin, Texas, and Boston's Route 128. The main line ministries are redrawing national policy and regulations, while private business organizations like the Keidanren have pushed for changes that affect recruitment and compensation. In some areas, such as finance and human resource management, changes have been slow and the impact minimal. In other areas the environment is visibly changing and the potential impact may be great. We turn now to examining Japan's status with respect to the six favorable factors listed above.

1. Favorable Rules of the Game

A national innovation system consists not only of technological inputs, but also of laws, regulations and conventions for securities, incorporation, taxes, accounting, corporate governance, bankruptcy, immigration, research and development, roles for university-business links, intellectual property protection, and many more elements. The American system of innovation is more favorable to new business ventures than that of virtually all other countries. For instance, according to the OECD, in Europe it takes twelve times as long on the average to set up a company as in the United States and costs four times as much (2001, p. 99).

Because these governing rules are essentially uniform throughout the United States—they do not explain Silicon Valley's high place within the country. They do help to explain why American firms lead in the world IT industry, and by extension, were a necessary condition for Silicon Valley's preeminence.[11]

Japan's Status

Japan's bureaucracy and regulations, which many credit for the country's spectacular industrial rise in the 1950s and 1960s, have more recently met with criticism for being an

obstacle to entrepreneurship. Policies that favored large producers over smaller ones, limited "wasteful" competition, and guided capital investment and labor to chosen sectors, are now seen to be barriers. There has been talk of change for the last two decades, but only recently have serious actions been taken, after serious study by numerous government working groups, such as the IT Strategy Council, by METI, by Japan's private and public financial institutions, and by private business groups such as Keidanren and Keizai Douyukai. One METI official says that his ministry looked closely at the U.S. policies on deregulation and U.S. firms' experiences with restructuring in the 1980s and 1990s. He emphasizes that there are no quick fixes, that policy changes took a long time to implement in the United States, and are expected to take some time in Japan (personal communication, November 7–8, 2001). The magnitude of the changes already made suggests the formidable array of obstacles that had been erected. METI laid out four categories in which it sought changes:

- Increasing labor mobility
- Deregulating capital markets
- Facilitating corporate restructuring
- Improving university-industry linkages.

Below, we list some of the major revisions made in these categories since 1997, together with the year of enactment.

Changing employee incentives and increasing labor mobility

• 1999. The Employment Security Law and Worker Dispatching Law was revised on Private Employment Agencies. Previously, there had been a state monopoly on assisting job seekers. This revision allowed private agencies to play a larger role in placing workers. Regulations still restrict the ways in which jobs can be advertised and brokered by private agencies.

• 1999. The Second Basic Plan for Immigration Control was issued, so that more foreign workers could be allowed into the country under the Technical Internship Program.

• The introduction of defined contribution retirement plans is in process (in contrast with existing defined benefit plans). The current defined benefit retirement plans, together with low taxes on lump sums paid to retiring employees, might be important in limiting worker mobility among firms. If so, the introduction of defined contribution (portable) pensions, like American 401(K) type plans, will mitigate these effects.

• 2002. Starting in 1998, companies were allowed to use stock options for compensation, although there are still severe restrictions on who can receive them and on how many they can receive. (In the United States, it is not unusual for 25 percent of the stock of a startup firm to be reserved for recruitment and compensation. Japanese companies have many fewer shares available for these purposes.)[12] In April 2002, the Commercial Code was again revised to allow more workers, including part-timers and contract workers, to receive stock options.

Deregulating capital markets to encourage risk capital investments

- 1997. Corporate pension funds were allowed to make venture fund investments and an Angel Tax incentive rule was introduced. Public pensions are still severely restricted to investing in low-risk categories.[13]
- 1998. The Limited Partnership Act for Venture Capital Investment further eased restrictions on pension fund investments through venture capital firms, and confirmed the limited liability status of investors. However, many pension plan providers have imposed such strict conditions on asset managers that they have been able to achieve only low rates of return.
- 1998. The Law for Facilitating the Creation of New Business gave government support to innovative small businesses, similar to SBIR initiatives in the United States. An amendment in 2000 gave further support to venture businesses planning IPOs.
- 2002. As of this writing, METI plans to exempt new companies from capital requirements for their first five years of operation. Under the 1990 Commercial Code revision, stock companies had to state minimum capital of ¥10 million. Under the planned new rules, companies initially have to state capitalization of only ¥1.

As we note above, opportunities were also created for companies to raise capital from the public through new stock exchanges. Previously, small-cap firms were limited to the JASDAQ OTC market, which routinely took up to three years to approve listings provided the firm was established enough to meet its financial requirements.[14] The new markets and sections, minus the now-defunct NASDAQ Japan, provide for much faster approval, sometimes in as little as a month, with less stringent financial requirements.[15]

Facilitating corporate restructuring

- 1997. The Commercial Code was revised so that the process of mergers and acquisitions was simplified.
- 2000. The Commercial Code was revised to introduce a legal framework for corporate divestitures, easing the process of spin-offs.
- 2000. The Civil Rehabilitation Law came into effect, modeled on the U.S. Bankruptcy Reform Act's Chapter 11. It is designed to encourage greater risk-taking by allowing businesses in trouble to rehabilitate through negotiation with creditors.

Encouraging interactions between universities and industry

- 1998. National universities were allowed to set up technology licensing offices to encourage the patenting and licensing of research discoveries.
- 1999. Firms were allowed to own intellectual property from government-funded research, including research taking place in national universities.
- 2000. Policies restricting involvement of national university faculties in business were eased with the passage of the Law to Strengthen Industrial Technology. This law makes it easier for faculty to take leaves of absence to work in a company or start a business. It also makes the use of corporate funds for research more flexible by extending the time limits for use. Previously, these

funds had to be spent within the period of one fiscal year. However, the types of expenditure are still limited mainly to equipment and materials.

