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Venture Capital and Economic Growth: An Industry Overview and Singapore's Experience^{*}

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Abstract

This paper provides an overview of the venture capital industry, and its development in Asia and Singapore. Venture capital plays an important role in innovation and economic growth. Indeed, the resurgence of the United States as a technology leader is intimately linked to the success of Silicon Valley. As Singapore enters the next phase of economic development, the creation of internal engines of growth is an urgent task. The Singapore government has done much to provide an environment for entrepreneurship to thrive. Its success at replicating the Silicon Valley culture will be important for Singapore's future economic success.

JEL Classification number: G24

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1. Introduction

As an investment class, venture capital and private equity¹ have had an impact on the economic growth process that is significantly greater than the actual proportion of funds invested by this asset class.² In particular, the Silicon Valley model of venture capital has transformed the innovation process in the United States, particularly in the fast growing, high technology sectors – semi-conductors, personal computers, biotechnology, and software – where venture-backed firms had risen into prominence (Rogers and Larsen, 1984). These successes, which include Microsoft, Apple, Sun Microsystems, Intel, DEC, Genetech, Amazon, eBay, have defined the emergence of new technologies and global business models. Likewise, in Singapore, a number of well-known companies had received venture capital financing at the early-stage of their development. Since the mid-1980s, venture capital has also contributed to the growth of a number of companies listed on the Stock Exchange of Singapore.³ These companies include Creative Technologies, Venture Manufacturing and Interwoven.

The experience of Silicon Valley has shown that thoughtful policies and support of the venture capital industry can create the right climate for innovation and entrepreneurship, which in turn will pay dividends in terms of job and wealth creation. The basic environment for innovation to thrive is an economy open to trade and investment, a sound infrastructure, a

¹ Venture capital refers to investment in young unproven startups while private equity generally refers to investments in mature companies, which may include the provision of financing for expansion, buyout of private and public companies and which involve significant corporate restructuring.

² In the United States, although the venture capital industry has grown substantially during the past decade – in line with the stock market and IPO boom – it is still small when measured by the amount of funds invested in this asset class. For instance, as reported in Berlin (1998), US\$6.2 billion of new venture capital funds were committed in the United States in 1996. Although this is double the average of US\$3 billion invested in the 1980s, the amount is small when compared with the US\$184 billion spent annually on R&D within U.S. corporations and U.S. government agencies.

³ See Wang, Wang and Qing (2002). The authors identified 63 companies listed on the Singapore Stock Exchange between 1987 and 1999 which were backed by venture capital. More than half of these companies were related to the electronic sector.

sensible approach to intellectual property rights, a risk-taking and achievement-oriented culture, an open-door policy to global talents, as well as a robust financial system which includes private equity and venture capital.

In its most basic form, venture capital combines the provision of finance with active support, governance and mentoring of the startup companies. Entrepreneurs turn to venture capital to finance the development of new ideas and technologies and at the same time gain access to professional management skills and strategic support of experienced venture capitalists. Recognizing the importance of venture capital in the growth process, the Singapore government has assiduously supported the development of the venture capital industry. Besides implementing regulatory and fiscal changes to attract top-tier international venture capital firms to establish a regional base in the country, the Singapore government, through various government agencies and government-related companies, has also funded a number of new local and foreign venture capital funds based in Singapore. As Singapore restructures its economy in the midst of the current global economic downturn, venture capital will continue to play an important role in fostering entrepreneurship and economic growth.

In this paper, we hope to accomplish a number of objectives. In Section 2, we provide an overview of the venture capital industry and describe the workings of a venture capital firm. This provides the setting for our discussion in Section 3 regarding the role that venture capital and private equity play in the innovation and growth process. Next, in Section 4, we describe the Silicon Valley model of venture capital and its linkages with Asian economies. In Section 5, we provide an overview of the venture capital industry in Asia and discuss some of the challenges facing the industry. We review Singapore's experience in Section 6, and the role of government support for the venture capital industry in Section 7. We conclude the paper in Section 8 with our thoughts on the challenges of replicating Silicon Valley in Singapore.

2. The Venture Capital Industry

As an investment class, private equity investment is perhaps the oldest asset class. During the late 1990s, it became one of the hottest investment phenomena, as venture-backed dotcoms and technology companies reaped spectacular returns for private investors. There are various reasons for investing in venture capital, such as diversification, low correlation with public market returns and hedging against inflation in the case of investment in land, timber or oil reserves. The strongest reason for participating in venture capital is the belief that private investing can generate higher risk-adjusted returns relative to public market investments. Table 1 below shows the historical performance of various asset classes from 1945 to 1997.

Table 1: Average Annual Return of Different Asset Classes, 1945-1997⁴

Asset Class	Average annual return %
Treasury bills	4.7
Treasury long bonds	5.5
corporate bonds	5.8
S&P 500	12.9
Small stocks	14.9
International stocks (outside U.S.)	11.4
Emerging market stocks	15.6
U.S. Venture capital	16.7
Real Estate	8.0
Commodities	7.8
Silver	5.0

Source: Venture Economics.

A well designed private equity programme can help to enhance portfolio returns, and at the same time reduce total portfolio risk by damping overall volatility, as private equity returns have a relatively low correlation with the returns of other asset classes: -25.7% against Treasury

⁴ The data for venture capital dated from the late 1950s when venture capital industry emerged.

bills, 16.3% against Treasury bonds, 14.6% against corporate bonds, 25.7% against large-cap stocks and 28.7% against small-cap stocks (Venture Economics). Over the long-term, the addition of private equity to an investment portfolio may increase the expected return of the total investment portfolio as well as reduce the variability of returns.

Globally, at least US\$136 billion of private equity and venture capital was invested in 1999, representing an increase of 65% over the 1998 figure of US\$83 billion, and approximately 0.5% of the world's gross domestic product (Global Private Equity, 2000, 2001, by 3i and PricewaterhouseCoopers). In 2000, the amount invested rose to US\$199 billion but this fell by half to US\$100 in 2001. The 2001 figure still represents 0.32% of the world's gross domestic product (down from 0.63% in 2000).⁵ The substantial contraction in 2001, following an all-time record of activity in 2000, mirrored the downturn in the global stock markets, particularly in the technology markets. Nonetheless, the contraction in investment marked the return to historical trends.

