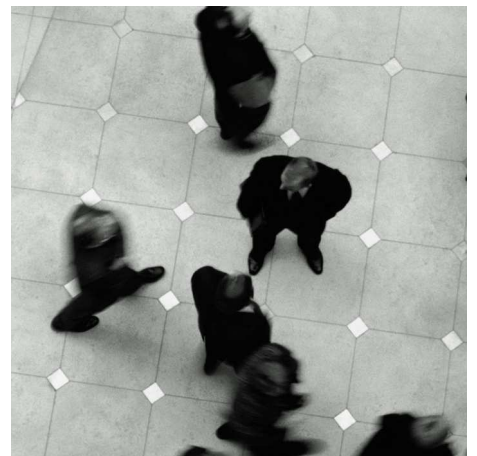


Venture Capital and its Development in New Zealand

Prepared for the New Zealand Venture Investment Fund Ltd

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Prologue: A View from Boston

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Living and working in Boston, it is easy to be convinced of the power of the venture capital model. The city is one of the great hubs of the venture capital industry, and these funds are integrated into Boston's fabric in many ways. For instance, venture capitalists provided seed funding to many of the leading companies today in the Boston area; the funds employ many of Harvard Business School's graduates; and many academic researchers aspire to make discoveries that will attract the interest of these investors. Venture capital has had a profound and very positive effect on life in the region over many years.

This local view is supported by an examination of studies on the impact of venture capital on the U.S. economy. Numerous works have suggested that not only does venture capital account for an impressive amount of private wealth creation, but has led to important wider social benefits as well. In particular, technological innovation—which economists have long argued is a critical driver of growth and prosperity—has been documented to be closely linked to venture capital funding.

It is natural to wonder, though, whether the venture capital industry can have the same effect elsewhere, particularly in a small and geographically isolated nation such as New Zealand. After all, the industry we see in Boston today is the product of many decades of evolution. The region's venture industry has benefited from its proximity to the many universities of the region and the financial hub of New York. Can these beneficial effects be duplicated in New Zealand?

Certainly, these concerns are reasonable ones. A venture capital industry cannot be created overnight. Even long-run subsidies to catalyse a venture industry can be wasted unless the legal and regulatory infrastructure and sufficiently attractive investments are present. Thus, it is important not to inflate expectations of how rapidly and easily a venture capital industry can be created.

At the same time, it is important to note that the venture capital industry is changing in ways that will make growth of an industry in New Zealand simultaneously more likely and more challenging. Investors in the United States and Europe are becoming increasingly willing to look beyond their backyards, and search the world for attractive firms. Major capital markets—particularly those geared towards emerging growth companies—have been much more willing (at least until the recent financial crisis) to embrace offerings from anywhere in the world. A number of nations that have “got it right”—who have succeeded in simultaneously creating favourable government policies for venture funds and nurturing nascent technology companies—have reaped an explosive growth in their venture activity, including both domestic funds and overseas organisations. But the

willingness of venture capitalists to invest in any market has been severely strained by the global financial crisis.

We acknowledge that there are substantial barriers to developing a venture industry in New Zealand. Venture capital is an “increasing returns” business: it is much easier doing the hundredth venture investment in a sector or a city than the first. A corollary to this observation is that pioneering venture funds are likely to face many frustrations and challenges. These barriers—when combined with the precarious global financial environment—suggest the continued need for public interventions to encourage venture activity.

Indeed, the financial crisis of 2008 opened the door to massive public interventions in the Western economies. In many nations, governments responded to the threats of illiquidity and insolvency by making huge investments in troubled firms, frequently taking large ownership stakes.

The magnitude of these investments boggles the imagination. Consider, for instance, the over \$150 billion invested by the U.S. government in AIG (American International Group) in September and November 2008 in exchange for 81 percent of the firm’s stock, without any assurances that the ailing insurer would not need more funds. Or the Swiss government’s infusion of \$60 billion into UBS in exchange for just under 10 percent of the firm’s equity: this capital represented about 20 percent of the nation’s gross domestic product. Moreover, the pressures in Western nations to rescue other failing sectors—beginning with their auto-makers—seem unrelenting and suggest that yet more transactions are to come.

If these extraordinary times call for massive public funds to be used for economic interventions, should they be entirely devoted to propping up troubled entities, or at least partially designed to promote new enterprises? In some sense, 2008 saw the initiation of a massive Western experiment in governments acting as venture capitalists, but as a very peculiar type of venture capitalist: one that focuses on the most troubled and poorly managed firms in the economy, some of which may be beyond salvation.

Moreover, the steps required to create a promising venture market are not mysterious: numerous case studies and large-sample analyses have identified unambiguously appropriate and inappropriate steps that policymakers can take, and from this research three important themes stand out. These themes underpin the recommendations in the venture capital study for the New Zealand Government that I and my LECG colleagues undertook in 2005, and they remain relevant and important (and if anything more so given the global financial crisis).

The first critical message is that the most important steps that policymakers can take are to create an environment that is conducive to venture investment. Far too often, policymakers have been tempted to intervene directly in the venture market in a way that has ignored the real possibilities and needs of the market. Creating a favourable environment—including addressing problematic tax policies, regulatory

hurdles, and barriers to entrepreneurship and the commercialisation of academic technology—is a very important starting point.

A second important lesson is the need for patience. Policymakers often have expected immediate returns from their venture capital initiatives. The historical record teaches us that building a venture capital industry is likely to take many years. The “increasing returns” nature of the venture capital industry means that pioneering funds and entrepreneurs are likely to face many challenges. Impatiently abandoning a venture capital initiative after a few years because it does not seem to be yielding fruit is an all-too-frequent mistake. The global financial crisis will have undoubtedly added many years to the process of developing a sustainable venture capital market in New Zealand (and elsewhere where venture capital is in its early stages).

A third central theme is the need to listen to the market. It is common in policy making circles to attempt to design detailed policies that are perceived to address public objectives precisely. In the venture capital arena, however, these efforts to “over-engineer” programmes have frequently been counter-productive. By attempting to mandate where venture capitalists must invest (e.g. targeting particular industries) or how investments will be structured (e.g. by restricting the securities used), policymakers have frequently hobbled their fledgling venture capital industries. Moreover, potential foreign institutional investors and co-investors, who are often critical to the growth of a young venture industry, are often scared away by such provisions.

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Executive summary

Venture capital, innovation and growth

The financing of young and emerging firms is a risky business. Uncertainty and information gaps characterise these firms, particularly in high-technology industries. These information problems make it difficult for potential financial providers to assess these firms, and can permit opportunistic behaviour by entrepreneurs after financing is received.

To address these information problems and the challenges of developing these businesses, venture capital investors employ a variety of mechanisms that have proven to be very effective. These include careful selection and screening of investee firms, close monitoring and control of the firm as it develops, staged release of finance dependent on the achievement of milestones, and experience and networks in transiting the firm to more traditional forms of ownership (e.g. by way of an IPO or sale to a corporate).

Market evidence from the U.S. indicates that venture-backed firms achieve a public listing earlier, grow faster, and are more innovative and efficient than their peers.

Public policy issues to initiate and sustain venture capital

The first and arguably most critical task for Government, in order to initiate and sustain venture capital markets, is to ensure that public policy settings (e.g. tax and regulatory settings) are conducive to venture capital investments. This involves removing impediments to the formation of venture funds and the companies they back, and may extend to some forms of support for the development of such activities.

It is instructive to observe that all venture capital markets of which we are aware were initiated with government support. These markets do not appear to emerge without some form of assistance. This leads to the question as to what it is about these markets that requires the need for government support, at least in their formative stages.

The desirability of venture capital from a public policy perspective lies in the importance of innovation as a spur for economic growth, and that venture capital is an efficient stimulator of innovation.

The potential market failures that suggest government assistance may be appropriate and needed to support the formation of a venture capital market relate to R&D spill-overs, infrastructure building, and information asymmetries.

R&D spill-overs (or positive externalities) refer to the divergence between (higher) social rates of return relative to private rates of return from R&D investments. These arise, for example, from the economic rents associated with innovations accruing to competitors who rapidly introduce imitations, to developers of complementary products,

or to the consumers of these products. Where these spill-overs are prevalent firms will tend to invest in R&D below the social optimum.

Evidence suggests these spill-overs are particularly severe among small innovative firms, as these organisations are less likely to defend effectively their intellectual property positions or extract most of the rents in their product markets. These small firms are also likely to be candidates for venture capital financing. Thus the clients of venture capitalists are often firms that are still at a stage in their development cycle in which R&D spill-overs are prevalent.

In terms of infrastructure building, evidence indicates venture capital is an “increasing returns” business (e.g. the activity of one fund makes it easier for a second fund to operate) and relies on a significant infrastructure (or eco-system) which is relatively specific to it. This infrastructure includes entrepreneurs, investors, lawyers, accountants, business advisers, information providers and information on the market, and the wider capital markets that are familiar with the venture capital process and its requirements. Individual private investors or fund managers benefit from this infrastructure and generally are unable to exclude others from also accessing many of its benefits. Thus some aspects of this infrastructure may have the characteristics of a public good (non-rivalry consumption and non-excludability) or a club good (excludability but at least partial non-rivalry in consumption). If so, individual market participants can be expected to under-invest in this infrastructure. This suggests a possible role for government support in the establishment phase of the market.

As regards information asymmetries, empirical research suggests that new firms, and especially technology-intensive ones with products yet to be tested in the market, are unable, due to information problems in the normal financing markets, to raise sufficient capital to fund all their positive net present value projects. This same issue arises for fund managers that wish to raise a venture capital fund in a market for which there is limited or no track record of performance.

Government support for processes that reduce this information asymmetry (e.g. by lowering transaction costs for private investors) may be desirable and efficient, particularly in the early stages of the market’s development. The New Zealand Venture Investment Fund (NZVIF) investment in the due diligence selection process of fund managers is an example, as other investors are able to free-ride on such processes (and they appear to do so). This is often referred to as the “certification effect”.

The above points may appear to reflect the pleadings of an interest group for special treatment. But research has indicated that venture capital has a critical role to play in the innovation process. Venture capital is a financing tool that aims to bridge the publicly and privately funded R&D space, and the development of viable and self-sustaining businesses. This is a task for which conventional finance firms are not well suited. History elsewhere indicates a venture capital market is unlikely to emerge in the absence of government support for an extended period.

At the same time, history conveys some substantial cautions about government intervention to spur venture capital. Literally tens of billions of dollars have been squandered by governments globally in ill-conceived efforts to stimulate venture capital. An extensive political economy and public finance literature emphasises the distortions that can result from government subsidies as particular interest groups or politicians seek to direct subsidies in a manner that benefits themselves. In the venture capital context this can express itself in firms accessing support due to their political connections rather than the strength of their business plan, or firms securing support based on their likelihood of success (to avoid the politically expensive event of government-backed firms failing) regardless of whether government support is needed to achieve that success.

Over time public programmes tend to converge towards the same market segments as the private sector, rather than addressing gaps in the provision of risk capital. This tendency can crowd out private investors or even delay the development of private participation in the venture capital market.