Other regulatory changes planned or under debate

- Administrative reforms are planned for 2004, which call for incorporating Japan's national universities as "independent entities." This move will lead to deregulation in hiring, tuition-setting, and fundraising, and consequently, to greater competition among universities for students, academic talent, and research funds. In conjunction with these reforms, the Japanese government is urging universities to merge and build stronger links with industry.
- A plan to allow flexibility in distributing assets and liabilities between parent and subsidiary firms is scheduled to go into effect in 2002. This should make mergers and spin-offs easier, encouraging the formation of more IT startups in Japan, since most of them are spin-offs of large firms (Kodama 2001).
- Proposals are being prepared to revise Japan's bankruptcy laws, although they will not be debated in the Diet until 2004.

In general, rule changes are hampered by interests that, among other things, create ministry-level disputes over jurisdiction. By far the most active agency has been METI, which has advanced a series of proposals to encourage the growth of ventures. As far back as 1975, it established the Venture Enterprise Center (VEC) to help small businesses by guaranteeing loans.[16] Another case in point is the Hiranuma Plan for the Creation of New Markets and New Jobs, put forth in May 2001. It calls for "creating 1,000 Venture Firms Sprung From Universities", "concentrating investment in the environment, biotechnology, data transmission, nano-technology, and materials [industries]." It also calls for "Doubling New Business Openings" (METI 2001). These initiatives are struggling in Japan's current recession.

2. Knowledge Intensity, Openness, and a High Quality, Mobile Work Force

Silicon Valley generates perhaps the highest flow rate of ideas about certain technologies of any place in the world. Its core competencies, for the most part, are in technologies of information, but also of biology and new materials. These competencies are sustained by a high level of research, performed for the most part by large firms but also in universities. The Valley is not a place where many breakthrough inventions are made; these tend to be distributed more widely around the country and the world. Rather, its strengths lie in generating ideas for products and bringing them to market. In recent years, it has also brought many new business models to market, with mixed success, as the collapse of many dotcoms shows.

While the companies of Silicon Valley are highly competitive, there is also an attitude that all can gain from sharing knowledge that is not company-proprietary. This is the philosophy behind open standards, which permit developers to produce and/or modify many applications or products using other parties' platforms or products, and ultimately provide a wider audience for the original platform. In short, ideas circulate. Frequent meetings at seminars, conferences, and ethnic and other associations offer other arenas in which knowledge can be exchanged among people from different companies. This knowledge, or "ambient awareness," drives competition, innovation, and collective benchmarking (Brown

and Duguid 2000). Networking also helps build a customer base and complementary relationships. These interactions take place among people with overlapping networks of relations.

Many workers in Silicon Valley advance their skills by doing demanding work. Many others continue their formal education, often by taking courses at Stanford in the Honors Program. This program, which includes video links with classrooms in the School of Engineering, offers still-employed workers a flexible way to learn. Several thousand employees from companies like Hewlett Packard, Apple Computer, IBM, and Intel have availed themselves of this program over the years (http://scpd.stanford.edu/scpd/).

Silicon Valley is also distinguished by workers who frequently move among different employers. A highly mobile labor market efficiently matches the various needs of both individuals and firms in a setting with many startups, rapidly growing firms, failing firms, and large, relatively stable ones. Although by no means everyone moves, the many who do carry with them ideas for new products, services, business models, and markets. There is, of course, a negative aspect to this mobility, as workers leave with valuable company-specific knowledge. There is a story, which may be apocryphal, that Bill Gates and Paul Allen located Microsoft in remote Redmond, Washington because they knew it would be more difficult to recruit workers there than in Silicon Valley, but also easier to keep them. Another downside of the mobile workforce is the potential disincentive for firms to train workers who might soon walk out the door.

Japan's Status

Many observers have praised Japanese firms' ability to share knowledge within and among themselves. (For several different perspectives on inter-firm knowledge sharing see, e.g., Aoki and Dore 1994, and Imai 1992). However, there are, arguably, differences in the learning that occurs within a Japanese firm (or related ones), and the learning that takes place in Silicon Valley. Ideas seem to circulate in Japan through more structured channels, such as those organized around membership in a firm, university, or high school alumni associations. *Keiretsu*, or *keiretsu*-type relationships, as well as the tradition of the "network state" inserting itself as a mediator among competing firms, may constrain cross-firm knowledge-sharing.[17] Business and government relations have traditionally been close, and structured inter-firm exchanges, at least among large or related firms, are frequent. This coordination, considered one of the strengths of the Japanese system during its high growth era, benefited established firms while startups without *keiretsu* connections struggled. As many observers have noted, in the postwar period, the bias of the Japanese government, especially within MITI, was toward preventing or mitigating seemingly wasteful competition (see, e.g. Johnson 1982). Cross-firm exchanges were often encouraged by the government either to coordinate or cartelize market responses, or to promote new technologies and agreement on technical standards.

Government-sponsored research associations do not reliably produce close collaboration; they sometimes are simply a means to distribute R&D subsidies equitably among firms (Goto and Odagiri 1997). The Ministry of International Trade and Industry (now METI) never depended heavily on joint research initiatives as a means of promoting national innovation. In fact, the Japanese government has had quite mixed results in its attempts to foster creative and cooperative connections among firms. As Callon (1993) demonstrated with regard to the government-sponsored computer projects in the late 1970s and early 1980s, actual cooperation and information exchange was much less than met the eye.