In its modern form, venture capital funds are basically pools of capital that invest in projects with an expectation of significant returns for the investment risk involved. Venture capital is a high-risk, but high-reward business. It is also neither a short term nor a liquid investment. Due to its high risk, length of investment (up to 10 years), the illiquidity of its investments and high minimum investment commitment, venture capital investing is generally out of reach of the average individual investors. The investors in venture capital firms include private and public pension funds, endowment funds, foundations, insurance companies, banks, corporations and wealthy individuals. An institutional investor, such as a pension fund or a university endowment fund, will typically allocate between 2% to 10% of their institutional portfolio to venture capital/ private equity as part of portfolio diversification. An exception is Yale University, which invests as much as 25% of its funds in private equity. This percentage

⁵ The 3i and PricewaterhouseCoopers report also contains details on the regional breakdowns and the investment trends in different sectors.

far exceeds other U.S University endowment funds, which invest an average of about 8.7% of their funds in private equity (Harvard Business School Case, 2001).

Venture capital firms come in a variety of organizational forms. They range from specialist firms with only a small fund (US\$10 million or less) under management to firms with more than 10 billion U.S. dollars invested globally. Not all venture capitalists invest in “*start-ups*.” A venture capitalist may invest before there is a real product to be commercialized (“*seed investing*”), or provide capital to start up a company in its first or second stages of development (“*early stage investing*”), as well as in later stages (“*expansion stage financing*”) when the company needs additional financing to expand its business as it plans for an initial public offering. Some venture firms specialize only in late-stage investing, while others are broadly diversified across the different stages of development. There is a trend towards specialization among venture capital firms in terms of the sectors they invest in. In the 1970s and 1980s, the preferred sectors of venture capital investment were consumer related industries (leisure, hotel, retailing, food and beverage). Since the 1990s, communications, computer-related, electronic-related, industrial products, biotechnology, energy, financial services have become popular with venture capital firms. Table 1 provides a distribution of the venture investments undertaken by venture capital firms in the United States in 1999.

The objective of a venture capital firm is to take their portfolio companies public or to sell them in order to realize their investment returns. A venture capital firm typically expects to have an intense involvement with each portfolio company for three to seven years⁶. If the investee company is successful in creating a viable business, the preferred route of exit and realization of the investment returns is via an initial public offering of the investee company on a stock exchange. While a public listing is the most glamorous form of exit, a venture capital

⁶ Barry, Muscarella, Peavy and Vetsuypens (1990) provides an excellent discussion of the role that venture capital firms play in the creation of new businesses.

firm may also realize its investment returns and divest its stake through put options (i.e. sale of stock to other shareholders or founders), or through mergers or acquisitions.

Table 2: Distribution of Venture Capital Investment in the United States in 1999

<u>Sector</u>	<u>%</u>
Computer software and services	34
Communications, Media	16
Consumer and business services	12
Medical and health care	23
Semi-conductors and other electronics	3
Computer hardware	7
Retail	5
<u>Total</u>	<u>100</u>

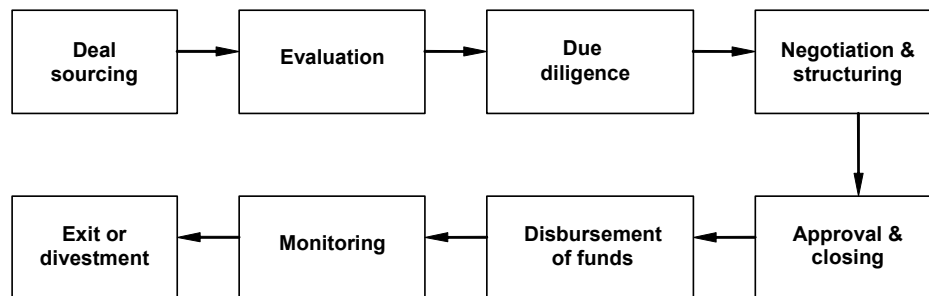
Source: Venture Economics.

For every successful company, a venture capital firm also expects that it may see a number failed companies in its portfolio. However, it is these “home-runs” that establish the reputation of a venture capital firm, and enable them to secure fresh investments and organize new funds. Generally speaking, a venture capital firm is restricted in the amount of its stake that it may dispose off at any one time after an initial public offering. Once this stock is freely tradable after the lock-up period, the venture fund will distribute the shares to its limited partner investors who may then manage the public stock as a regular stock holding (or may liquidate their holdings upon the disbursement).

The venture investment process is a long and tedious one. Venture capitalists typically invest in a small percentage of the businesses they review. The rejection rate is very high; typically, only one out of every ten to twenty projects will pass the initial screening where more than one partner will review the project in detail. Besides the technical and business merits of the proposed company, the quality of the founder entrepreneurs is also a key factor in determining whether the company will receive funding. To mitigate investment risks, venture

capital firms will typically assemble a portfolio of between twenty to thirty young companies in a single venture fund, as well as co-invest with other professional venture capital firms. Many venture capital partnerships manage multiple funds simultaneously. Figure 1 below illustrates the typical investment process for a venture capital firm.

Figure 1: A Typical Venture Capital Investment Process



Unlike bank lending, venture capitalists are not passive financiers. A good venture capital firm nurtures growth in companies through the personal involvement of the venture partners and officers in the management, strategic marketing and planning of their investee companies. With their industry network of contacts, venture capitalists play a very important advisory role in formulating the business strategy of the portfolio companies and advising the management. It is common for partners of venture capital firms to take a seat on the board of the investee company to ensure that the investment has the best chance of being successful.