The tendency of political decision-making processes to lead to sub-optimal outcomes points to the need for the careful design of any publicly funded support for venture capital. The fund-of-fund design used for the NZVIF is a good example of this, whereby the allocation of funds to fund managers is devolved to an independent board and its fund management team, and is subject to private investors committing money to the same fund (i.e. the fund manager must pass a market test prior to obtaining government support).

The venture capital funding process incorporates a rigorous screening and monitoring process of investee firms. This work is undertaken by venture capital fund managers operating in purpose-built entities (in terms of their incentives, information and capabilities). The NZVIF programme has been designed carefully to dovetail into these processes.

Government interventions in venture capital markets often ignore the realities of the venture capital market development process. For instance, many public venture capital initiatives have been abandoned after a few years: the programme designers have apparently not understood that these markets take many years to evolve. Others have added requirements—such as the stipulation that investee firms focus only on “pre-commercial” research—that while seemingly reasonable from a public policy perspective, run counter to the nature of the venturing process. In other cases, reasonable programmes have been undermined by other poorly considered initiatives sponsored elsewhere by government that provide capital to seed and early stage firms at very low rates (or even at zero cost as grants), and thus distort the market and potential recipients’ expectations for venture capital.

Lastly, it is important to not forget the international nature of the venture capital process. Today’s venture industry is global on many levels. Investors’ capital commitments, venture capitalists’ investments, and the entrepreneurial firms themselves increasingly

flow across borders and continents. To attempt to build a national venture capital market without strong global ties is a recipe for an irrelevant and unsuccessful sector.

Venture capital in New Zealand

Prior to the establishment of the NZVIF programme in 2002 and the resulting VIF Venture Capital Funds there was a virtual absence of dedicated venture capital funds operating in New Zealand. Private equity investment activity had been focused in later stage investments, management buy-outs, restructurings and so forth, with occasional investments in the venture capital space.

Government had previously provided support for the venture capital sector by way of the Development Finance Corporation in the 1970s/80s, and the Greenstone Fund in the early 1990s. However neither was dedicated to venture capital and neither led to the formation of a venture capital market.

The NZVIF was established in 2002 with \$100 million of committed capital and the following objectives:

- To accelerate development of the venture capital industry by increasing the level of early stage investment activity in the New Zealand market;
- To develop a larger pool of people in New Zealand's venture capital market with skills and expertise in early stage investment;
- To facilitate commercialisation of innovations from the Crown Research Institutes (CRIs), universities and the private sector; and
- To get more New Zealand businesses on paths to global success by increasing their access to international experts, networks and market knowledge.

This initiative has achieved the following results thus far (as at 31 March 2009).

Table 1: NZVIC Venture Capital Funds Portfolio (as at 31 March 2009)

Number of NZVIF VC Funds	6
Amount invested by NZVIF in VIF VC Funds	\$71 m
Amount committed by NZVIF to VIF VC Funds	\$110m
Number of companies invested in through NZVIF VC Funds	48
Number of seed and start up investments	33
Cumulative amount invested through the NZVIF VC Funds (NZVIF & private sector)	\$218m*
Number of key investment personnel in NZVIF VC Funds	19
Number of deals from Crown Research Institutes & Universities	11
Number of companies exporting	28
Number of companies attracting offshore capital	16

*This is the matched private capital. However the total amount of private capital invested into the portfolio companies over the same time is closer to \$400m.

Investments made by the NZVIF Venture Capital Funds are distributed by stage and sector as set below.

Figure 1: NZVIC Venture Capital Portfolio: Stage by value (as at 31 March 2009)

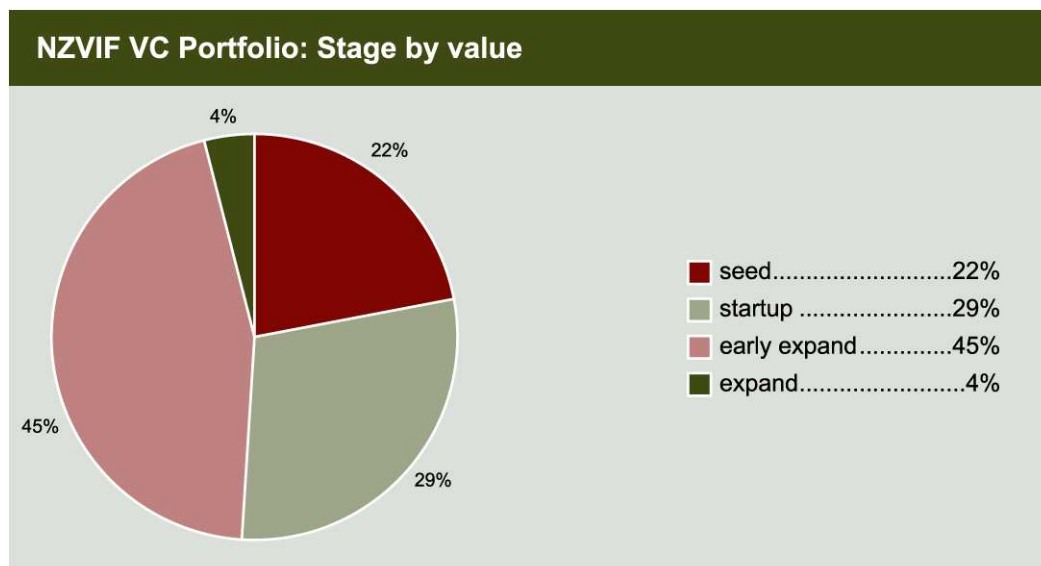
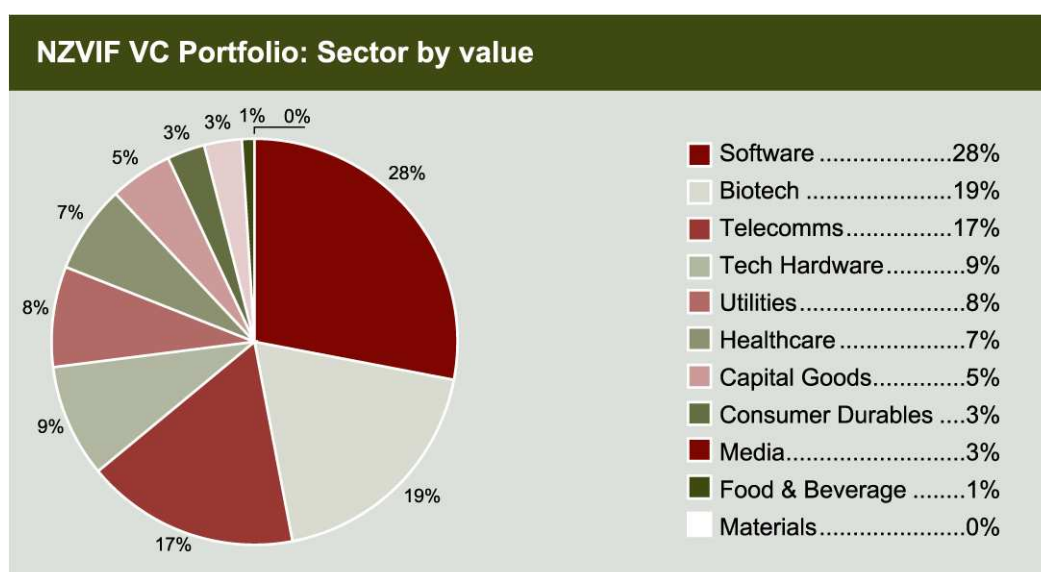


Figure 2: NZVIC Venture Capital Portfolio: Sector by value (as at 31 March 2009)



Venture capital has the potential to contribute very significantly to New Zealand's economic growth, and to the level of innovation and efficiency of its young and emerging businesses, and is an important complement to other aspects of New Zealand's innovation and growth systems (e.g. to publicly and privately funded R&D, university and CRI research programmes, and so forth).

However, developing a viable venture capital industry is a long term task, and is not easy. It requires prolonged commitment from those involved directly and from policy makers. Over recent years the growth in New Zealand's venture capital activity is encouraging but modest. The VIF Venture Capital Funds are growing slowly and at this stage their value is just under the amount invested. Few divestments have been made and none of the options to buy out the Crown's stake in these Funds within the first five years have been exercised (these options have now lapsed for four of the six Funds).

We were commissioned by the Ministry of Research, Science & Technology, the Ministry of Economic Development and The Treasury in 2005 to undertake a study of New Zealand venture capital markets.¹ The recommendations of that study, and progress to date against them, are appended (see Appendix 1). In that we recommended the government maintain its policy to support the venture capital market through the NZVIF and its associated VIF Venture Capital Funds, as we considered this structure to be appropriate to the task. We remain of this view for reasons outlined in this report.

In our view the government should maintain a steady and predictable policy with respect to the development of a venture capital market. The global financial crisis has slowed the ability of the VIF Venture Capital Funds to grow and exit their investee businesses over the medium term. In reality, given that four of them are now more than half way through their 10 year terms and face a difficult environment, these Fund managers may find it challenging to raise further funds without government support. This suggests that government support is likely to be necessary for at least the next generation of funds. If this is accepted, it suggests that the government should be viewing its involvement in this sector for at least another fifteen years (assuming each generation of fund is about ten years).

In our 2005 study the underlying policy themes of our recommendations were for government to:

- Create and nurture a policy environment that is conducive to venture investment, entrepreneurship, and the commercialisation of technology.
- Be patient and persistent. The historical record teaches that building a venture capital industry takes many years.
- Listen to the market, and design interventions to dovetail with and support the development of conventional venture capital institutions and arrangements.

We consider these policy themes remain just as relevant and important now as they were then if New Zealand is to develop a viable New Zealand venture capital market.

¹ Josh Lerner, David Moore, and Stuart Shepherd, "A Study of New Zealand's Venture Capital Market and Implications for Public Policy: To the Ministry of Research, Science & Technology," LECG, September 2005.

1 Introduction

This report on venture capital and its development in New Zealand was commissioned by the New Zealand Venture Investment Fund Ltd (NZVIF). It is intended to provide an accessible description of venture capital and its role in fostering innovation and economic growth, the way in which other countries have developed their venture markets, the state of venture capital in New Zealand, and the key public policy issues that arise in relation to developing and sustaining venture capital markets. The report draws on and updates material in the 2005 New Zealand venture capital study undertaken by the same authors.²

1.1 Venture capital and the structure of this report

We define venture capital as a subset of private equity, and that portion that is focused on equity or equity-linked investments in privately held, high growth companies in their seed, start-up and early expansion phases of development.

Private equity funds in turn are pools of capital specialising in venture capital, business expansions, leveraged and management buyouts, mezzanine investments, distressed debt, and related investments. Internationally these pools of capital are organised typically as partnerships and are not listed and traded in security markets and hence the term “private equity”.

The rationale for venture capital funds is straightforward. Many start-up firms require substantial capital. A firm’s founder may not have sufficient funds to finance the business alone and therefore must seek outside financing. Entrepreneurial firms characterised by significant intangible assets, and which anticipate years of negative earnings in their early development, are unlikely to be able to secure bank loans or other debt financing, and typically struggle to attract normal equity financing. Venture capital aims to fill this gap in the supply of finance.

Venture capital fund managers can play a very significant role in providing finance and related expertise to fuel the development of young and growing firms in an economy. There is growing evidence that vibrant venture capital markets spur innovation and economic growth.