There are historic reasons for Japan's low mobility of labor.[18] Labor historians note that economic and political conditions in the 1950s and 1960s led to a wage system that favored seniority and long term tenure, early and mandatory retirement, and enterprise unionism. These factors in turn gave rise to and were reinforced by nonportable pension plans largely tied to specific firms;[19] by firm-specific training in the companies; and by limited general education in universities. Highly qualified engineers and managers are disinclined to leave their firms not only because of the negative impact on wages, pensions, and taxes but also because of their tendency to identify more strongly with their companies than with their technical specialties or professions.[20]

The rigidities of Japan's labor market will be difficult to overcome, but some emerging trends are encouraging. For instance, a recent survey shows that Internet companies in Tokyo primarily select subcontractors based on introductions made by acquaintances or people in the same trade (Fujitsu Research Institute, et al. 2001). This suggests that networking is important—at least within the Internet community—within Tokyo. Another trend is the increase in the number of temporary and part-time workers. This, of course, reflects difficulties in the job market but may also reflect the growing number of young people preferring to try different jobs rather than being tied to one firm.[21] In fiscal year 1999, the number of temporary workers went up by 19.3 percent to over 1 million. These workers are a potential source of labor flexibility (and information exchange). December 1999's amendment to the Manpower Dispatching Business Law expanded the number of fields in which temporary staff could be used and allowed private agencies into this market. Still, there remains a mismatch between Japan's labor and capital markets, which that both favor security over mobility, and the needs of technologically dynamic industries, which benefit from mobility.

Many Japanese companies (mostly those that are not internationally competitive) still find it difficult to move to an open business and investment style. Banks, in particular, seem unable to change practices that date back to a time when they were shielded from the effects of bad investments by financial market protections and bureaucratic direction.

METI is trying to introduce mobility at the corporate board level by discouraging company executives and managers from also serving as board members in their firms. While Japan's commercial code formally provides shareholders the right to control the management of a company, in reality they are silent. Decision-making still resides mainly with the company president, and directors are internally promoted, rarely brought in from companies outside the main *keiretsu* or banking group. In the long run, the weakening influence of the main bank relationships with firms (as equity and bond fundraising makes gains over borrowing), as well as the increasing entry of foreign investors, and the growing involvement of active, private, individual investors will help to change this situation.

3. Merit Matters: The Importance of Immigrants and Foreign Linkages

Merit matters most in Silicon Valley. What a person knows and can do is much more important than his or her other attributes. The fact that many of the Valley's most successful engineers and entrepreneurs are immigrants testifies to the importance of ability. Whatever their backgrounds, talented people are readily accepted. Intel CEO Craig Barrett has said that "every doctorate should come with a green card attached to it." In addition, immigrant entrepreneurs also build connections to high tech centers in their home countries (Saxenian

2000). These networks give Valley firms access to skills, technologies, and markets in other regions. They lead to outsourcing, co-investments, technology exchanges, and innovations across countries.

Japan's Status

Although the quality of the Japanese workforce is very high, the virtual absence of immigrants and the relatively low number of women in technical and professional jobs have denied the country important sources of talent. Another obstacle is the weakness of ties between individuals in Japan and the rest of the world. In China, by comparison, one-third of the graduates of Tsinghua University, the country's leading technical university, leave to work elsewhere, mostly in the United States. Many of these people will return to China and will retain American connections. This has been the pattern among Taiwanese, Israelis, and Indians. In contrast, there are few Japanese high tech workers in Silicon Valley or other U.S. clusters. One possible reason for their absence could be the relatively poor English-speaking ability of many Japanese professionals, along with the even poorer Japanese-speaking ability of Americans and other foreigners (see MEXT 2002).

Relationships are also established through students from abroad in American universities. There has been a steady increase in their numbers from all regions (Institute of International Education 2001). But the data on the Asian countries and fields of study show an interesting pattern, as displayed in figure 2. Business studies are widely popular across countries, but Japan has many fewer studying engineering, math, and computer science, as well as physical and life sciences. In 1997–98, India sent 35 percent of its overseas students to study engineering, whereas Japan's engineering students accounted for 3.5 percent of its total number of overseas students. No doubt Japan's existing educational excellence in engineering and other technical fields accounts for the low numbers, but the result is fewer opportunities to be exposed to American-style entrepreneurship and to forge longer-term relationships.