The compensation structure for venture capital firms is usually performance-based. As an investment manager, the venture capital firm will typically charge a management fee to cover the costs of managing the committed capital. The management fee will usually be paid quarterly for the life of the fund or it may be tapered or curtailed in the later stages of a fund's life. This is very often negotiated with investors upon formation of the fund. "Carried interest" is the term used to denote the profit split of proceeds to the general partner. This is the general

partners' fee for carrying the management responsibility plus all the liability and for providing the needed expertise to successfully manage the investment.

U.S.-based venture capital firms have generally outperformed their counterparts in Europe. Tables 3A and 3B below provides the historical performance of U.S. and European private equity and venture capital firms. Comparable statistics for Asia are not available.

Table 3A: Annualized Net Returns of US Private Equity Firms, as of 31 Dec 2000

Private equity funds by Specialization	1 Year	3 Year	5 Year	10 Year	20 Year
Early/Seed Stage	40.7	89.4	63.5	35.1	23.5
Balanced Venture	33.3	61.3	32.7	26.8	17.4
Later Stage Venture	18.3	31.0	30.8	25.0	18.1
All Venture	32.5	62.5	46.8	29.4	19.6
All Buyouts	11.2	14.7	17.4	16.5	18.5
All Private Equity	19.0	30.1	28.1	22.0	19.2

Table 3B: Annualized Net Returns of European Private Equity Firms, as of 31 Dec 2000

Private equity funds by Specialization	1 Year	3 Year	5 Year	10 Year
Early/Seed Stage	22.5	13.8	20.9	13.1
Balanced Venture	29.2	20.1	19.4	12.0
Later Stage Venture	29.1	37.3	33.3	17.8
All Venture	27.9	28.3	27.7	15.7
All Buyouts	10.2	19.4	26.1	18.4
All Private Equity	19.0	23.7	23.8	15.5

Source: Venture Economics, 2001.

3. The Role of Venture Capital in Innovation and Growth

Despite its importance, there have not been as many studies conducted on the venture capital industry as on the other parts of the financial sector. At the theoretical level, the most fundamental question is: why does venture capital exist at all? Why do we need a set of

specialized firms that focus on entrepreneurial financing – albeit one that involves significant risk, but also potentially yield high returns? To begin with, the presence of informational asymmetries – due to adverse selection and moral hazard⁷ – and the ability of venture capitalist to mitigate these asymmetries are crucial to understanding the emergence of the venture capital industry (Amit, Brander and Zott, 1998, and Gompers and Lerner, 2001).

Venture capitalists play an important role in forging linkages among a diverse set of organizations – investment banks, universities, large corporations, entrepreneurial companies – that are critical to the innovation process (Florida and Kenny, 1988). This intricate set of overlapping networks allows venture capitalists to tap into a rich channel of information flow, and enables them to manage many of the risks associated with enterprise formation. It is this informational access within the industry networks that allows venture capitalists to reduce the informational asymmetries in the investment process, thereby lowering the risk barriers for undertaking private investments.

However, while this comparative advantage in managing informational asymmetries is important, it does not explain why governments around the world are eager to support the development of the venture capital industry. If the only advantage of venture capitalists industry over banks and other financial institutions lies in the industry networks that they have access to, then the promotion of industry networks will serve to improve the capabilities of financial institutions in providing entrepreneurial financing. The answer lies in the fact that venture capital offers an alternative model of innovation and technological change.

As a model of innovation, the venture capital process overcomes some of the disadvantages of sporadic individual entrepreneurship as well as the inertia that is frequently

⁷ Adverse selection, or “hidden information” refers to the situation where one party to a transaction has relevant information that is not known to the other party, or is only known imperfectly. For instance, an entrepreneur may have a better idea of his own product than the venture capitalist. Moral hazard, or “hidden action” refers to the situation where one party to a transaction cannot observe relevant actions taken by the other party. Even if the actions can be observed, the problem still occurs if legal verifiability of these actions is not possible.

observed in corporate-based innovation. As a result of their participation in different industry networks, and the information flow that they can tap into, venture capitalists are well-positioned to spot and create nascent investment opportunities in different sectors of the economy.⁸ Partners in venture capital firms are often experienced managers who have run companies or were former entrepreneurs who had successfully founded companies. Thus, they possess the domain experience, industry network and experience to provide assistance and add value to startup companies. By participating in scientific breakthroughs and the formation of new companies, venture capitalists catalyze and accelerate technological change⁹. Their reward in this process is the share of the economic rent that they capture. A good venture capitalist can therefore create substantial wealth not only for the investors, but for the economy as well.¹⁰

The importance of venture capital in the economic growth process is seen most clearly in the contribution of Silicon Valley to the U.S. economy. According to a study by Barry, Muscarella, Peavy and Vetsuypens (1990), 30% of the market value of firms going public between 1978 and 1987 had received venture capital financing. A Harvard Business School Case (1994) reported that 30 venture-backed companies that went public collectively commanded sales of US\$74 billion, employed more than 420,000 people and had a market

⁸ In fact, the ascent of the venture-capital industry in the Silicon Valley represents a partial response to dissatisfaction with the inertia and inflexibility that frequently occurs in corporate R&D processes.

⁹ See Barney, Busenitz, Fiet and Moesel (1996) for a review of the effectiveness of the mentoring and strategic assistance provided by venture capital firms to new startup companies.