This report describes venture capital and its development in New Zealand as follows:

- Section 2 explores the role venture capital can play in fuelling innovation and economic growth and examines lessons from other countries.
- Section 3 describes the rationale for government intervention in these markets.

² Ibid.

- Section 4 examines attempts over the last thirty years to develop venture capital markets in New Zealand and the current state of those markets.
- Section 5 draws conclusions from the above for public policy settings relating to venture capital.

2 Venture capital, innovation and growth

Venture capital was established to address the very challenging funding issues faced by young, technology-intensive firms. This structure has been shown to have a substantial positive effect on economic growth. Not only is the overall economic impact of venture-backed firms substantial, but they appear particularly effective in stimulating economic growth. While there may be a need for government intervention to “prime the pump” of venture capital, such policies need to be designed carefully to avoid all-too-common pitfalls.

In this section we describe the history of venture capital and the key messages from the academic literature, the experience of a number of countries, and the relationship between venture capital, innovation and economic growth.³

2.1 Context

During the 1980s and 1990s there was a tremendous boom in the private equity industry. The pool of world-wide private equity funds - partnerships specialising in venture capital, leveraged buyouts, mezzanine investments, build-ups, distressed debt, and related investments - had grown from about \$5 billion in 1980 to over one trillion dollars in 2008. Private equity's growth over that period has outstripped that of almost every other class of financial product. At the same time, the sector has been characterised by a pattern of boom and bust: the rapid increases in fundraising in the late 1960s, mid 1980s and late 1990s were followed by precipitous declines in the 1970s, early 1990s, and early 2000s. Much of the growth has arisen from the venture capital sector, which specialises in funding young and emerging firms.

As a result of this rapid growth, venture capital has attracted increasing attention in both the popular press and academic literature. The recent dramatic growth and intense cyclicity in the venture capital industry has been accompanied by new academic research that explores its form and function.

Venture capital funds are closely related to other private equity funds that undertake buyout investments, sharing similar legal structures, incentive schemes, and investors. Those funds similarly invest in entities that often find external financing difficult to raise,

³ Unless indicated otherwise this section is based on:

Gompers, P. and Lerner, J., 1999. *The Venture Capital Cycle*. MIT Press

Gompers P. and Lerner, J., 2001. *The Money of Invention: How Venture Capital Creates New Wealth*. Harvard Business School Press

Fenn, G.W., Liang, N. and Prowse, S., 1995, “The Economics of the Private Equity Market,” *Staff Studies*. Board of Governors of the Federal Reserve System (U.S.)

namely troubled firms that need to undergo restructuring of some kind. Similar to venture capitalists, buyout funds protect the value of their equity stakes by undertaking careful due diligence before making investments and retaining powerful oversight rights afterwards. Together, the organisations that finance these high-risk, potentially high-reward projects are termed private equity groups.

Typically, these investors do not primarily invest their own capital, but rather raise the bulk of their funds from institutions and individuals. Large institutional investors, such as pension funds and university endowments, are happy to hold illiquid long-run investments such as private equity in their portfolio. Often, these groups have neither the staff nor the expertise to make such investments themselves directly.

2.2 History of venture capital in the United States

The venture capital industry was in its initial decades a predominantly American phenomenon. It had its origins in the family offices that managed the wealth of high net worth individuals in the last decades of the nineteenth century and the first decades of this century. Wealthy families such as the Phippes, Rockefellers, Vanderbilts, and Whitneys invested in and advised a variety of business enterprises, including the predecessor entities to AT&T, Eastern Airlines, and McDonald-Douglas. Gradually, these families began involving outsiders to select and oversee these investments.

The first formal venture capital firm, however, was not established until after World War II. American Research and Development (ARD) was formed in 1946 by MIT President Karl Compton, Harvard Business School Professor Georges F. Doriot and local business leaders. A small group of venture capitalists made high-risk investments into emerging companies that were based on technology developed for World War II. One of Doriot's key insights was the need for a financing service (later to become known as venture capital) that had the capability to undertake three tasks; to sort the promising firms from many applicants, to control those firms in a way that limits the agency problems by using a mixture of incentive and monitoring tools, and to develop a certifying role for bringing new firms to the market through a reputation for quality and fair dealing.

The success of the investments ranged widely. Almost half of ARD's profits during its 26 year existence as an independent entity came from its USD70,000 investment in Digital Equipment Company in 1957, which grew in value to USD355 million. Because institutional investors were reluctant to invest, ARD was structured as a publicly traded closed-end fund and marketed mostly to individuals. The few other venture organisations that begun in the decade after ARD's formation were also structured as closed-end funds. The early venture capital funds were almost exclusively focused in the United States, with the exception of a few government-backed initiatives such as the United Kingdom's 3i.

The first venture capital limited partnership, Draper, Gaither, and Anderson, was formed in 1958. Imitators soon followed, but limited partnerships accounted for a minority of the venture pool during the 1960s and 1970s. Most venture organisations raised money

either through closed-end funds or Small Business Investment Companies (SBICs, which were federally guaranteed risk-capital pools that proliferated during the 1960s). While the market for SBICs in the late 1960s and early 1970s was strong, incentive problems ultimately led to the collapse of the sector. The annual flow of money into private equity during its first three decades never exceeded a few hundred million dollars and usually was substantially less. During these years, while a few funds made a considerable number of investments in buyouts and other transactions involving mature firms, these private equity organisations were universally referred to as venture capital funds.

The activity in the private equity industry increased dramatically in the late 1970s and early 1980s. Industry observers attribute much of the shift to the U.S. Department of Labor's clarification of the Employee Retirement Income Security Act's "prudent man" rule in 1979. Prior to this year, the legislation limited pension funds from investing substantial amounts of money into venture capital or other high-risk asset classes. The Department of Labor's clarification of the rule explicitly allowed pension managers to invest in high-risk assets, including private equity. Numerous specialised funds—concentrating in areas such as leveraged buyouts, mezzanine transactions and such hybrids as venture leasing—sprung up during these years. Another important change in the private equity industry during this period was the rise of the limited partnership as the dominant organisational form.

The subsequent years saw both very good and trying times for private equity investors. On the one hand, during the 1980s venture capitalists backed many of the most successful high-technology companies, including Cisco Systems, Genentech, Microsoft, and Sun Microsystems. Numerous successful buyouts—such as Avis, Beatrice, Dr. Pepper, Gibson Greetings, and McCall Pattern—garnered considerable public attention in the 1980s. At the same time, commitments to the private equity industry during this decade were very uneven. The annual flow of money into venture capital funds increased by a factor of ten during the first half of the 1980s, but steadily declined from 1987 through 1991. Buyouts underwent an even more dramatic rise through the 1980s, followed by a precipitous fall at the end of the decade.

Much of this pattern was driven by the changing fortunes of private equity investments. Returns on venture capital funds had declined sharply in the mid-1980s after being exceedingly attractive in the 1970s. This fall was apparently triggered by over-investment in a few industries, such as computer hardware, and the entry of many inexperienced venture capitalists. Buyout returns underwent a similar decline in the late 1980s, due in large part to the increased competition between groups for transactions. As investors became disappointed with returns, they committed less capital to the industry. During these years many of the early funds geared towards European and Asian private equity investments were formed. These pioneering funds frequently encountered disappointing returns, a function of inexperienced venture capitalists and entrepreneurs. The 1990s saw these patterns repeated on an unprecedented scale. Much of the decade saw dramatic growth and excellent returns in almost every part of the private equity industry. This recovery was triggered by several factors. The exit of many inexperienced investors at the beginning of the decade ensured that the remaining groups faced less

competition for transactions. The healthy market for the initial public offerings during much of the decade meant that it was easier for all investors to exit private equity transactions. Meanwhile, the extent of technological innovation—particularly in information technology-related industries—created extraordinary opportunities for venture capitalists. New capital commitments to both venture and buyout funds rose in response to these changing circumstances, increasing to record levels by the late 1990s and 2000.

But as is often the case, the growth of private equity increased at a pace that was too great to be sustainable. Institutional and individual investors—attracted especially by the tremendously high returns being enjoyed by venture funds—flooded money into the industry at unprecedented rates. In many cases, groups staggered under the weight of capital. In other cases, groups that should have not raised capital succeeded in garnering considerable funds. Too rapid growth led to over-stretched partners, inadequate due diligence, and in many cases, poor investment decisions. The level of venture investments, and the exiting of these investments, was considerably more modest in the first decade of the 21st century than in the heady days of 1999-2000. At the same time, the level was well above that of the 1980s and first half of the 1990s.

But the most revolutionary changes in private equity in recent years have not been in the patterns of investment, but rather in the structure of the private equity groups themselves. Private equity organisations, while in the business of funding innovation, had been remarkably steadfast in retaining the limited partnership structure since the mid-1960s. In recent years, however, a flurry of experimentation has taken hold in the industry. Among the changes have been the establishment of affiliate funds in different regions and nations, and the expansion of the scope of funds to include real estate, mezzanine, and bond funds.

What explains these sudden changes on the part of the major private equity groups in recent years? Gompers and Lerner consider that this reflects a more fundamental shift in the industry, as private equity groups struggle to address the increasing efficiency of their investing.⁴ Facing increased competition, they are seeking to find new ways to differentiate themselves.

Evidence of the increased efficiency of the private equity industry can be seen in many places. While venture capital for much of its first decades had the flavour of a cottage industry, with a considerable number of relatively small groups working alongside one another, today it is much more competitive.

Given this changed competitive environment, the leading groups are increasingly seeking to differentiate themselves from the mass of other investors. They are

⁴ See Gompers and Lerner, (2001). *The Money of Invention: How Venture Capital Creates New Wealth*, chapter 10.

employing a variety of tools to build up and characterise their “brands”, to help distinguish themselves from other investors. These steps include strategic partnerships, provision of additional services, and aggressive fundraising as described above, as well as many other initiatives to build their visibility in the international markets.

To be sure, private equity is not unique in this transformation. For instance, the investment banking industry underwent a similar transformation in the 1950s and 1960s, as the leading “bulge bracket” firms solidified their leadership positions. The gap between the leading banks and the following ones significantly increased during these years, as the leading groups greatly enhanced their range of activities and boosted their hiring of personnel. Similarly, the management of the major banks was transformed during these years, as procedures were systematised and management structures formalised.

Thus, the U.S. venture capital industry that in the 1990s was able to attract enormous resources had been 30 to 40 years in the making. While it is likely to take less time to develop a self-sustaining venture capital industry elsewhere by building on the experience and learnings of the U.S. and other countries, it nevertheless takes considerable time.

2.3 History of venture capital outside the United States

Venture capital’s evolution outside the United States was much slower. While private equity flourished in many nations in the 1980s, the venture industry only developed slowly.⁵ Beginning in the mid-1990s, however, investments in venture capital outside the United States proliferated.

In part, the growth during the 1990s reflected limited partners’ enthusiasm for venture capital in all sizes and shapes during these years. But it also may have reflected a more profound shift: that private sector conditions had ripened for venture capital to flourish in other countries and regions around the world. The same underlying technological innovations driving the U.S. venture-capital revolution have unleashed a similar surge of entrepreneurial spirit elsewhere. Countries that had relatively dismal track records of financing fresh ideas were experiencing the first stirrings of entrepreneurial revolution. This second consideration points to an optimistic future for venture-capital markets outside the United States.