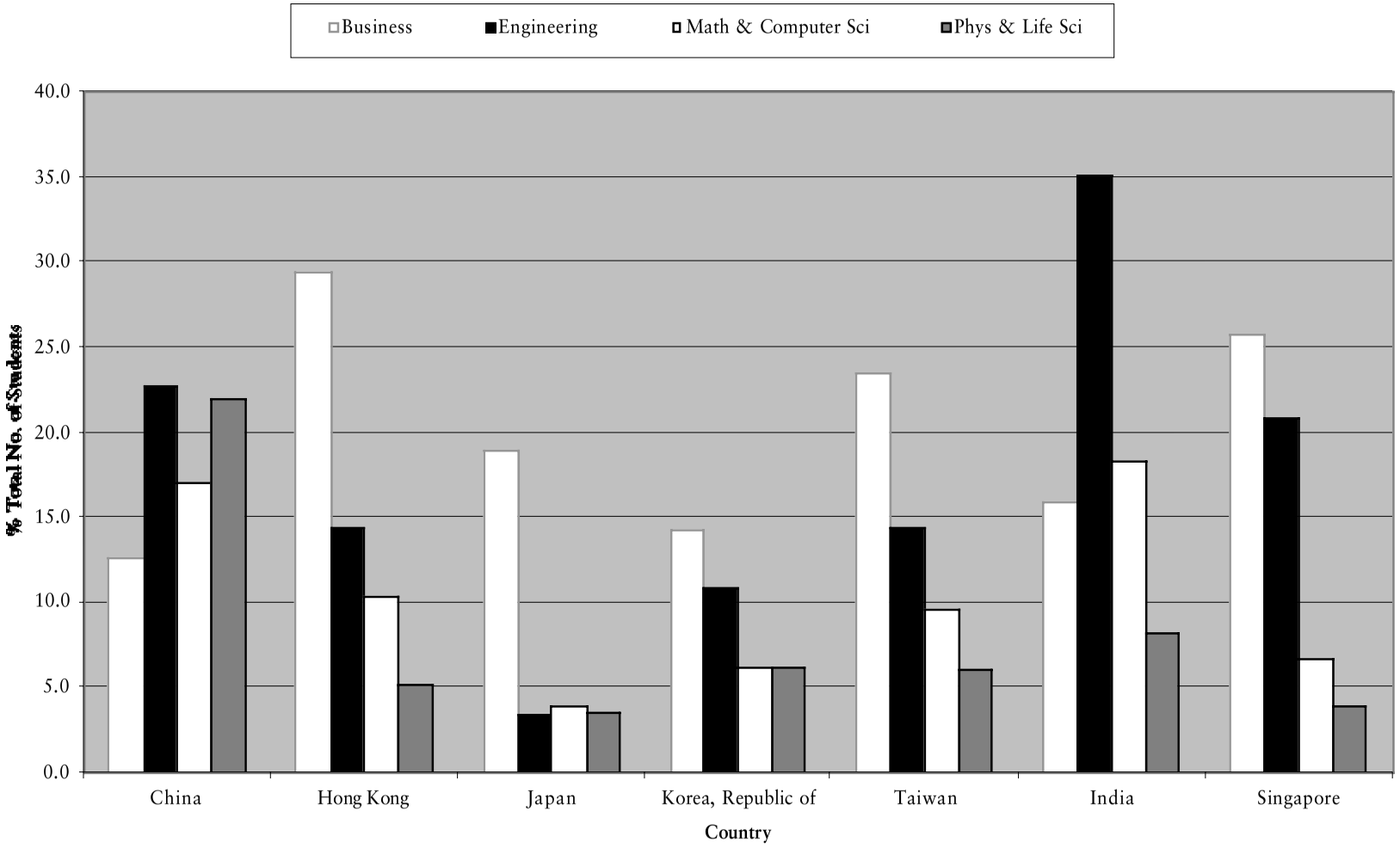
Changes are taking place, however, in Japan's immigration patterns. The number of Japanese living abroad both in the short and long term has been rising steadily, though the number of permanent residents has risen more slowly (Ministry of Foreign Affairs 2000). And Japan currently has its highest-ever level of foreign workers, both legal and extralegal. Most go into manufacturing jobs, but substantial gains are also being made in the IT industry, and particularly in software development. Japan's Ministry of Justice statistics show that 3,760 foreigners entered on the basis of technical qualifications in 1999, versus 1,758 in 1993 (Adelman 2000). One major recruiting company, Pasona, is recruiting directly in India for high tech workers. And the Keidanren business group has been calling for greater tolerance of foreign workers.

In sum, although many Japanese claim that their society is meritocratic, it is not yet entirely open to the range of talents available irrespective of age, gender, and country of origin.

4. A Climate that Rewards Risk-Taking and is Tolerant of Failure

A distinctive feature of the U.S. high tech economy is the extent to which risk-taking is encouraged and failure is not excessively punished. Many new ventures fail, so a climate in which the stigma of failure hangs over the unsuccessful entrepreneur is a powerful deterrent to starting—especially if the rewards for risk-taking are not high. Entrepreneurs and their financiers often view failure as a learning experience and they are rarely punished for it in subsequent ventures.

Figure 2. Foreign Students in the United States by Country and Field of Study (1997/1998)



Source: Institute for International Education 2001.

Such tolerance for failure is reinforced by bankruptcy laws that limit liability for entrepreneurs. These laws limit liability to invested capital and do not permit creditors to reach beyond the company. Similarly, the availability of limited partnerships for venture capital firms enables them to engage in riskier ventures. On the reward side, laws that permit entrepreneurs to acquire stock in a company for the ideas, organization, and hard work they put into it reinforces enthusiasm for taking bold initiatives.

Japan's Status

Kneller (2000) notes that though attitudes are slowly changing, "[t]he cost of failure for someone willing to swim against the current and join a venture company is high in Japan … failure is regarded not as a valuable learning experience but as a sign of ineptitude or moral turpitude. Family members are likely to be ostracized. Credit ratings are ruined. Obtaining a housing mortgage or renting an apartment becomes impossible". *The GEM 2000 Executive Report* (Reynolds, Hay, et al. 2000) also notes that negative social attitudes toward entrepreneurs remain one of the most serious barriers. A recent survey by Japan's Small and Medium Enterprise Agency suggested that the top personal reasons for not starting a business were the risk to livelihood, perception of intensifying competition, desire to be a salaried worker, high barriers to entry, and the low social standing of entrepreneurs (Suzuki 1999).

In addition, there are the financial risks faced by entrepreneurs. The personal costs for financing ventures is high, with banks requiring personal guarantees for loans. Defaults are a much more serious matter in Japan than in the United States where, in most states, it is difficult to seize a primary residence or car. In Japan, however, only the most basic items (such as clothing, furniture, and other household goods of small value) are protected from seizure (Imai and Akiyama 1998). One legal expert also notes that, "there is no understanding in Japan that the assets of the [company] president and the assets of the corporation are separate…. Most people do not understand this difference yet" (Harney 2000). The provision of venture capital predicated on the acceptance of high risk, as in the United States and elsewhere, would help to change these deep-seated views.