¹⁰ While the venture capital-financed innovation process accelerates the technological change, the pressure to generate investment returns may sometimes cause venture capital firms to rush portfolio companies into an initial public offering when the business has not been adequately developed. In the late 1990s, when the availability of funding was at an all-time high, venture capital firms duplicated one another's investments, even when the potential market could only support one or two companies. This "venture capital myopia" phenomenon was most evident during the height of the Internet bubble (Gompers and Lerner, 2000).

value of US\$88 billion at the end of 1993.¹¹ Of these 30 firms, all had received venture capital funding, at different stage of their development, from Silicon Valley venture capital firms.¹²

4. The Silicon Valley Edge

For several decades, Silicon Valley has nurtured the growth of America's high technology and entrepreneurial communities resulting in significant job creation, growth and international competitiveness. Silicon Valley was the epicenter of both the birth of the personal-computer industry and the recent Internet boom, and remains one of the most dynamic economic regions in the world, despite the current downturn in the technology market.¹³

Silicon Valley is generally viewed as a habitat for innovation and entrepreneurship (Lee, Miller, Hancock and Rowen, 2000). Geographically, Silicon Valley is a thin wedge located between San Francisco and San Jose.¹⁴ It is home to more than 10,000 high-tech companies, with total sales of more than US\$250 billion a year, boosting the contribution of the technology sector to over 10% of the U.S. Gross Domestic Product. By some estimates, the venture capital firms located along Sand Hill Road in Menlo Park in California is estimated to control up to a third of the independently-raised venture capital funds in the United States, and around one-sixth of the world's aggregate venture capital funds.

A widely held view of the Silicon Valley model is that it owes its success more to its organizational model, than its technological edge (Aoki, 2000). According to this view, Silicon

¹¹ The list of companies includes Apple Computer, Biogen, Cirrus, Federal Express, Intel, Microsoft, Starbucks and Sun Microsystems.

¹² We discussed Singapore's experience in Section 6.

¹³ For a detailed review of the U.S. private equity and venture capital industry, please refer to Gompers and Lerner (1999), as well as Lerner (2000). Libecap (2000) provides a good discussion of the linkage between entrepreneurship and economic growth in the U.S. economy.

¹⁴ Besides the Silicon Valley, the United States is also home to other technology hubs: Silicon Desert (Utah), Silicon Alley (New York), Silicon Hills (Austin) and Silicon Forest (either Seattle or Portland).

Valley is better seen as a style or culture of conducting business and investing, with a product that happens to be technology. In this sense, Silicon Valley can also be compared with entrepreneurial “clusters” in other industries, such as Hollywood (for the movie industry) or London and New York (for the global financial industry). The factors that had contributed to the success of these entrepreneurial clusters include a stable social and political environment, acceptance of immigrant talent and a culture of risk taking.¹⁵

Other key success factors for Silicon Valley include: (i) a large talent pool, (ii) a large network of suppliers, (iii) access to venture capital, and (iv) access to excellent educational facilities and research institutions.¹⁶ Furthermore, tough patent laws that protect intellectual property and the Californian tax structure that historically treated capital gains more generously than income, fostered an environment where creativity and entrepreneurship can flourish (Lee, et. al, 2000). In the 1990s, the abolition of regulations, which hindered the sharing of technical knowledge at an early stage of innovation process, was credited for the rapid convergence of the telecommunications industry with the computer and entertainment industries in the United States as it spurred venture investment activities in Silicon Valley, leading to an unprecedented technology boom. This was widely regarded a major factor underlying the technology resurgence of the United States.

While the above factors were important ingredients in the success of Silicon Valley, they are not unique to Silicon Valley. In fact, in the early 1970s, Boston's Route 128 was more than a match for Silicon Valley in terms of both venture capital and access to research. Yet by the late 1970s, Silicon Valley had created more high-tech jobs than Route 128, and when both

¹⁵ A detailed assessment is provided in *Silicon Valley: A Survey*, The Economist (1997). See also *Technology and Development: A Survey*, The Economist (2001).

¹⁶ The proximity to universities such as Stanford and University of California’s campuses at Berkeley, Santa Cruz, Los Angeles, etc., and to research institutions such as Xerox's Palo Alto Research Centre is often cited as important differentiating success factors of the Silicon Valley. The Economist (1997) reported that up to 1,000 companies have originated from Stanford University.

clusters suffered a shakeout in the mid-1980s, Silicon Valley had proven to be far more resilient. Silicon Valley's success owes more to its culture and the structure of the organizations which provided much flexibility and adaptability (Saxenian, 1994).

The key aspects of the Silicon Valley culture can be broadly categorized as (i) meritocracy; (ii) tolerance of failure, and (iii) enthusiasm for change and new ideas. The emphasis on meritocracy in Silicon Valley is an attraction to immigrant talent who wants to pursue entrepreneurial ambitions. Silicon Valley is also quick to forgive and forget mistakes made by would-be entrepreneurs. In fact, many of the new technology companies are headed by entrepreneurs whose previous companies had failed. It is often said that in Silicon Valley, failure is merely a battle scar; by contrast, failure is a stigma in Europe and many parts of Asia. The presence of corporate and individual consumers who are willing to try new products and new ideas (known as "digital upscale believers") is another important success factor for Silicon Valley, as it creates the market for young technology companies to build their businesses.

Like other entrepreneurial clusters, one of Silicon Valley's many strengths is its ability to continually renew itself. Silicon Valley is undergoing another transformation following the Internet bubble burst and the tech-stock meltdown. Since the downturn of the technology market in 2001, unemployment has risen from a historic low of 1% in December 2000 to 6.4% in October 2001 (Joint Venture: Silicon Valley Network, 2001).¹⁷ However, even as venture capital firms and startup companies weather the current difficult times, Silicon Valley is already positioning for the next wave of innovation and growth in three broad areas: (i) deepening of the info-communications technologies; (ii) convergence of biotechnology and information technologies; and (iii) commercialization of nanotechnology and micro-machining.

Immigrant talent plays a major role in Silicon Valley. A significant proportion of the technology startups in Silicon Valley have at least one foreign founder (Saxenian, 1999). The

¹⁷ At the start of the Internet explosion in 1994, Silicon Valley was home to nearly 800,000 jobs. By the end of the Internet boom, the region's employment topped 1.02 million.

two most important groups are overseas Chinese (from Taiwan and mainland China) and professionals from India. These immigrant entrepreneurs have created linkages between Silicon Valley and the technology centers in their home countries by helping to build professional and social networks that span national boundaries to facilitate flows of capital, talent, and technology. For instance, Taiwanese entrepreneurs have linked the technology communities in Silicon Valley and the technology hubs in the Hsinchu region in Taiwan. Similarly, Indian professional and entrepreneurs in Silicon Valley became key middlemen linking U.S. businesses to low-cost software expertise in India, such as Bangalore and Hyderabad.