Unfortunately, even less evidence exists on the international venture capital experience than on the United States. This may stem in part from the difficulties inherent in

⁵ U.S. investors make a clear distinction between buyouts and venture capital. However, in most other regions of the world the term *venture capital* encompasses *all* private-equity investments. Though we try to keep the distinction clear, the lack of sufficient data on venture capital and private-equity investments outside the United States can muddy the picture.

measuring entrepreneurial activity in many countries. Most governments have not invested in the data-collection technologies needed to gather useful feedback on their policy initiatives.

Nevertheless, there are many similarities with the U.S. experience across nations. One of the most striking parallels is the pattern of fundraising and investment. As in the United States, international private-equity activity shows a cyclical pattern. After growth in activity in the 1980s, the period from 1989 to 1992 saw substantial declines in fundraising. Many of these early funds had disappointing returns, mirroring the U.S. experience in those same years. Between 1991 and 1999, however, international private-equity commitments increased nearly fourfold. The subsequent years saw substantial declines.

To deepen our understanding of international venture capital we take a closer look at the experience in Europe. On the supply side of venturing, tax policies and attitudes of large institutional investors play a prominent role in the availability of venture funding. On the demand side, legal, regulatory, and cultural forces all influence whether people with creative ideas will be motivated to seek the financial backing they need to commercialise their innovations.

European private equity has endured a roller-coaster ride similar to that in the United States. A boom in the late 1980s was followed by a bust in the early 1990s. The closing years of the 1990s saw an extraordinary recovery. Fundraising—fuelled by U.S. institutional investors' heightened interest in European opportunities—far surpassed earlier milestones.

Historically, over 90 percent of European private equity funds went to buyouts or other later-stage investments. Between 1995 and 1999, venture-capital commitments grew more than tenfold in Germany—from 89 million euros to more than 1 billion euros in 1999. Similarly, venture capital commitments in France grew from only 26 million euros in 1995 to 519 million euros in 1999. Investors saw deal prices escalate and bidding wars break out—all signs that too much money was chasing too few deals. Almost inevitably, returns of these venture funds proved disappointing, and fundraising in the venture sector collapsed.

Venture capital outside the U.S. has not been exempt from the downturn that began in 2000. Once the level of returns began suffering, many of the established groups such as 3i began scaling back their venture capital initiatives in favour of later-stage investing. Many of the new, specialised funds have struggled as well to raise additional capital.

However, there have been some very positive changes in the European venture market that augur well for the future. Traditionally, national boundaries have compartmentalised the key sources of capital for European venture investing. Venture firms would raise funds from banks, insurance companies, and government bodies in their own country, with little involvement from outside investors. The one exception was in the United Kingdom, where fundraising has long had a strong international flavour with particularly heavy involvement from U.S. institutional investors. These

barriers are now breaking down, however. Institutional investors—particularly in the United States—are now investing more in European funds, as are international venture capital funds.

What impact have these changes exerted on the overall venture scene in Europe? As one consequence, investment advisors, sometimes called gatekeepers, have multiplied. These firms advise investors, primarily large institutions, about their private equity investments or manage their holdings directly. Several large U.S. gatekeepers have established in Europe, drawn there by pension reforms as well as European *and* U.S. institutional investors' new involvement in that region's venture industry. Local advisors have also established successful operations.

Unlike their U.S. counterparts, many European venture capitalists often have financial or consulting, rather than operating backgrounds. Perhaps as a result, they traditionally have not gotten as involved in their portfolio companies' management as U.S. venture capitalists do. Instead, they tend to focus more on assessing those firms' financial performance.

Also unlike the U.S. approach, European venture firms tend to invest in the same country where the fund is located. This preference reflects traditional legal and regulatory restrictions (which have since eased) and the distinct business cultures that characterise the various European nations. However, localisation of investment still strongly defines the "European way."

Finally, whereas the size of U.S. venture capital transactions has ballooned in recent years, European transactions have not followed suit. As a result, some European start-ups find it difficult to compete in the "winner-take-all" contests that characterise the high-tech industry.

The European experience highlights the need for venture capital to be adapted and matched to the local environment.

2.4 Impact of venture capital on the economy

Clearly, venture capital exerts a major impact on the fates of individual companies. But does all this fundraising and investing influence the overall economic landscape as well? How would we even determine whether such an influence exists? And if it did exist, how would we measure it?

In this section, we look at the experience of the U.S. venture capital market, which is the most developed and mature. It is important to note, though, for most of the period 1970 to 1995, investments made by the entire U.S. venture-capital sector totalled less than the research-and-development and capital-expenditure budgets of large, individual companies such as IBM, General Motors, or Merck. On the face of it, we might conclude that the importance of the venture-capital sector has been exaggerated.

One way to explore this question of economic impact is to examine the impact of venture capital investing on wealth, jobs, and other financial measures across a variety of industries. Though it would be useful to track the fate of every venture-capital-financed company and find out where the innovation or technology ended up, in reality we can track only those companies that have gone public. Consistent information on venture-backed firms that were acquired or went out of business simply does not exist.

These firms have had an unmistakable effect on the U.S. economy. In December 2004, 917 firms were publicly traded on U.S. markets after receiving their private financing from venture capitalists (this does not include the firms that went public but were subsequently acquired or delisted). The activity in the IPO market closely mirrors the investment cycles of venture capital financing. During the early 1980s and the 1990s, the U.S. economy witnessed a marked increase in both venture-capital investment activity and venture-backed IPO activity. The evidence is clear: a healthy public-offering market has gone hand-in-hand with a robust venture-capital sector.

Table 2: Relative status of venture-backed and non-venture backed firms (as at September 2008, USD millions, employee numbers in thousands)⁶

	Number of firms	Market capitalization	Employees (000s)	Sales	Operating income before depreciation	Net income	Average profit margin
Venture-backed	895	2,359,498	3,210	925,717	168,642	63,402	6.8%
Non-venture	5,803	25,607,925	49,176	20,955,942	4,264,172	1,567,303	7.1%
Totals	6,698	27,967,423	52,386	21,881,659	4,432,814	1,630,705	7.1%
Venture-backed as a % of total	13.4%	8.4%	6.1%	4.2%	3.8%	3.9%	N/A

One way to assess the overall impact of the venture-capital industry is to look at the economic “weight” of venture-backed companies in the context of the U.S. publicly listed sector. Using data available as of the end of September 2008, venture-backed firms that had gone public made up just over 13 percent of the total number of publicly

⁶ See Appendix 2 for data sources for this table.

listed firms in existence in the United States at that time. And of the total market value of publicly listed firms (\$28 trillion), venture-backed companies came in at \$2.4 trillion, or 8.4 percent.

Venture-backed firms also made up over 4 percent (\$0.9 trillion) of total sales (\$21.9 trillion) of all U.S. public firms at the time. And contrary to the general perception that venture-backed companies are not profitable, after-tax profit margins for these companies averaged 6.8 percent—close to the average of the non-venture-backed firms of 7.1 percent. Finally, venture-backed firms employed 6.1 percent of the total public-company workforce—most of these jobs being high-salary, skilled positions in the technology sector. Clearly, venture investing has fuelled a substantial portion of the U.S. economy.

Venture investing not only supports a substantial fraction of the U.S. economy; it also strengthens particular industries. To be sure, it has relatively little impact on industries dominated by mature companies—such as the energy, manufacturing, and transportation industries. That is because the mission of venture investors is to capitalise on revolutionary changes in an industry, and the above sectors often have a relatively low propensity for radical innovation.

But contrast those industries with highly innovative ones, and the picture looks completely different. For example, companies in the computer software and hardware industry that received venture backing during their gestation as private firms represented more than 75 percent of the software industry's value.⁷ Venture-financed firms also play a central role in the biotechnology, computer-services, industrial-services, and semiconductor industries. All of these industries have experienced tremendous innovation and upheaval in recent years. Venture capital has helped catalyse change in these industries, providing the resources for entrepreneurs to generate substantial returns from their ideas.

As these statistics suggest, venture capitalists create whole new industries and seed fledgling companies that later dominate those industries. It is clear the venture-capital revolution was one of the driving forces behind the transformation of the U.S. economy in the late 20th century. It is this high impact that venture capital can exert on economic growth that makes it attractive to governments intent on policy settings that are capable of supporting long-term growth.

⁷ Gompers and Lerner, (2001). *The Money of Invention: How Venture Capital Creates New Wealth*.

2.5 Impact of venture capital on innovation

The financing of young and restructuring firms is a risky business. Uncertainty and informational gaps often characterise these firms, particularly in high-technology industries. These information problems make it difficult to assess these firms, and permit opportunistic behaviour by entrepreneurs after financing is received.

To address these information problems, venture capital investors employ a variety of mechanisms, which seem to be critical in boosting innovation.

2.5.1 Venture capital tools

The first of these is the screening process that venture capitalists use in selecting investment opportunities. This appears to be more efficient than the process that corporate research and development typically uses. A key metric important for all venture capitalists is whether a particular business proposal has a sustainable competitive advantage. In the technology industries that venture capitalists target, sustainable competitive advantages normally derive from intellectual property and innovative ability. Unless a venture capitalist sees the potential for patents or some other form of protected intellectual property, the investment is unlikely to proceed.

By contrast, most large, mature corporations tend to look to their existing lines of business when choosing projects to fund. Technologies outside the firm's core market, or projects that raise internal political tensions, often get shelved. In fact, many successful venture-backed start-ups are launched by employees who leave when their company declines to pursue what they see as a promising technology.

In addition to the initial selection process, the advice that venture firms provide to entrepreneurs, as well as the post-investment monitoring and control, support top-quality innovation. Venture capitalists also tend to spot more potential future applications of technology than larger, mature companies do, perhaps because older companies focus on narrower markets.

Finally, the staging of investments also improves the efficiency of venture capital funding. In large corporations, research and development budgets are typically set at the beginning of a project, with few interim reviews. Even if projects do get reviewed mid-stream, few are terminated when signs suggest that they are not working out. This contrasts with venture capital funding patterns in which funding commitments are provided in stages, with thresholds needing to be reached for funding to continue. Thus an innovative idea only continues to be funded if its promoters are able to continue to execute, and conversely those projects that prove promising are able to access capital in a timely fashion. Thus, it is not surprising that venture capital has emerged as the

dominant form of equity financing in the U.S. for privately held high-technology businesses.⁸

Interviews with venture capitalists and entrepreneurs suggest that the consequences of these tools are that venture capital plays an important role in boosting innovation. Its assistance has two dimensions: accelerating growth and assuring long-run success, as illustrated in Tables 3 and 4.

Table 3: Age of firms (in months) at time of Initial Public Offering (January 2003-September 2008)⁹

Months from founding date to IPO		
	Average	Median
Venture-backed firms	105	91
Non-venture backed firms	203	109

Table 4: Age of firms (in months) at time of Initial Public Offering: by SIC code January 2003-September 2008)

Months from founding to IPO				
	Average		Median	
SIC Code	Venture-backed	Non-venture	Venture-backed	Non-venture
Pharmaceuticals (2834)	86	178	74	199
Semiconductors (3674)	120	175	103	95
Software (7372)	102	195	92	229
Business services (mostly B2B) (7389)	101	138	81	144

⁸ While evidence regarding the financing of these firms is imprecise, Freear and Wetzel's survey suggests that venture capital accounts for about two-thirds of the external equity financing raised by privately held technology-intensive businesses from private-sector sources. See Freear, J. and Wetzel, W., (1990). "Who Bankrolls High-Tech Entrepreneurs?" *Journal of Business Venturing*, 5(2).