5. Research Universities and Institutes that Interact with Industry

Excellent universities are rich sources of advanced research, of ideas that become embodied in new companies, and, most important, of good graduates. An early attraction of the Stanford Industrial Park, for example, was its capacity to give high tech firms access to students. Likewise, Stanford University administrators were attracted by the possibility of garnering interesting consulting possibilities for their faculty. In Silicon Valley, some faculty members in salient departments interact with industry as consultants and advisors to companies, serve on their boards of directors, and, if consistent with the university's needs, take short-term leaves of absence to work in industry. In much of continental Europe as well as Japan, many faculty members of excellent universities apparently interact rather less with industry.

Ideas and knowledge need to pass both ways: between universities and industry. At Stanford, interactions take many forms. Faculty and students work with industry; industry transfers technology to the university, and vice versa; the university sponsors seminars in which many attendees are from industry; and industry people regularly give lectures and courses at the university. For example, while he was CEO of Intel, Andy Grove co-taught a course at Stanford's Graduate School of Business for many years.

Companies, nonprofit organizations, and local government also collaborate on problems of common concern. Independent-sector organizations are vehicles through which

business leaders can undertake civic responsibilities. Favorable laws governing nonprofit organizations and financial contributions to them foster community participation in civic undertakings. Many companies in Silicon Valley have matching programs for employee contributions to nonprofit educational institutions, human service organizations, museums, and environmental organizations.

Japan's Status

Compared with their counterparts at American universities, the faculties of Japanese universities seem to be less concerned with establishing formal licensing relationships with industry. No doubt, the official barriers set by the Ministry of Education (Monbusho), which limited national university faculties' involvement in companies, made such arrangements infeasible, until recent amendments were made. This is not to say, however, that no substantive relationships were formed between individual university faculty members and companies. Large companies have long supported the work of academic laboratories with funding. But because of the official restrictions on university–industry relations, subsequent discoveries did not translate into tangible benefits for the university. Discoveries by individual faculty were passed along to the sponsoring firm with an implicit understanding that additional financial help would be offered some time in the future. Japanese universities could not leverage ideas into new companies and have played no role in the startup community. As a recent report notes, while 2,624 startups emerged from American universities between 1980 and 2000, Japanese universities produced only 240 startups between 1980 and 2001 (*Nikkei Weekly* 2002b).

Private financial contributions, which have been so important to the development of American universities, have also, so far, had no impact on Japanese universities. Prior to the government's recent decision to incorporate national universities and cut direct funding, there seemed to be little incentive for universities as institutions to encourage closer ties with business. Monbusho's policies limiting use of donations also made it difficult for companies to compensate individual university researchers and professors for their work (Kneller 1999). Further, the use of corporate funds is still restricted (mostly to the purchase of equipment), with little passing through to graduate students or postdoctoral research personnel. The time and costs involved in establishing intellectual property rights have led many professors to make informal arrangements with companies. In many cases, they have not bothered to apply for patents, leaving the company free to have exclusive rights. The university researcher is compensated through future donations or research contracts from that company.

Some analysts argue that this setup may be in the national interest. Kneller (1999) notes that this way of transferring technology from faculties to markets may be efficient if there is a good match between a company and a professor's research. The drawback occurs, however, when the match is poor. The near-exclusive relationship between a professor and a firm means that an opportunity not pursued by one firm is usually not then made available to other potentially interested companies.

In the past, Japanese universities had almost no formal role in commercializing patents. However, the 1998 law which allowed (and subsidized) national universities to set up U.S.-style Technology Licensing Offices (TLOs) has led to over a dozen being established. It is too early to assess the results—early indications are that they are less active in licensing than are American TLOs—but there are signs of bureaucratic obstacles and of TLOs being reserved for government officials as *amakudari*, or post-retirement positions. It is useful to recognize

that these offices are new, and that even Stanford University has had few big money makers through its Office of Technology Licensing.

Some of Japan's restrictions on university–industry linkages are being eased, which has led to new efforts to engage in joint research. The 1995 Basic Law for Science and Technology attempted to foster institutional partnerships, primarily between industry and universities. One researcher found that in just two years (1994–96), the central government's go-ahead resulted in a 30 percent increase in the number of such joint projects (Hane 1999). In 2000 alone, METI reported another 30 percent increase in the number of joint research projects (*Nikkei Weekly* 2002b). Prominent institutions, such as Kyoto University and Keio University, have established new, high-budget joint research facilities to host these projects.

In response to further industry demands to increase incentives for cooperation with university researchers, Monbusho is giving tax breaks to joint research facilities and making it easier for company researchers to conduct on-campus research. Even so, there remain severe restrictions on licensing and development of the discoveries that result from these projects.

Under the aforementioned Law to Strengthen Industrial Technology, passed in April 2000, faculty members, under certain rules, can be involved in setting up commercial enterprises without resigning. Professors can take a one year leave of absence to start a company. Faculty members can now accept consulting fees and own patents if they meet basic guidelines. That said, the proposed mechanisms are complex, and have to pass through the Ministry of Finance.

Despite a loosening of the rules, the strict hierarchy within a senior professor's *kouza*, or laboratory, remains a powerful disincentive against younger university faculty taking time off to work for a company. One's promotion is highly dependent on loyalty to senior faculty and chance vacancies in the hierarchy. Thus, the incentive for cultivating close relations with firms in the United States—furthering one's own research—is weaker in Japan for younger researchers. This system also reduces competition among researchers even as it increases the difficulty in recruiting the most promising new faculty members and accommodating new areas of research.

Yet another inhibiting factor is the weak competition among Japanese universities for research funds. The majority of research funding comes from government agencies, allocated according to a predetermined formula, not through competing proposals. Although efforts have been made in recent years to increase competitive funding, this so far happens only for large projects and comes with many bureaucratic strings attached (Blanpied 1998).