Sexanian (2001) noted that the impact that the transnational community that developed as a result of the Silicon Valley connection has accelerated the upgrading of Taiwan's technological infrastructure by transferring technical know-how and organizational models as well as by forging closer ties with Silicon Valley. This linkage with the Silicon Valley is one factor contributing to the attraction of China, Taiwan and India as destinations for venture capital investments. These countries are now benefiting from the flow of talent, expertise and funding from their countrymen who had previously left for Silicon Valley and other technology hubs in the United States.

Another linkage between Silicon Valley and Asia is the participation by Asian corporations, governments and private investors in the private equity and venture capital industry. Anecdotal evidence suggests that the amount of investments by Asian investors have increased in the last few years.

The success of Silicon Valley in fostering innovation and growth have prompted the authorities in Hong Kong and Malaysia to announce plans to develop their own versions of Silicon Valleys, and support the development of venture capital industry.¹⁸ While policies to

¹⁸ Malaysia had set aside 750 square kilometers just south of Kuala Lumpur, and a sum of US\$40 billion, to build its version of Silicon Valley – Cyberjaya, or the Multimedia Super Corridor – that is aimed at becoming the single largest cyber-hub in Southeast Asia. Similarly, Hong Kong had announced that it intends to turn itself into a regional centre for the development of information technology. Hong

promote innovation and entrepreneurship have been introduced, it is uncertain whether these efforts to replicate Silicon Valley will achieve the stated objectives.

A recent study by Wallsten (2001) suggests that the impact of such efforts may be smaller than anticipated. Using a panel dataset for the United States, Wallsten examined the efficiency of the two common policy approaches to emulate Silicon Valley generate regional technology growth, namely, public venture capital funds (that provide subsidies for startup high-tech companies) and investment in science parks.¹⁹ The author found that science parks have had little impact on regional high-tech employment. Furthermore, public venture capital also appeared to have crowded out private venture capital. While the results are preliminary and applicable only in the context of the United States, they also remind us that while we have increased our understanding regarding the dynamics of firm clustering as in Silicon Valley and other successful high-tech regions, we have very little empirical evidence about the effectiveness of government policies in this area.

5. The Venture Capital Industry in Asia

The success of Silicon Valley has fuelled the growth of the venture capital industry worldwide. In terms of development, the Asian private equity-venture capital industry is still relatively less developed compared with the United States and Europe. Historically, venture-capital -backed entrepreneurship had not been responsible for most of Asia's current large companies, which tended to be spin-offs from established companies or set up by governments

Kong's Cyberport project, a science park for high-tech ventures and budgeted at US\$1.7 billion, is expected to be completed in 2003. In the case of Singapore, the government had already devoted significant resources to develop science parks, such as those along the Buona Vista Science and Technology Corridor.

¹⁹ By stipulating that a minimum portion be invested in technology startups, government investments in private venture capital funds also hopes to achieve the objective of subsidizing startups as public venture capital funds.

as part of their economic development programmes.²⁰ State entrepreneurship was prevalent in Asia in the 1960s and 1970s. Furthermore, there were few avenues of funding for private businesses, apart from government assistance schemes and collateralized bank loans. Venture capital, as a source of funding for early-stage projects, only became available in the mid-1980s. The situation is rapidly changing as Asian governments have stepped up efforts to develop the private equity-venture capital industry. These efforts include funding new venture capital funds and implementing tax incentives, which we shall discuss later.

In 1999, Asia represents just 5% (or US\$7 billion) of the US\$131 billion of the global private equity and venture capital market (Venture Economics). Table 4 shows the global distribution of private equity investments in 1999. Relative to the capitalization of the regional equity markets and the aggregate gross domestic product, the activity in the Asian private equity-venture capital market was on par with European markets but still lagged significantly behind the activity in the United States.

Table 4: World Wide Private Equity Disbursements in 1999

	North America	Europe	Japan	Asia ex-Japan
Private Equity Disbursements (US\$ billion)	99	25	1	6
As % of Equity Market Capitalization	1.00%	0.28%	0.02%	0.29%
As % of Gross Domestic Product	0.68%	0.21%	0.04%	0.25%

Source: Venture Economics, Guide to Venture Capital, 2001.

At present, there are more than 1000 venture capital and private equity funds in Asia (excluding Japan) and the total funds under management is estimated at US\$1.4 billion (Guide to Venture Capital in Asia, 2002). As Table 5 shows, the total funds under management in Asia

²⁰ See Lockett and Wright (2002) for a discussion of some of the key aspects of the venture capital industry in Asia and the Pacific Rim.

grew by 16% from US\$918 million in 1998 to US\$1.068 billion in 1999 and by 31% from 1999 to US\$1.46 billion in 2000. Within Asia, China has garnered an increasing proportion of the venture funds as it is generally viewed an attractive destination for venture capital investments, given the expectations of continued rapid economic growth over the next decade. By contrast, the share of venture capital funds that Japan received had declined proportionately although the absolute amounts remained stable.

Table 5: Asian Venture Capital Funds, 1998-2000

US\$ million	1998		1999		2000	
		%		%		%
Hong Kong, China	\$129	14.1	\$190	17.8	\$313	22.3
Japan	231	25.2	221	20.7	229	16.3
South Korea	123	13.4	131	12.3	175	12.4
Singapore	64	7.0	85	8.0	118	8.4
Taiwan	124	13.5	132	12.4	162	11.5
Other Asian Countries	247	26.9	309	28.9	409	29.1
Total	\$918	100.0	\$1,068	100.0	\$1,406	100.0

Source: Guide to Venture Capital in Asia, 2001 and 2002 (adapted from Bruton, Ahlstrom and Singh, 2000).