⁹ See Appendix 2 for data sources.

With reliable, predictable support from venture capitalists, start-ups can invest in the research, market development, marketing, and strategising that they need to attain the necessary scale to go public. As a result, venture-backed firms tend to be considerably younger at the time of their IPOs than non-venture-backed companies. h and assuring long-run success, as illustrated in Tables 3 and 4.

Table 3 and Table 4 illustrate this phenomenon using U.S. data from January 2003 to September 2008. These tables show the time, in months, from company founding to the issuing of equity in an initial public offering in various industries. In all but one case in the industries covered in Table 4, the venture-backed IPOs reached the public market sooner than the non-venture-backed group. Venture capitalists speed the development of companies because they help companies pursue effective strategies and ensure access to capital.

2.5.2 Venture capital and the innovation process

It might be thought that it would not be difficult to address the question of the impact of venture capital on innovation. For instance, one could seek to explain across industries and time whether, controlling for R&D spending, venture capital funding has an impact on various measures of innovation. But even a simple model of the relationship between venture capital, R&D, and innovation suggests that this approach is likely to give misleading estimates.

This is because both venture funding and innovation could be positively related to a third unobserved factor, the arrival of technological opportunities. Thus, there could be more innovation at times when there was more venture capital, not because the venture capital caused the innovation, but rather because the venture capitalists reacted to some fundamental technological shock which led to more innovation.

Hellmann and Puri (2000),¹⁰ examine a sample of 170 recently formed firms in Silicon Valley, including both venture-backed and non-venture firms. Using questionnaire responses, they find empirical evidence that venture capital financing is related to product market strategies and outcomes of start-ups. They find that firms that are pursuing what they term an “innovator strategy” (a classification based on the content analysis of survey responses) are significantly more likely to obtain venture capital, and to do so faster. The presence of a venture capitalist is also associated with a significant reduction in the time taken to bring a product to market, especially for innovators. Furthermore, firms are more likely to note the obtaining of venture capital as a significant milestone in the lifecycle of the company as compared to other financing events.

¹⁰ Hellmann, T. and Puri, M., (2000). "The Interaction between Product Market and Financing Strategy: The Role of Venture Capital," *Review of Financial Studies*, 13(4).

The results suggest significant interrelations between investor type and product market dimensions, and a role of venture capital in encouraging innovative companies. Given the small size of the sample and the limited data, Hellmann and Puri can only modestly address concerns about causality. Unfortunately, the possibility remains that more innovative firms select venture capital for financing, rather than venture capital causing firms to be more innovative.

Kortum and Lerner (2000),¹¹ by way of contrast, examine these patterns on an aggregate industry level, rather than on the firm level. They address concerns about causality in two ways. First, they exploit the major discontinuity in the recent history of the venture capital industry: as discussed above, in the late 1970s, this discontinuity arose from the U.S. Department of Labor's clarification of the Employee Retirement Income Security Act (a policy shift that freed pensions to invest in venture capital). This shift led to a sharp increase in the funds committed to venture capital. This type of external change should identify the role of venture capital, because it is unlikely to be related to the arrival of entrepreneurial opportunities. They exploit this shift in instrumental variable regressions. Second, they use R&D expenditures to control for the arrival of technological opportunities that are anticipated by economic actors at the time, but that are unobserved to econometricians. In the framework of a simple model, they show that the causality problem disappears if they estimate the impact of venture capital on the patent-R&D ratio, rather than on patenting itself.

Even after addressing these causality concerns, the results suggest that venture funding does have a strong positive impact on innovation. The estimated coefficients vary according to the techniques employed, but on average a dollar of venture capital appears to be three to four times more potent in stimulating patenting than a dollar of traditional corporate R&D. The estimates therefore suggest that venture capital, even though it averaged less than three percent of corporate R&D from 1983 to 1992, is responsible for a much greater share—perhaps ten percent—of U.S. industrial innovations in this decade.

A natural concern with the above analysis is that it looks at the relationship between venture capital and patenting, not venture capital and innovation. One possible explanation is that such funding leads entrepreneurs to protect their intellectual property with patents rather than other mechanisms such as trade secrets. For instance, it may be that the entrepreneurs can fool their venture investors by applying for large numbers of patents, even if the contributions of many of them are very modest. If this is true, we might infer that the patents of venture-backed firms would be lower quality than non-venture-backed patent filings.

¹¹ Kortum, S.S. and Lerner, J., (2000). "Assessing the Contribution of Venture Capital to Innovation," *RAND Journal of Economics*, 31(4).

How could we investigate this question of patent quality? One possibility is to check the number of other patents that cite a particular patent. Higher-quality patents, we might assume, would be cited by other innovators more often than lower-quality ones. Similarly, if venture-backed patents are lower quality, then companies receiving venture funding would be less likely to initiate patent-infringement litigation (it makes no sense to pay money to engage in the costly process of patent litigation to defend low-quality patents).

So, what do we get when we measure patent quality with these criteria? As it happens, the patents of venture-backed firms are more frequently cited by other patents and are more aggressively litigated—thus we can conclude that they are high quality. Furthermore, the venture-backed firms more frequently litigate trade secrets, which suggests that they are not simply patenting frantically in lieu of relying on trade-secret protection. These findings reinforce the notion that venture-supported firms are simply more innovative than their non-venture-supported counterparts.¹²

Recent studies have supported these insights. Mollica and Zingales (2007)¹³ study the impact of venture capital on innovation and the creation of new businesses in geographical areas in U.S., while attempting to control for the quality of research in the area and the supply of potential venture capital investment from local and state pension funds. They find venture capital has a significant and positive effect on the production of patents and on the creation of new businesses.

Da Rin and Penas (2007)¹⁴ examine, using Dutch data, how venture capital contributes to a firm's innovation strategies. They focus their study on the effects of venture capital in building "absorptive capacity" (i.e. the capacity to assimilate and exploit new knowledge). They find that venture capital fund managers push investee companies towards building absorptive capacity and towards more permanent in-house R&D efforts. By contrast, they find that public funding relaxes financial constraints, but does not lead to a build-up of absorptive capacity. These results shed light on one way in which venture capital shapes and contributes to its investee firm's innovation strategies.

At a macro level, evidence of a positive relationship between the level of venture capital investment in an economy and indicators of innovation is set out in the three graphs below (note the causal linkages are untested but it seems plausible that they are symbiotic). These graphs plot the level of venture capital investment as a percentage of

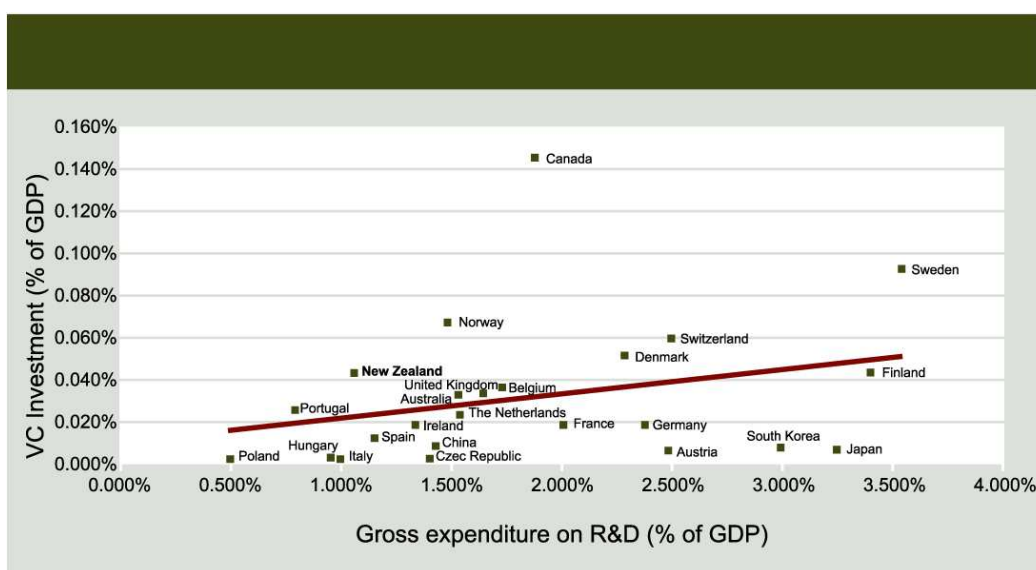
¹² Kortum & Lerner, *ibid.*

¹³ Mollica, M.A., and Zingales, L., (2007) "The Impact of Venture Capital on Innovation and on the Creation of New Business," Working paper.

¹⁴ Da Rin, M. and Penas, M.F., (2007). "The Effect of Venture Capital on Innovation Strategies," *NBER Working Papers*.

GDP and three indicators of innovation; gross expenditure on R&D (GERD) as a percentage of GDP, the number of triadic patents per million inhabitants, and the number of scientific publications per million of inhabitants. The trend line is the linear least squares regression line of best fit.

Figure 3: Venture capital investment (% of GDP) relative to gross expenditure on R&D (% of GDP): by country¹⁵



¹⁵ For illustrative purposes, Israel and the U.S. are omitted as outliers in Figure 3, Figure 4 and Figure 5. Data sources for these three figures are provided in Appendix 2.