Further changes will occur when Japan's national universities become "independent administrative agencies" as of April 2003, following a major restructuring of Monbusho, which will merge with the Science and Technology Agency. These universities will then have to seek other sources of funding, including commercializing research. The latter path may be even more critical to Japan's schools given the weak tradition of philanthropy, as well as tax laws that presently give no incentives to donate to nonprofits. Early signs are encouraging: about 40 percent of university startups have so far found venture funding, and most express an interest in going public over the long term (*Nikkei Weekly* 2002c). But until changes are made to the incentive structure, Monbusho funding will continue to play an important role in the promotion of entrepreneurship in Japan's universities (e.g., through the establishment of several Venture Business Laboratories on campuses).

6. A Specialized Business Infrastructure

In the United States in general and in the Silicon Valley in particular, a strong array of support services enables new businesses to get up and running fast—thereby increasing their odds of being first to market. These services include law, accounting, venture capital, personnel search and recruitment, marketing, and equipment leasing, among others. Money can be supplied quickly. Personnel search firms can recruit workers fast because they are in continuous contact with executives and professional staff in the region and elsewhere. Lawyers play a critical role in Silicon Valley as counselors to company founders. They are valued as much for their networks and their knowledge of the habitat as for their legal expertise. In return for their counsel, they sometimes obtain equity in the startup firm.

Finance plays a central role. The rise of private venture capital in the United States owes much to the federal government initiatives in the 1950s that matched private equity to increase opportunities for small companies through the creation of SBICs (Small Business Investment Companies). Private venture capitalists (VCs) picked up where the federal government left off, and as SBIC regulations came to be seen as too onerous. VCs are now the main source of funding for new companies together with investment from private individuals, or "angels."

According to a recent study, $273 billion in venture capital investments from 1970 to 2000 went toward creating companies that in the year 2000 were responsible for 5.9 percent of jobs and 13.1 percent of the GDP in the United States (DRI-WEFA and NVCA, 2001). The computer, consumer, health, and communications industries received the greatest benefit. Although any such estimate is subject to methodological difficulties, the impact of venture funding clearly has been large.

VCs do much more than supply money. It is sometimes said that their business is company creation rather than financing. VCs seek startups with high growth potential and shepherd them through the process of organization, growth, legal navigation, recruitment, and marketing toward a successful exit strategy, which may come in the form of an IPO or acquisition by another firm. These backers, many of whom have had experience operating in high tech firms, coach founders who lack important kinds of know-how and need advice. They also identify other experts who can help their portfolio companies.

Less publicly discussed, because data on them are sparse, are angel investors—private individuals who provide seed capital. These and other early stage funds are crucial sources of support for young companies with rapid growth potential. The scale of angel investing may approach that of organized venture capital.

Japan's Status

A specialized business infrastructure develops interactively in a region. If there is little entrepreneurial activity, there will likely be little infrastructure. For instance, venture capitalists with expertise are very valuable, but they obtain their knowledge mainly through experience. This is a slow process, but as expertise accumulates, it attracts more business, and the cycle continues.

According to conventional views, Japan has just experienced its third, concentrated period of "venture" investment.[22] The first venture capital firms became active in the early 1970s, following some venture initiatives in the United States. Difficulties in getting off the ground, combined with the recession following the first oil shock in 1973, led to retrench-

ment and an increased reluctance to take risks. These venture firms were typically bank-created organizations and predictably exhibited an aversion to risk and a preference for loans—an inappropriate mode of capital for companies short of physical assets. This Japanese bias toward debt financing persists today. The second round came in the mid-1980s, fueled by a capital glut in the financial services sector. Then, many large companies were running huge cash surpluses, with underdeveloped equity markets, and just-liberalizing capital flows. These first two periods failed to establish venture capital as a significant instrument for encouraging entrepreneurship. The current period, dating from the mid-1990s, also appears to have made little difference, even though the profile of venture capital in Japan is higher today. Despite the excitement generated by venture capital investment worldwide, there are few indications that much U.S.-type venture capital is finding its way to Japanese startups.[23]

Venture investments differ, one to another, in a variety of ways. One noticeable difference lies in where and what kinds of investments are made. Less than 40 percent of venture investment in Japan, as categorized by the Nikkei Sangyo Shinbun's Annual Venture Capital Survey, is directed at high tech sectors, compared with about 80 percent in the United States (Stanford University GSB 1999). Most of the investment is concentrated in Tokyo, with a considerable amount being invested overseas.

Another large difference can be seen in the sources of funds for startups in Silicon Valley (and the United States in general) versus those in Japan. Between 85 to over 95 percent of Japanese venture funding comes from corporations, and indeed, most venture capital firms are subsidiaries of large corporations, banks, and insurance companies (*2001 Guide to Venture Capital in Asia*; Stanford University GSB 1999, and Nakagawa 1999).[24] In the United States, a high proportion comes from pension funds and other institutional investors—including university endowments. Also in contrast to U.S.-style VCs, those responsible for handling investments in Japan rarely hold equity in their portfolio companies. In other words, they are not risking their own money. Moreover, few Japanese VC firms can claim to have the expertise that one commonly finds among American VCs. Entrepreneurs there are even less knowledgeable about the risks and processes of starting a new business. Venture capitalists in Japan do not typically supply them with know-how, assistance with business plans, strategy, or management.