According to a study by Bain Consulting, the top twenty-two private equity funds in Asia counted for 37% of the aggregate funds under management in Asia in 1999. In the wake of the sharp decline in the U.S. stock markets and the bursting of the Internet bubble, activity in the Asian venture capital market has cooled, in line with the experience in the European and U.S. venture capital markets. For the first six months of 2002, a total of US\$545.2 million was disbursed to Asia-Pacific companies (Venture Economics, 18 July 2002). The figure represented a sharp drop from the same period in 2001, when more than US\$2 billion was invested in Asia-Pacific companies. The total amount of venture funds raised for the first half of 2002 was US\$1.3 billion, compared with US\$3.5 billion raised for the same period in 2001.

Venture capital firms in Asia had historically focused more on late-stage expansion financing and investment in mature companies, rather than early-stage financing in startups (Chu and Hisrich, 2001)²¹. Very few venture capital funds invested in start-ups unless there are significant compensatory government incentives to do so. The focus on late-stage investments is also due partly to the limited development of the long-term debt market – so that relatively mature firms had to rely on short-term debt and private equity – and is also a reflection of the relative scarcity of “leading-edge” start-up technology companies in Asia.²² Traditionally, the main competitive advantage of Asian economies had been low-cost manufacturing labor, and this had been the source of investment opportunities for expansion-financing and joint-ventures. It was only in the mid 1990s that true venture capital transactions, related to the Internet and telecommunications sectors, become more prevalent (Harvard Business School Case, 1996).

With a longer history of venture capital, the venture capital industry in Europe and the United States have well-developed mechanisms for monitoring and managing risks, as well as exercising governance. In Asia, the regulatory framework for the venture capital industry still lags behind although governments have recently stepped up efforts to create the appropriate set of incentives and legislation to promote and regulate the venture capital industry.²³ Other challenges that venture capital firms in Asia had to contend with include cumbersome regulations, fragmented markets and relatively less developed infrastructure. Also, the shortage of experienced managers, as well as the cultural resistance of Asian entrepreneurs to share control with venture capital firms are additional challenges to overcome.

While the financial infrastructure for the venture capital industry has improved over the past decade, venture-backed companies in Asia generally have fewer exit options compared

²¹ Expansion financing refers to the private equity investments to enable companies to restructure, expand capacity and move into new markets.

²² A discussion of some of the same issues in the Japanese context can be found in Nagakwa (1999).

²³ This was one of the reasons behind the preference by Asian venture capital firms for expansion-financing and investment in relatively more mature companies.

with their counterparts in the United States and Europe. Besides a public listing, a trade-sale through a merger or acquisition is the other common form of exit. However, the activity in the mergers and acquisitions market had been relatively limited. Available statistics and anecdotal reports indicate that the investment returns from Asian venture capital funds had been below those of the United States in recent years. Moreover, the track records of “home-runs” did not match those in the United States and Europe.

Nonetheless, investment interest in China has increased, as investors expect continued strong economic growth over the next decade. The total venture capital funds under management in China are expected to increase further. South Korea is now regarded as an attractive investment destination for wireless technology given the country’s well-developed infrastructure and Internet usage. Singapore is also well-placed to become a regional hub for private equity and venture capital, in view the Singapore government’s efforts that had successfully drawn top-tier venture capital and private equity firms to locate in the country.

6. Venture Capital in Singapore

Singapore’s experience in venture capital industry is relatively recent. One of the first venture capital funds to be established in Singapore was South East Asia Venture Investment (“SEAVI”) in 1983, with participation from the U.S venture capital firm Advent International. In 1985, the Singapore government, through the Economic Development Board (“EDB”) established the EDB Venture Capital Programme and introduced tax incentives to promote the growth of the industry in Singapore. Since then, a number of international venture capital firms had established presence in Singapore, attracted by the availability of generous tax incentives and funding from the government and government-linked venture funds. Many venture capital firms also chose Singapore because of its excellent physical infrastructure.

At present, there are more than one hundred venture capital firms operating in Singapore with aggregate funds under management totaling S\$13.7 billion in 2001, as shown in

Table 6. This represents an annualized growth rate of 37% since 1983, when the total funds totaled just S\$48 million. Except for 1998 when the Asian Financial Crisis hit the region, the annual growth rate of funds under management had been about 15% or more. As at 2001, around 420 venture investment professionals are employed in Singapore, and 635 companies have received venture capital funding, as of 2001 (Economic Development Board).

Table 6: Venture Capital Funds under Management in Singapore

Year	S\$ million	Annual rate of Growth %
1983	48	
1985	162	83.7
1990	1,245	50.4
1995	5,319	33.7
1996	6,232	17.2
1997	7,381	18.4
1998	7,712	4.5
1999	8,843	14.7
2000	11,500	30.0
2001	13,700	19.1

Note: The figures for 1985, 1990 and 1995 are annualized rates against the preceding period.

Source: Economic Development Board of Singapore.

Slightly more than 85% of the funds managed by Singapore-based venture funds are invested outside of Singapore (Bruton, et. al, 2002). While there were a number of high-profile venture investments in the late 1990s, the average amount invested in each deal is still small when compared with those in the United States. In 1999, the average sum of venture capital invested per company in Singapore was only about US\$2 million (Global Entrepreneurship Monitor, 2000). In the United States, where the figure was the highest, it was US\$ 13.2 million.

Venture capital firms operating in Singapore have lamented the limited availability of good investment opportunities even though investment in early-stage technology startups by venture funds managed out of Singapore was estimated to reach 40% – compared with only

about 25% in Taiwan, which is better known for its technology and entrepreneurial activity (European Venture Capital Journal, 1999). The high percentage of funds invested in early stage startups reflected partly the requirements that venture firms must fulfill in order to qualify for preferential tax treatment of investment gains.²⁴ This explains the fact that venture capital investments in local startups, measured as a percentage of gross domestic product, is high in Singapore (0.18%) when compared to nineteen other nations, according to a study by the Global Entrepreneurship Monitor in 1999. Singapore ranks fifth in the survey, behind the United States (0.53%), Israel, Canada and South Korea.²⁵

It is difficult to assess the performance of the venture capital industry in Singapore. Although there are several studies on the venture capital industry in Singapore (Scheela, 1994; Tan, 1998; Bruton, et. al, 2002), these are mainly descriptive surveys. The problem is one of data completeness and accuracy – a problem that is present in most studies on the venture capital industry, particularly in emerging economies²⁶. However, we can gain an idea of the success of the venture capital industry in Singapore indirectly.²⁷ Wang, et. al (2002) found that between 1987 and 1999, there were 63 companies backed by venture capital that were listed on the Singapore stock exchange. This translates into a success rate of about 10%, considering the number of firms backed by venture capital totaled more than 630 companies (Economic Development Board). Of the companies that were listed, 52 (83%) are Singapore-based

²⁴ The preferential treatment given to venture capital firms for investment in technology startups is in line with the government's objective to promote entrepreneurship in the technology sector.