Figure 4: Venture capital investment (% of GDP) relative to the number of triadic patents (per million inhabitants): by country

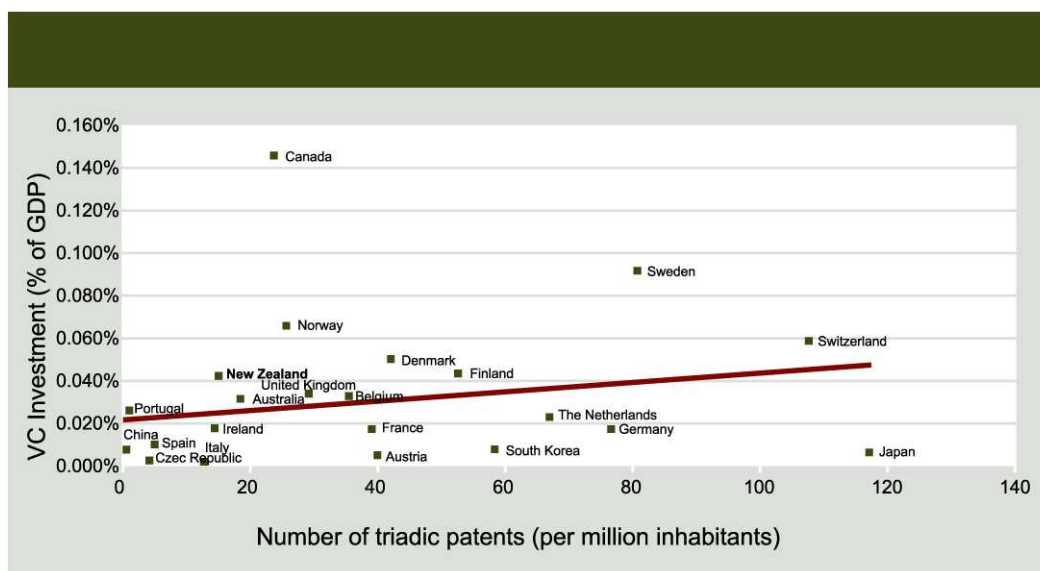
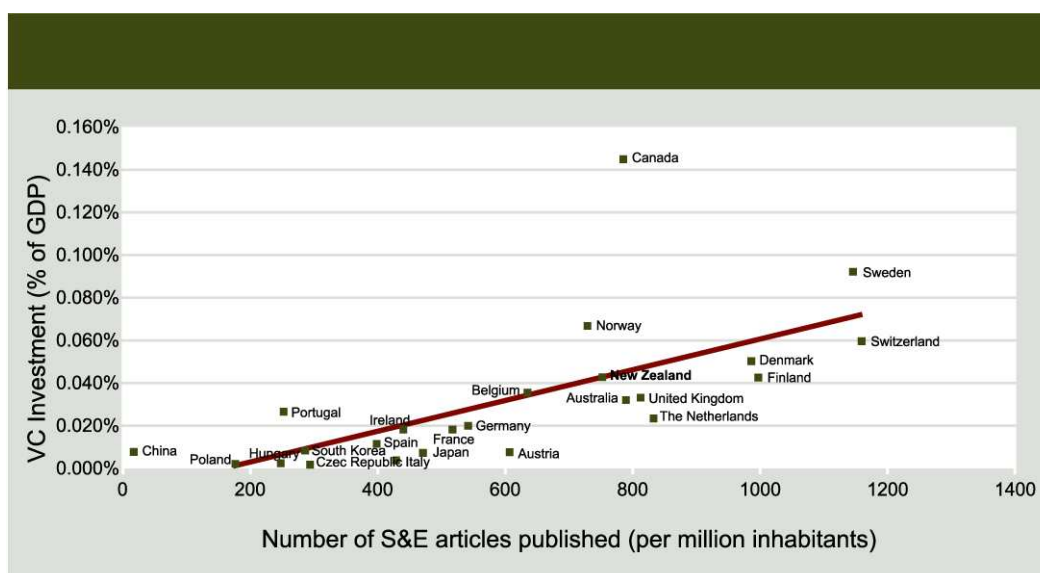


Figure 5: Venture capital investment (% of GDP) relative to the number of science and engineering articles (per million habitants): by country



In summary, there is strong evidence from firm-level research that venture capital spurs innovation. At the macro level, those economies that perform well in relation to innovation also have strong venture capital markets.

2.6 The impact of venture capital on firm efficiency

Two key tools of venture capital fund managers are careful screening of investment targets and the monitoring of their investments once they are committed. A number of studies examine the relative importance of these tools and other attributes of venture capital activity.

Chemmanur, Krishnan and Nandy (2008)¹⁶ examine ways in which venture capital contributes to the efficiency of firms, using data on venture-backed and non-venture-backed firms in the U.S., and find:

- The overall efficiency (measured using total factor productivity techniques) of venture backed firms is higher than non-venture-backed firms.
- The efficiency of venture backed firms is higher prior to receiving venture financing (attributed to screening), and growth in efficiency subsequent to receiving venture financing is greater for such firms relative to non-venture backed firms (attributed to monitoring). This increase in efficiency of venture-backed firms relative to non-venture-backed firms increases monotonically over the four years subsequent to the year of initial venture financing, and continues until exit.
- While the efficiency of venture-backed firms prior to venture financing is similar whether the venture capital fund involved is perceived to be of high or low reputation (determined on the basis of their market share), the increase in firm efficiency subsequent to financing is significantly higher where a high reputation venture capital fund is involved (attributed to the greater monitoring ability of higher reputation venture capital funds).
- The efficiency gains generated by venture-backed firms arise primarily from improvement in product market performance (i.e. sales). However, where high reputation venture capital funds are involved, the additional efficiency gains arise from both product market performance and reductions in input costs.
- Both the level of efficiency of venture-backed firms prior to receiving venture financing and the growth in efficiency subsequently positively affect the probability of a successful exit (by way of IPO or acquisition).

Sorensen (2006)¹⁷ examines, using U.S. data, whether the difference in the experience¹⁸ of the venture capital fund affects the likelihood of an IPO for the venture backed firm,

¹⁶ Chemmanur, T., Krishnan, K., (2008). "How Does Venture Capital Financing Improve Efficiency in Private Firms? A Look Beneath the Surface," *Center for Economic Studies Working Papers*.

¹⁷ Sorensen, M., 2006. "How Smart is Smart Money? A Two-Sided Matching Model of Venture Capital," *Journal of Finance*, 62(6).

and considers whether these effects arise from improved sorting (or screening) and/or influence (monitoring). He finds that both improved screening and monitoring have a significant effect, but that screening (choosing good firms) is almost twice as important as monitoring.

Lindsey (2008)¹⁹ tests for and finds that alliances (which are assumed to be efficiency enhancing) are more prevalent among companies sharing a common venture capital investor than otherwise. Further, such alliances are concentrated where contracting problems are more pronounced, consistent with the view that venture capitalists utilise privately held information and control rights to facilitate such alliances. She finds that these alliances improve the probability of a successful exit for venture backed firms.

Puri and Zarutskie (2008)²⁰ examine the differences in life cycles for venture and non-venture backed firms using a dataset that includes surviving and failed firms. They find:

- The main difference between venture-backed firms relative to non-venture-backed firms is that the former are much larger at every point of the firm's life cycle (whether they succeed or fail). Venture-backed firms grow more rapidly, but they found little difference in profitability measures at times of exit.
- Venture-backed firms' cumulative failure rates are lower than non-venture-backed but the story is nuanced. Venture capital appears initially "patient" in that venture-backed firms are less likely to fail in the first five years but, conditional on surviving past this point, are then more likely to fail relative to non-venture-backed firms.

Thus, these studies confirm that private information, screening and monitoring all play important roles in contributing to the overall efficiency of the venture capital market. They also support the notion that venture capital is a useful tool in enhancing productivity.

2.7 Lessons from other countries

In our 2005 study we reviewed the experience of five countries that had taken significant steps to develop their venture capital markets and on which there was readily

¹⁸ "Experience" in this study is measured by the number of investment rounds the venture capital fund has participated in since 1975.

¹⁹ Lindsey, L., (2008). "Blurring Firm Boundaries: The Role of Venture Capital in Strategic Alliances," *Journal of Finance*, 63(3).

²⁰ Puri, M. and Zarutskie, R., (2008). "On the Lifecycle Dynamics of Venture-Capital and Non-Venture-Capital-Finance Firms," *NBER Working Papers*.

available information. These were; Israel, Singapore, Canada, Australia and Finland. Our findings from this review were as follows:

- The Israeli government's direct investment policy, the Yozma Group, was instrumental to the successful pump priming of the Israeli venture capital industry. The fund's incentives were well designed and were successful at leveraging foreign capital and management expertise. This enabled local managers to learn from their foreign counterparts and enabled the training of venture capital professionals and support services (e.g. banking, law and accounting) that went on to successfully operate the domestic venture capital industry independent of direct investment by government equity programmes. Another important lesson was the associated timely exit of the government from the Yozma group activities once it had successfully established a sustainable venture capital sector.
- Early government initiatives in Singapore focused on demand-side policies in relation to the development of capabilities in research and development. Subsequent government policies, particularly in the late 1990s, shifted focus to supply side policies focusing on venture capital investments in seed and start-ups in high technology sectors. The major lesson derived from the Singaporean experience is that complementary demand side policies can very effectively foster the research and development and entrepreneurial capabilities that are imperative to the development of a self-sustaining and robust venture capital industry.
- The Canadian experience provides an illustration of the counter-productive effects of poorly designed policies. The tax incentives for the LSVCCs programme led to an influx of inexperienced investors into venture capital. The excess competition for investment-ready firms crowded out private sector investment. It also led to much waste of resources and to many experienced investors, including U.S. pension funds, shifting away from the Canadian markets over this period.
- Lessons from Australia were at best tentative at the time of our 2005 study, but a review was being undertaken. Experience at that stage suggested, consistent with lessons learnt from other jurisdictions, public/private funds which leverage both private capital and management expertise and which focus on seed and start-up firms seem to be successful at increasing the overall supply of venture capital. However there had been limited uptake at that time of the venture capital limited partnership arrangements due to the restrictions placed on the investments that qualify for this. Since 2005 venture capital funds in Australia have raised on average \$250 million per annum.²¹
- The key lesson to be drawn from the experience of Finland is the need to design any direct government stimulation of these markets in such a way that is attractive

²¹ Thompson Reuters, (2008). *Thompson Reuters & the Australian Private Equity & Venture Capital Association Limited Yearbook 2008*. AVCAL/Thompson Reuters.

to private investors (e.g. by shifting their risk/return profile through the inclusion of favourable buy-out provisions or other mechanisms). A further lesson is that the performance assessment framework for government participation in venture capital markets needs to take account of the long-term nature of these investments and recognise that a focus on annual profitability targets in the early period of these investments are likely to be counter-productive.

2.8 Findings from OECD studies

The OECD undertook studies of venture capital trends and policies in ten member country studies in 2003, covering Canada, Denmark, Israel, Korea, Portugal, Norway, Spain, Sweden, the U.S. and the U.K. The venture capital policy recommendations from these studies were summarised in a 2004 publication and a summary table of policy recommendations from those studies is reproduced below.²²

²² OECD (2004), “Science Technology Industry - Venture capital: Trends and Policy Recommendations,” *OECD project on Growth Follow-up: Micro-Policies for Growth and Productivity*, page 5.

Box 1: OECD Venture Capital Policy Recommendations

Investment regulations

- Ease quantitative restrictions on institutional investors to diversify sources of venture funds.
- Support the development of a private equity culture among institutional investment managers.
- Facilitate creation of alternative investment pooling ventures, such as fund-of-funds.
- Improve accounting standards and performance benchmarks to reduce opacity of venture capital funds and protect investors.
- Remove barriers to inflows of foreign venture capital finance.

Taxation

- Reduce complexity in tax treatment of capital from different sources and types of investment.
- Decrease high capital gains tax rates and wealth taxes which can deter venture capital investments and entrepreneurs.
- Evaluate targeted tax incentives for venture capital investment and consider phasing out those failing to meet a cost-benefit test.

Equity programmes

- Use public equity funds to leverage private financing.
- Target public schemes to financing gaps, e.g. start-up firms.
- Employ private managers for public and hybrid equity funds.
- Consolidate regional and local equity funds or use alternative support schemes.
- Focus venture funding on knowledge-based clusters of enterprises, universities, support services, etc.
- Evaluate public equity funds and phase-out when private venture market matures.

Business angel networks

- Link local and regional business angel networks to each other and to national initiatives.
- Ensure linkages between business angel networks and technology incubators, public-research spin-offs, etc.
- Provide complementary support services to enhance investment-readiness of small firms and increase demand.

Second-tier stock market

- Encourage less fragmentation in second-tier stock markets through mergers, e.g. at Nordic or European level.
- Enhance alternative exit routes such as mergers and acquisitions (M&A).