As in the United States, little is known about Japanese angel investing, but the paucity of new firms suggests that there is not much of it. Most VCs avoid seed and early stage funding altogether, preferring to fund at a later stage. This should not be surprising given that the average time to IPO in Japan has been twenty-seven years, compared to five to seven years in the United States (Nakagawa 1999). The government in Japan has established regulations on angel investments—though these are applicable only to a few types of companies—in order to encourage it. But Japanese angels do not enjoy the tax advantages of their American counterparts. For example, capital losses from ventures cannot be applied to offset gains made in other investments that the government does not categorize as a "venture" (Stanford GSB 1999).

A substantial disconnect also exists within the venture divisions of large financial firms, where it seems that many bank officers assigned to these divisions use screening techniques similar to those developed for traditional loan clients. The investment strategies employed by most Japanese VC firms also inhibit close oversight of portfolio companies. Rather than investing intensively in a few carefully considered startups, VCs in Japan tend to invest a small amount in many companies. According to one MITI survey, a typical U.S. IT fund invests in six companies, while Japanese VC funds invest in an average of about thirty

(American Embassy 2000). This five-fold difference is another reason why VCs in Japan cannot pay close attention to their companies.[25]

A final hurdle is the distrust that still seems to pervade the relationship between entrepreneur and VC. One observer notes,

> In Japan, the relationship between venture capital and venture business is, in general, distant and hands-off. Japanese venture capitalists seldom sit on the board of their portfolio company. Part of this can be attributed to a fiercely competitive national consciousness, what the Japanese call *kyoosoo ishiki*. There is a fear that disclosed information will somehow find its way into the hands of competitors … [E]ntrepreneurs fear that VCs seek short-term profit at long-term expense, are greedy and will take over the company." (Borton 1992, xviii)

This suggests that in Japan, as in many other countries, there is significant antipathy toward ceding partial control over a company to others. Many entrepreneurs would then choose not to pursue such funding. On the funders' side, information asymmetry between them and early stage firms is a significant problem everywhere. It is mitigated somewhat in the United States by close scrutiny and oversight by the VCs. But in Japan, where venture investments are at arms-length, the risks are still unacceptably high for many VCs. For these and other reasons, Japanese startups have been dependent on debt financing through all stages of investment. But in the current financial climate, where private banks' nonperforming assets are estimated somewhere between ¥60 to ¥100 trillion, small firms and, especially, emerging firms, have had difficulty in securing even bank loans. Perhaps this is why a recent report says that Japanese Internet companies, at least, are actively trying to change their financing away from loans and personal savings (Fujitsu Research Institute, et. al. 2001).

Aside from venture capitalists, there is—as should be expected given the aforementioned endogeneity of this kind of infrastructure—a dearth of professionals such as attorneys, accountants, and MBA-trained managers, incubator managers, and investment analysts who have skills related to new and growing high tech firms. For instance, although Japanese venture incubators are gaining greater acceptance, their managers are relatively inexperienced, acting more as landlords and less as service-providers.[26] The shortage of lawyers is particularly noteworthy.[27] They are needed to help clear bad debt, settle shareholder disputes, perform mergers and acquisitions, and settle sales of assets (Kimoshita 2000). Whether they can play the counseling role that they do in Silicon Valley—or what other profession can be their functional equivalent—remains unclear.

Japanese regulations create hurdles to developing a professional support base for entrepreneurship. The entry and practices of foreign professionals are severely restricted. Appropriate training (equivalent to MBAs or JDs) for Japanese professionals remains relatively limited, though the situation is rapidly improving as some of Japan's most prominent schools establish new MBA, accounting, executive training, and IT programs.[28] Interestingly, many of the courses in these programs are taught in English.

Recruitment of executives by private placement firms was highly regulated until 1997, when the government monopoly on placement was broken. Until then, private headhunters were limited to recruiting only for certain industries and certain levels of management. Compensation to service suppliers in the form of equity in the firm has been strictly limited and rare. These restrictions mean that clients pay more for services, and talented professionals do not get compensated appropriately.

Despite these varied obstacles, there is growing recognition in Japan of the importance of professional guidance to startups. Some VC firms have started to send expert consultants to their portfolio companies. One question not much considered by researchers thus far is the possibility that risk capital coming from certain types of companies, such as trading or electronics firms, is accompanied by substantial oversight and strategic consulting. Providing services to portfolio firms is a costly investment especially if the investor enters at a late stage with expectations of an imminent IPO. While further policy changes will doubtless take place to encourage entrepreneurship, the shortage of experienced professionals able to shepherd clients through the process will be a bottleneck for some time.

The Future

A convergence of electronic products, computers, and media content is well underway in Japan. The strength of Japanese companies in consumer electronics and wireless mobile communications suggests that they will do well in this environment. Many of these companies are major players in the world market, and the country's strengths in science and technology will keep them strong. But technological dynamism in information technologies, biology, medicine, and materials, will continue, and Japanese firms have lagged in the past decade. Moreover, the competition is growing, especially from China.

The formula for creating an environment friendly to entrepreneurship is not readily at hand but the most important step is to acknowledge that there is a problem. This is now happening in Japan. Important actions have been taken only recently and there is bound to be a lag before the payoffs are fully realized. And more policy changes are coming. Japan has succeeded in transforming itself twice in the past 130 years. It can happen again.

Notes

[1] The items under comparison are computer, office and communications equipment, and software that is either purchased or developed in-house on own account.

[2] In hindsight, it appears that U.S. firms may have over-invested in IT, leaving an open question as to whether the resulting productivity gains were adequate compensation for these levels of investment.

[3] See Gordon 2000 and McKinsey Global Institute 2001. Japanese productivity figures were, notably, made lower by the high levels of inefficiency in its small business sectors.

[4] Total entrepreneurial activity is measured in terms of the percentage of the adult population engaged as entrepreneurs.