²⁵ Japan came in last; venture capital investments in startups were only just 0.022% of gross domestic product in 1999.

²⁶ See Fenn and Liang (1998) for a discussion on the relative merits of databases on private equity and venture capital that are commercially and publicly available. The paper also discusses research findings of studies that use these data and important issues that the available data have not been able to address.

²⁷ Some studies had utilized surveys to supplement the available data. However, due to the private nature of the venture capital industry, the disclosure of information is usually biased, as not all firms responded to the surveys, and information released tended to present the facts in a positive light.

companies, and more than half are in electronic-related industries. Of course, this statistic understates the success of venture capital investments in Singapore, as it does not include exits through trade sale as well as mergers and acquisitions.

7. Government Support of Venture Capital

The origins of the U.S. venture capital industry can be traced to the passage of the Small Business Investment Act in 1958 by the U.S. Federal Government which had decided to play an active role in promoting small firm development. This created the incentives for the development of Small Business Investment Corporations (“SBICs”). The SBICs were to provide early stage financing for companies in various industries. Venture companies that qualify with the U.S. Small Business Administration (“SBA”) were – and still are, today – able to borrow money from the SBA at lower rates as long as they invested their funds in small businesses. By the mid-1960s, 700 SBICs controlled the majority of risk capital invested in the United States. Over time, many of the managers of SBICs left their firms and founded venture capital funds not associated with the government.

In Singapore, too, the genesis of the venture capital industry can be traced to government efforts to kick start the industry in 1985. Since then, the Singapore government has continued to provide significant support to the venture capital industry. In 2000, about 19% of the US\$7.4 billion of venture capital present in Singapore had its origins in government funding (Guide to Venture Capital in Asia, 2001). In fact, a number of venture capital firms are either subsidiaries of government-linked companies, or else, are backed by government funds. There are also a number of tax-incentive schemes administered by the Economic Development Board or the Monetary Authority of Singapore (“MAS”). As one of the Singapore government’s objectives is to foster entrepreneurship and develop a risk-taking business culture, government-backed venture capital firms are encouraged to focus on investments in high-tech startups and early stage investments.

Other Asian governments have initiated similar efforts to promote the venture capital industry. For instance, the South Korean government has encouraged high-tech start-ups by giving tax breaks and subsidies for venture capital investments. As a result, venture capital investments in South Korea jumped from US\$1m in 1995 to US\$65m in 2000. Privately financed R&D accounted for 80% of all R&D investment in 1999, compared with only 20% in the 1970s. In Japan, regulations have also been amended to promote venture capital. For instance, corporate pension funds were also allowed to invest in venture investment since 1997²⁸. Also, under the Angel Tax Incentive introduced in 1997, a person investing in start-up ventures enjoys a special tax deduction, for up to three years, on any loss due to the investment. In Hong Kong, the authorities has established a US\$100 million fund to invest in private equity and venture capital funds, while the Malaysian government has launched the MSC Venture Corporation, a US\$30 million venture fund with a mandate to invest in high-tech startups.

In Singapore, the high degree of government support and participation in the venture capital industry is not surprising if one considered the rationale behind the government's promotion of the venture capital industry. Since becoming an independent nation in 1965, Singapore has been one of the Asian tiger economies, growing at an average rate of about 8% per year till the mid-1990s before the Asian financial crisis hit the region. An urgent task in the early years of independence was the attraction of multinational companies to Singapore to set up manufacturing and service operations for export to regional and world markets. This export orientation was a necessary part of the strategy to overcome a weak domestic industrial base and limited market. While this strategy had been successful in accelerating the economic growth of Singapore in the 1960s and 1970s, it had also encouraged Singapore companies to play a largely intermediary or supporting role for the multinational companies. By the mid-1980s, as costs of doing business in Singapore escalated and other economies in Asia and

²⁸ In Japan, corporate pension funds amounted to around 6 billion yen, and if even 2-3% of these funds are invested in venture funds, they will become a major source of venture capital investment.

elsewhere offered cheaper locations for manufacturing operations, concerns over hollowing out of the manufacturing sector prompted the government to undertake a review of the competitiveness of the Singapore economy, just as the economy went into a recession in 1985.

The 1985 economic review led to initial efforts – as part of the package of policy measures designed to lift the economy out of the recession – to develop the venture capital industry in Singapore (Ministry of Trade and Industry, 1986). A number of venture capital firms, including the EDB Venture Capital Fund, were established with government funding. Since then, the government has introduced regulatory reform and fiscal incentives to attract and support venture capital firms in the country, as well as fund new venture capital funds. In the 1990s, policies were implemented to increase the participation of foreign companies in the domestic market, upgrade the communications infrastructure, as well as stimulate the development of the bond and equity markets. To increase the skill base, the government has encouraged the entry of foreign professional and technical talents (Neidorf, 1999). Funding for basic research at Singapore universities was also increased to develop capabilities in technology, particularly in the life-sciences and communications sectors.²⁹

In 1999, the National Science and Technology Board of Singapore launched the Technology Entrepreneurship 21 Plan, aimed at developing venture capital and infrastructure support to promote entrepreneurship.³⁰ A US\$1 billion Technopreneurship Investment Fund (“TIF”) was established under the Technology Entrepreneurship Plan. Currently managed by TIF Ventures, the main objective of TIF is to invest in top-tier international venture capital firms, with the requirement that they establish operations in Singapore, and allocate a portion of

²⁹ At the National University of Singapore, research funding has increased from S\$54 million in 1996 to S\$156.6 million in 2001. The graduate student population also rose from 12% in 1990 to 27% in 2001.