We note that our policy recommendations in our 2005 study were consistent with the first three categories of recommendations above (our study did not cover business angel investors and second-tier stock markets).

2.9 Funding and investment activities across countries

Mayer, Schoors and Yafeh (2003)²³ compare sources of funds and investment activities of venture capital funds in Germany, Israel, Japan and the U.K. The sources of venture capital funds differ significantly across these countries, e.g. banks are particularly important in Germany, corporations in Israel, insurance companies in Japan, and pension funds in the U.K.

Their study tests for relationships between differing sources of funds and the investment activities of the venture capital funds in terms of stage, sector and geographical location. They find differences in investment patterns are related to variations in funding sources. For example, bank and pension-fund backed venture capital funds invest more in later stage activities than individual and corporate backed funds, while the latter invest more in early stage and outside their own country. They also find that these patterns differ across countries; for example, bank-backed venture capital funds in Germany and Japan are as involved in early stage finance as other funds in these countries, whereas they tend to invest in relatively late-stage finance in Israel and the U.K.

These findings provide useful insights when raising capital for a venture capital fund in relation to matching of the investor base with the intended investment activities.

²³ Mayer, C., Schoors, K. and Yafeh, Y., (2003). "Sources of Funds and Investment Activities of Venture Capital Funds: Evidence from Germany, Israel, Japan and the U.K.," *NBER Working Papers*.

3 Rationale for government intervention

It is natural to ask why government should intervene in the venture capital market at all, as it may appear to be an activity best left to private market players. In this chapter we explore the rationale for possible government intervention and its limitations.

3.1 Public policy issues to initiate and sustain venture capital

It is instructive to observe that all venture capital markets of which we are aware were initiated with government support. These markets do not appear to emerge without some form of assistance. This leads to the question as to what it is that requires the need for government support in these markets, at least in their formative stages.

The desirability of venture capital markets from a public policy perspective lies in the importance of innovation as a spur for economic growth, and that venture capital appears to be a very efficient stimulator of innovation. Venture capitalists have developed a set of tools that are very well suited to the challenging task of nurturing high-risk but promising new ideas and taking them to market. Venture capital will never supplant other well-springs of innovation, such as vibrant universities and research laboratories, and is best viewed as a complement to them.

In contrast to the extensive research on other government interventions in the economy, such as regulation, taxation, welfare and privatisations, government interventions in the venture capital markets have been subjected to much less academic research and there is not as yet a well developed theory, and empirical testing, of the costs and benefits of government involvement in this sector. However, there is an emerging view that government assistance may be warranted to address one or more of three issues – R&D spill-overs, infrastructure building, and information asymmetries.

At the same time, history also conveys some substantial cautions about government intervention to spur venture capital. Literally tens of billions of dollars have been squandered by governments internationally in ill-conceived efforts to stimulate venture capital. In many cases, these efforts have been doomed to failure due to poorly designed programmes which were not based on an understanding of the workings of venture capital markets, or were designed on the basis of politically-directed allocation models without any role for signals from the market.²⁴

²⁴ See Gompers and Lerner, (2001). *The Money of Invention: How Venture Capital Creates New Wealth*, chapters 8 & 9.

3.1.1 The presence of R&D spill-overs

An extensive literature (reviewed in Griliches (1992)²⁵ and Jaffe (1996)²⁶ has documented the presence of economic spill-overs (or positive externalities) from R&D. These spill-overs take several forms. For instance, the rents associated with innovations may accrue to competitors who rapidly introduce imitations, to developers of complementary products, or to the consumers of these products. Whatever the mechanism of the spill-overs, however, the consequence is the same: firms will invest below the social optimum in R&D.

After reviewing a wide variety of studies, Griliches estimates that the gap between the private and social rate of return is substantial and probably between 50 and 100 percent of the private rate of return (depending in part on the nature of the R&D). While few studies have examined how these gaps vary with firm characteristics, a number of case-based analyses (Jewkes *et al.* (1958)²⁷, Mansfield, *et al.* (1977)²⁸) suggest that spill-over problems are particularly severe among small firms. These organisations are less likely to defend effectively their intellectual property positions or to extract most of the rents in their product markets. Small firms are also likely to be candidates for venture capital financing.

Public finance theory demonstrates that publicly financed support can be an appropriate and efficiency enhancing response to raise the level of investment in activities that generate positive externalities. While this is widely recognised in the case of core R&D (e.g. this is the basis in New Zealand for the Foundation of Research, Science & Technology and other granting programmes for R&D) it appears to also apply in the case of venture capital.

Viewed in this way, venture capital is an extension of the innovation system which already receives government support. In this context venture capital is designed to provide finance and associated business development services to firms which are still at a stage in their development cycle in which R&D spill-overs are prevalent.

²⁵ Griliches, Z., (1992). "The Search for R&D Spill-overs," *Scandinavian Journal of Economics*, 94(suppl.).

²⁶ Jaffe, A.B., (1996). "Economic Analysis of Research Spillovers: Implications for the Advanced Technology Program," *Economic Assessment Office, The Advanced Technology Program, National Institutes of Standards and Technology, U.S. Department of Commerce*.

²⁷ Jewkes, J., Sawers, D. and Stillerman, R., (1958). *The Sources of Invention*. St. Martin's.

²⁸ Mansfield, E. *et al.*, (1977). "Social and Private Rates of Return from Industrial Innovations," *Quarterly Journal of Economics*, 91(2).

3.1.2 Infrastructure building

A growing body of literature has suggested that venture capital is an “increasing returns” business: activity by one fund makes it easier for a second fund to operate, and so forth.²⁹ It is also clear that a venture capital market relies on a significant infrastructure (or eco-system) relatively specific to it to be self-sustaining. This infrastructure takes a variety of forms, including the following examples:

- Entrepreneurs become familiar with the trade-offs associated with venture capital financing. Initial disputes about the terms and conditions commonplace in venture financing are balanced with an appreciation for the possible gains with the involvement of a seasoned financier.
- Intermediaries such as lawyers, accountants and business advisers become familiar with the venture capital process and can better advise entrepreneurs and financiers alike.
- Investors gain greater comfort that the sector in which venture capitalists are operating is viable and become more willing to back funds, and to invest in venture-backed IPOs.
- Venture capitalists more readily find peers with whom they can share transactions. The syndication of transactions is an important part of “judgment sharing”, which allows venture capitalists to make more effective decisions than if they were operating alone.

Individual private investors or venture capital fund managers are unlikely to be able to capture many of the benefits from establishing this infrastructure and thus can be expected to under-invest in it. This form of market failure suggests a possible role for government.

The United States’ Small Business Investment Company (SBIC) provides an example of how public venture programmes can support the development of venture-investing infrastructure.³⁰ This programme stimulated the proliferation of many venture-related institutions in Silicon Valley and Route 128—the two major venture capital locations in the U.S. One notable example, Venture Economics, which originated as the SBIC

²⁹ Lerner, J., (1994). “The Syndication of Venture Capital Investments,” *Financial Management* 23(Autumn); Sorenson, O. and Stuart, T.E., (2001) “Syndication Networks and the Spatial Distribution of Venture Capital Investment,” *American Journal of Sociology*, 106(6); Hochberg, Y.V., Ljungqvist, A. & Lu, Y., (2007). “Whom You Know Matters: Venture Capital Networks and Investment Performance,” *Journal of Finance*, 62(1).

³⁰ Noone, C.M. and Rubel, S.M., (1970). *SBICs: Pioneers in Organized Venture Capital*. Capital Publishing Co.

Reporting Service in 1961, gradually expanded its scope to become the major source of returns data on the entire venture industry.

New Zealand's experience to date supports the view that some form of government stimulation is required to establish the infrastructure required to sustain a venture capital market. Prior to NZVIF there was no venture capital market to speak of, or infrastructure to support it, but this has increased since the inception of the NZVIF. There are now six VIF Venture Capital Funds that have invested in excess of \$200 million over the last six years.

We note infrastructure building would suggest a transitory role for government support, lasting only for as long as is required for a critical mass of infrastructure to be developed.

3.1.3 Information asymmetries

Empirical research suggests that new firms, and especially technology-intensive ones with products yet to be tested in the market, may receive insufficient capital to fund all their positive net present value projects due to information problems in the normal financing markets.³¹ This same issue arises for fund managers that wish to raise a venture capital fund in a market for which there is limited or no track record of performance.

As discussed above, venture capitalists specialise in financing these types of firms and have developed a range of mechanisms that attempt to address some of these information problems. These processes appear to be used by other investors to "certify" the most promising investments.

Lerner (1999)³² suggests this "certification effect" is one of the key drivers behind the very marked higher performance of awardee firms in the United States Small Business Innovation Research (SBIR) programme, relative to matching non-awardee firms. This difference in performance is illustrated in Table 5. This table presents the growth in

³¹ The literature on capital constraints (reviewed in Hubbard, R.G., (1998). "Capital-Market Imperfections and Investment," *Journal of Economic Literature*, 36(1)) documents that an inability to obtain external financing limits many forms of business investment. Particularly relevant are Hall, B.H., (1992). "Investment and Research and Development at the Firm Level: Does the Source of Financing Matter?" *NBER Working Papers*; Hao, K.Y. and Jaffe A.B., (1993). "Effect of Liquidity on Firms' R&D Spending," *Economics of Innovation and New Technology*, 2; Hao & Jaffe (1993), and Himmelberg, C.P. and Petersen, B.C., (1994). "R&D and Internal Finance: A Panel Study of Small Firms in High-Tech Industries," *Review of Economics and Statistics*, 76(1). These show that capital constraints appear to limit research-and-development expenditures, especially in smaller firms.

³² Lerner, J., (1999). "The Government as Venture Capitalist: The Long-Run Impact of the SBIR Program," *Journal of Finance*, 63.

employment between 1985 and 1995 of 541 firms that received Phase II awards between 1983 and 1985 as part of the Small Business Innovation research programme, as well as that of 894 firms that did not receive awards but that were selected to match these firms as closely as possible. The tabulation is presented for all awardees, and for firms that were or were not located in a zip code with at least one early-stage venture financing between 1983 and 1985. The results show the awardees grew considerably faster than companies in the same locations that did not receive awards.

Table 5: Growth of SBIR awardees and matching firms³³

	Change in employment	
	SBIR awardees	Matching non-awardees
Entire sample	+26	+6
Firms in zip code with VC activity	+47	+3
Firms in zip code without VC activity	+13	+7

The NZVIF programme, which incorporates a heavy investment in due diligence procedures, development and documentation of terms, and performance reporting requirements, is likely to create a “certification” effect in the investing market for those fund managers that are able to meet the NZVIF requirements. The interview evidence in our 2005 study suggested this has in fact been happening in the New Zealand market.

3.2 Limitations of government interventions

Even if there are sound economic reasons why government interventions in the venture capital markets could potentially be efficiency enhancing, there are also good reasons why this potential may not be achieved.

3.2.1 Distortions from political decision making

An extensive political economy and public finance literature emphasises the distortions that may result from government subsidies as particular interest groups or politicians seek to direct subsidies in a manner that benefits themselves. As articulated by Olson (1965)³⁴ and Stigler (1971)³⁵, and formally modelled in works such as Peltzman (1976)³⁶

³³ This table is based on Lerner (1999).