[5] This report defines venture capital as, "risk money invested by professionals in small, young companies with the potential to grow rapidly into enterprises that contribute significantly to local, regional and national economies" (Reynolds, et al., 2001, 46).

[6] The reputation of NASDAQ Japan, as well as those of the other new markets, also suffered from allegations that some of the companies listed on these exchanges had considerable *yakuza* or gangster connections, who were attracted by the lower listing standards. The best-known case of this involved the Mothers-listed Liquid Audio Japan, whose former president was arrested for kidnapping a rival. The stock markets have issued background checks for companies applying for a listing.

[7] The firms listed on NASDAQ Japan were transferred to a new section of the Osaka exchange called the Japan New Market (CNN.com 2002).

[8] See discussions by Imai 1992, Aoki 1984 and 1986, and case studies by Laage-Hellman 1997 on advanced materials. See also Chesbrough 1999 on disk drives.

[9] Chandler carries his analysis only up until the mid-1990s, virtually ignoring such trends as the rapid migration of high-tech manufacturing to Korea, Taiwan, and China; the impact of the Internet boom (and bust); networking; wireless telecommunications and computing; and the disappearing act of European IT firms.

[10] One potentially rich area for startups to is in mobile computing. DoCoMo's success and its unique business model have sparked the creation of some startups that have developed technology or content tied to the DoCoMo mobile computing platforms. One example is Cybird, which builds software for the wireless and mobile communications market (an area in which major investor, NTT DoCoMo, has gained world dominance), and ACCESS, which creates software for Internet appliances. These companies seek sales worldwide, but they got their start creating applications for larger mobile phone and computing companies in Japan.

[11] In addition to establishing favorable rules, the U.S. government helped the computer industry in its early years by buying its products and, throughout, by supporting research and early systems development. This was most important in the areas of network computing and computer science, which prepared the way for the Internet.

[12] Of course, stock options are used to retain employees and promote loyalty, as well as to entice new recruits. In Japan, where mobility is low, stock options are a relatively new and unexplored way to recruit experienced workers into new companies. But with so few IPOs, and so many restrictions on their use, they are not yet a strong incentive.

[13] Public pensions are managed by the government and provide all workers with a basic pension, as well as providing pension insurance for the private sector, and coverage for public servants. Public pensions complement corporate pensions and private retirement accounts.

[14] JASDAQ, distinct from Japan NASDAQ, is an OTC market operated by the Japan Securities Dealers Association (JSDA). It is a frequently used stepping stone to listing on the more prestigious Tokyo Stock Exchange.

[15] The establishment of these new markets seems to have had an important impact on the number of IPOs in Japan. From August 1, 2000 to July 31, 2001, 189 companies went IPO. Sixty-six of these listed either on NASDAQ Japan or MOTHERS, the rest listing as OTC,

TSE, or a regional exchange (Gaijin Investor Inc. 2001).

[16] The VEC function as loan guarantor is similar to that played by the Small Business Administration (SBIC) in the United States, which was a significant supplier of venture capital before the rise of a private VC industry.

[17] The concept of the network state is best illustrated in Okimoto 1989.

[18] For a historical review see Inagami 1998. For recent discussions see, for example, Brown, et al. 1997, Dore 1986, Dore, Bounine-Cabalé, and Tapiola 1989, Hart and Kawasaki 1999, Hashimoto 1990, and Sako and Sato 1997.

[19] Many workers benefit from a combination of a public pension plan and corporate pension fund. The latter are not as of yet, portable, but moves to establish 401(K)-type plans are underway, as we noted above, though reform has been difficult because of the impact the recession has had on other aspects of pension planning including contribution schedules and shortfalls in company reserves. The first company to establish a 401(k)-like plan with a defined contribution scheme is Pasona, which is Japan's largest temporary staffing agency.

[20] This sense of traditional group consciousness expressed through one's main institutional affiliation (such as a company) is most famously explicated in Nakane 1973. The current climate of rising job insecurity has evidently eroded this loyalty, however, (as evidenced by a recent survey by Manpower Inc.), suggesting that company loyalty derived from more than cultural determinants.

[21] The rate of employment for Japanese college graduates has been about 65 percent in recent years. But big firms continue to absorb a high proportion of the best graduates, albeit in smaller numbers.

[22] We experienced difficulties in comparing American and Japanese VC because of the divergence between the countries' respective conceptions of the meanings of *venture capital* and *startup*. This problem is compounded by the official concepts put forward by Japan's ministries and agencies. In addition to equity funds, METI defines venture capital to include several types of bonds and loans—forms of debt financing that are not defined as "venture capital" in the United States. These types of debt make up the vast majority of VC investment in Japan, with equity investment making up as little as 20 percent of overall venture investment (Borton 1992).

[23] With the partial exception of VCs like Softbank and the now-troubled Hikari Tsushin.

[24] Further, while U.S. pension fund managers are able to devote a part of their portfolio to venture funds, Japanese managers are prohibited by law from doing so.

[25] It should be noted that the investment strategy of a few large stakeholders, such as banks and securities firms, may skew the overall figures.

[26] As a result of this, and because most incubators are owned or operated by large parent companies for their spin-offs, incubators in Japan face weak demand.

[27] The Legal Training and Research Institute is the only state-sanctioned law school in Japan, and the percentage of acceptance hovers in the area of 2–3 percent. Moreover, passage quotas limit bar admission to 1,000 per year, low by any comparison but especially so given the entrance of about 47,000 to the bar in the United States in the year 2000 (National Conference of Bar Examiners 2001).

[28] One notable effort is Hitotsubashi University's Graduate School of International Corporate Strategy, with programs in finance and business. They have partnered with such firms as Morgan Stanley Dean Witter Japan Limited, and Toyota Motor Corporation to develop the curriculum.

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