³⁰ In 2002, the National Science and Technology Board was renamed as the Agency of Science, Technology and Research (“A*STAR”), which continues to lead the country’s efforts to develop its technology capabilities, particularly in life sciences and bio-technologies.

the funds to invest Singapore-based startups. Table 7 presents a list of the major venture-capital related efforts by government agencies in Singapore so far.

Table 7: Selected Efforts by Singapore Government Agencies to Promote Private Equity, R&D and Entrepreneurship

Managing Agency	Programme	Year	Size of Programme	Focus
EDB Venture Capital Fund	Venture Capital fund	1985	S\$100 million	This was an initial government effort to provide venture capital funds in Singapore. It was introduced in conjunction with national efforts to promote entrepreneurship.
National Science and Technology Board	National Technology Plan	1991	S\$2 billion (1991-1995)	NSTB to coordinate efforts to improve national competitiveness in the areas of science and technology. An early effort was aimed at increasing the aggregate R&D expenditure to 2% of GDP.
National Science and Technology Board	Second National Technology Plan	1996	S\$4 billion (1996-2000)	The aim of the the 2nd Technology Plan was to refocus and strengthen science and technology efforts. The emphasis was on creating the climate and institutions to support entrepreneurship.
TIF Ventures (originated within NSTB)	Techno-preneurship Investment Fund	1999	US\$1 billion	The objective was to promote technology-oriented entrepreneurship and develop the venture capital industry in Singapore. Comprises three sub-funds: a. US\$500 million broad-based fund b. US\$250 million strategic fund c. US\$250 million early stage fund
VISS (a subsidiary of TIF Ventures)	Venture investment support for startups	1999	US\$10 million	Equity investment in high-tech startup, on a co-investment basis, with experienced venture investors.
NSTB, EDB and TIF Ventures	Business Angel fund Co-investment Scheme	1999	N.A.	Co-investment with business angels in the technology sector.
EDB	Technopreneur Investment Incentive Scheme	1999	N.A.	Loss insurance for investors in high-tech start-ups.
EDB	Startup Enterprise Development Scheme ("SEEDS")	2001	S\$50 million	Provision of equity financing for startups, on a match-funding basis, in the seed stage of formation.

Source: Adapted from Table 1 of Bruton, et. al., (2002), with additional information from the Economic Development Board of Singapore (www.sedb.com).

Besides helping to create the next wave of global companies, a well-developed private equity industry is an integral component of Singapore's plan to become a regional financial centre. An active venture capital market also helps to build a potential pipeline of companies that will seek a listing on the Stock Exchange of Singapore. However, the pre-conditions for a successful venture capital industry is a constant stream of high-quality investment opportunities and a critical mass of experienced managers and successful entrepreneurs who, as venture capitalists, angel investors or private equity fund managers, can help companies build their businesses. The Singapore government is providing assistance, through the Economic Development Board, to help develop the venture capital industry in these areas.

The importance placed on the role of venture capital in Singapore's economic growth has not diminished even as Singapore currently weathers its worst economic down-turn since independence.³¹ A high-level Economic Review Committee ("ERC") was formed in 2001 to recommend further reforms aimed at bolstering economic competitiveness. Among the recommendations are further initiatives to encourage technology entrepreneurship and develop the venture capital industry.³² These include streamlining the tax incentives separately administered by the Economic Development Board and the Monetary Authority of Singapore for the private equity industry into one single package, to ensure that the tax incentives are comprehensive and cover all types of private equity. Underlying the ERC recommendations is

³¹ In a speech given by Mr Ngiam Tong Dow, President of the EDB Society (and a former Chairman of Economic Development Board) on 9 November 2002, and reported in *The Straits Times* (Singapore) on 10 November 2002, he remarked that "it is time we harness the other half of Singapore, the private sector, to join us in making the investment decisions to secure our economic and political future."

³² The recommendations were put forward by the Financial Services Working Group of the Subcommittee on Services Industries, Economic Review Committee in September 2002. The report can be downloaded from the website at www.erc.gov.sg

the recognition that private equity and venture capital are critical to the formation, development and growth of companies.³³

8. Conclusion

In this paper, we have sought to provide an overview of the venture capital industry, and the role that it plays in the innovation and economic growth process. Indeed, the resurgence of the United States as the world's technology leader in the 1990s is intimately connected with the success of Silicon Valley. As a global venture capital hub, Silicon Valley provides a model for Asian economies that are looking to develop domestic engines of growth. It is useful to bear in mind that while the U.S. government had initially implemented policies that helped to create the eco-system for entrepreneurship and venture capital to thrive, the eventual success of Silicon Valley was largely endogenously driven. The Silicon Valley culture of risk-taking, acceptance of global talent and openness to new ideas creates a virtuous cycle that attracts a continual inflow of talent and funding to the region.

As Singapore enters the next phase of its economic development, the creation of internal engines of growth is an urgent task. The Singapore government has done much to create the initial conditions for venture capital and entrepreneurship to thrive in the economy. It must now take on the more difficult task of fostering a culture of risk-taking and openness to new ideas in a population that had historically looked to the government for direction and guidance in many areas of economic life. The Singapore government's efforts in replicating Silicon Valley – not just its physical environment, but its vibrancy, culture and ethos – will be a key to the country's future economic success.

³³ As reported in the ERC report "Positioning Singapore as a Pre-eminent Financial Centre in Asia," 84% of the managers surveyed by the European Venture Capital Association believed that their companies would not have existed or would have grown less rapidly without private equity. See Queen (2002) for a discussion of the support provided by the U.K. government and the European Union to the venture capital industry in the United Kingdom and Europe.

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