³⁴ Olson, M., (1965). *The Logic of Collective Action*. Harvard University Press.

and Becker (1983)³⁷, the theory of regulatory capture suggests that direct and indirect subsidies will be captured by parties whose joint political activity such as lobbying is not too difficult to arrange (i.e., when “free-riding” by coalition members is not too large a problem).

These distortions may manifest themselves in several ways. One possibility (discussed, for instance, in Eisinger (1988)³⁸, is that firms may seek transfer payments that increase their profits directly. Politicians may acquiesce to such transfers in the case of companies that are politically connected. A more subtle distortion is discussed by Cohen and Noll (1991)³⁹ and Wallsten (2000)⁴⁰ where officials may seek to select firms based on their likely success and fund them regardless of whether the government funds are needed to achieve that success. They can then claim credit for the firms’ ultimate success even if the marginal contribution of the public funds was very low. In programmes where a central group makes highly visible awards, the dangers of political distortions are likely to be high.

An illustration of these problems can be found in the largest public venture programme in the United States, the SBIR programme. Congressmen and their staffers pressure programme managers to award funding to companies in their states and, reflecting this, in almost every recent fiscal year all 50 states have received at least one SBIR award. Table 5 above highlights the consequences of such political pressures. In particular, it contrasts what happened to the workforce size of SBIR awardees located in regions characterised by considerable high-tech activity (that is, with venture capital activity in the same zip code) and those elsewhere. It reveals that in the 10 years after receipt of SBIR funding, the workforce of the average award recipient in a high-tech region grew by 47 (a doubling in size). The workforces of other awardees—those located in regions *not* characterised by high-tech activity—grew by only 13 employees. Though the recipients of SBIR awards grew considerably faster than a sample of matched firms, the superior performance, as measured by growth in employment (as well as sales and other

³⁵ Stigler, G.J., (1971). “The Theory of Economic Regulation,” *Bell Journal of Economics*, 2(1).

³⁶ Peltzman, S., (1976). “Toward a More General Theory of Regulation,” *Journal of Law & Economics*, 19(2).

³⁷ Becker, G.S., (1983). “A Theory of Competition Among Pressure Groups for Political Influence,” *Quarterly Journal of Economics*, 93(3).

³⁸ Eisinger, P.K., (1988). *The Rise of the Entrepreneurial State: State and Local Economic Development Policy in the United States*. University of Wisconsin Press

³⁹ Cohen, L.R. and Noll, R.G., (1991). *The Technology Pork Barrel*. Brookings Institution Press.

⁴⁰ Wallsten, S.J., (2000). “The Effects of Government-Industry R&D Programs on Private R&D,” *RAND Journal of Economics*, 31(1): 82-100.

measures), was confined to awardees in areas that already had private venture activity. In the name of geographic “diversity,” the programme funded firms with inferior prospects.

Staying with the SBIR example, particular companies have managed to capture a disproportionate number of awards. These “SBIR mills” often have staff in Washington that focus only on identifying opportunities for subsidy applications. This problem has proven difficult to eliminate, as “mill” staffers tend to be active, wily lobbyists. Moreover, “mills” commercialise far fewer projects than those firms that receive just one SBIR grant.⁴¹

This tendency of the political decision-making process leading to sub-optimal outcomes points to the need for the careful design of any publicly funded support for venture capital.⁴² The fund-of-fund design used for the NZVIF is a good example of this, whereby the allocation of funds to fund managers is devolved to a board independent of government and its fund management team. Fund allocation is also subject to private investors committing to the same fund (i.e. the fund manager must pass a market test prior to obtaining government support). Further, under this arrangement, the allocation of funds to individual firms is undertaken by the fund manager, who in turn is subject to governance exercised by private investors and NZVIF.

3.2.2 Duration and extent of public funding programmes

In all countries that have a venture capital sector that we are aware of, government funds have been used to effectively “prime the pump” for private venture capital by reducing the imbalances of funding across different stages, sectors and regions. This is particularly so in early stage investment in seed and start-up where the risk profile of investments is higher than its later stage counterparts, the investment horizon is longer, and there is often a lack of liquidity and general certainty of the investment’s return. Hence, private sector investors are often reluctant to invest in these early stages and government may play an important role in risk-sharing and ensuring sufficient equity capital is available.

In some countries, the government has played a dominant role for a long period of time. Examples include the U.S. SBIC programme and Yozma in Israel. These schemes not only channelled substantial amounts of risk capital to young firms, but helped to train

⁴¹ Lerner, J., (1999). “The Government as Venture Capitalist: The Long-Run Impact of the SBIR Program,” *Journal of Finance*, 63.

⁴² For a wider description of these public sector design issues see Chapter 10 of Scott G., (2001). *Public Sector Management in New Zealand: Lessons and Challenges*. Centre for Law and Economics, Australian National University; and Horn M., (1995). *The Political Economy of Public Administration – Institutional Choice in the Public Sector*. Cambridge University Press.

managers who later launched their own funds, stimulated growth in venture markets and instilled a venture culture.

However not all public initiatives are well-targeted and some have outlived their original purpose and usefulness. Over time public programmes tend to converge towards the same market segments as the private sector, rather than address gaps in the provision of risk capital. This can potentially crowd out private investors or even delay the development of private early stage financing. It is therefore necessary that the type and extent of government's role is continually evaluated. For example, in Israel Yozma was terminated as private sources of capital grew in the late 1990s, and was then re-invigorated in the early 2000s to address the lack of venture capital funding following the bursting of the "tech bubble".

These two examples illustrate that government funding should probably not continue indefinitely and that its purpose and direction may need to change over time. It is therefore useful to develop an evaluation system of such programmes which is capable of identifying the point at which a market is self-sustaining or when it requires a different form of intervention.

4 History and state of venture capital in NZ

Prior to the establishment of the NZVIF programme in 2002 and the resulting VIF Venture Capital Funds there was a virtual absence of dedicated venture capital funds operating in New Zealand. Private equity investment activity had been focused in later stage investments, management buy-outs, restructurings and so forth, with occasional investments in the venture capital space.

4.1 Government participation in venture capital

New Zealand governments have intervened in the venture capital (or similar) markets in three distinct phases over the last 40 years, with the establishment of a development bank, a private equity fund, and the NZVIF.

4.1.1 Development Finance Corporation

Government interventions in private equity and venture capital can be traced back to the establishment of the Development Finance Corporation (DFC) in 1964.

DFC was established as a development bank jointly owned by private banks, the Reserve Bank and the Government.⁴³ It was created to assist the development of New Zealand industry and in particular the export sectors. Its mandate included investment in areas now described as venture capital and it supported two venture capital style programmes, the Applied Technology Programme and the Small Business Venture Capital Fund. These were consolidated into DFC Ventures in 1984.

DFC became fully government-owned in 1973 and until 1977 enjoyed the benefit of a government guarantee. From the mid-1980s DFC took a more commercial approach to its lending, reflecting the changed public policy environment at the time to encourage all state-owned businesses to perform in accordance with commercial criteria.

The government in 1988 sold DFC to the National Provident Fund (80%) and Salomon Brothers (20%). In 1989, subsequent to severe deterioration in asset prices (and particularly in property in the case of the DFC), DFC became technically insolvent, which led to it being placed under statutory management and eventually wound up.

⁴³ This description of DFC is drawn from a speech from Dr Don Brash when Governor of the Reserve Bank of New Zealand (Brash, D., (1991). "The DFC Failure – Lessons for Banking Supervision," *Reserve Bank Bulletin*, 54(1).

4.1.2 The Greenstone Fund

The next example of government involvement in venture capital/private equity markets was the establishment of the Greenstone Fund in 1993. This \$25 million fund was a joint government/private sector fund with the following investors; Government (20%), the National Provident Fund (20%), National Mutual (20%) and AMP (40%). Pencarrow Private Equity Ltd was the fund manager. While its mandate allowed for investment in venture capital projects, in practice it focused on later stage investment and management buy-outs.

Greenstone was established as a 10 year limited life fund, but was subsequently extended to March 2007 and has been wound up.

We note that neither DFC nor the Greenstone Fund were successful in seeding a venture capital market in New Zealand.

4.2 Establishment of NZVIF

The most recent example of government intervention in the venture capital markets is the establishment of the New Zealand Venture Investment Fund (NZVIF) in 2002. The following provides some context to the development of NZVIF.

4.2.1 The state of the market as at 2000-02

The New Zealand venture capital market prior to NZVIF was characterised by:

- A virtual absence of dedicated local venture capital funds, very few private equity funds that invested in venturing, and a general lack of skills in these funds to manage venture capital investments.⁴⁴
- Little evidence of venture capital funds or managers with a venturing investment track record. There were one or two groups with some private equity track record.
- A fledgling industry association.

There were a number of funds that were either publicly listed vehicles or captive funds (on behalf of a single investor). Two of the current VIF Venture Capital Fund managers were operating as stand-alone private equity fund managers at that time: No 8 Ventures

⁴⁴ Of the wider group that identified themselves as venture capital fund managers that existed at the time, it is not known how formalised their structures were, or whether they had the typical characteristics of a standard venture capital fund, such as fixed life funds and a blind pool of capital committed to a portfolio of investments.

and Direct Capital. Direct Capital had achieved a first close of its TMT Ventures Fund, which was established as a specialist Australasian telecommunications and media fund, with capacity to do both early and late stage investments. No. 8 Ventures had recently raised its first venture capital fund, and was actively investing. In addition there were several individuals involved in various ways with technology companies, either brokering deals, advising and/or investing. Much of the activity was driven off the success of individual New Zealand technology companies that had caught the technology wave of the 1990s.

4.2.2 Government has another look at venture capital

It was during this time, in the presence of limited activity in the local market, that the Government began to (again) consider its role in venture capital and the importance of the sector in contributing to the growth of the economy. In particular, Government perceived a lack of commercial projects being brought to market by the CRIs and universities. This concern extended to a perceived gap in the supply of appropriate forms of financing and commercialisation/investment experience available to support emerging, innovative New Zealand companies and technologies.

In 2000 the NZ Treasury commissioned a study to review the New Zealand venture capital sector. The following extract from its Executive Summary sets out its key findings:⁴⁵

“The quality of decision making and advisory services within the venture capital market is critical to its medium term performance. Private sector advisors and investors have strong incentives as well as the requisite experience to provide high quality advice and make wise investment decisions. Any involvement by the government in this market should ideally be via existing players rather than standalone public agencies.

As for venture capital firms an exit strategy should be a priority for any government programme to assist business development via the venture capital market. The market is maturing steadily – gaps are being closed and the market is segmenting to cater for specific demands. Although this process is slow, the increased number and range of businesses active in the venture capital market over the past five years confirms that progress is being made. It tends to be more difficult for governments to withdraw from programmes than to start them. The more permanent a programme is perceived to be, the more likely it is to distort business behaviour.

If profitable projects are being forgone in the venture capital market it most probably relates to information. Differences in the quality and depth of

⁴⁵ Infometrics Ltd., (2000). “New Zealand’s Venture Capital Market: A Study Commissioned by the New Zealand Treasury,” *New Zealand Treasury Working Paper*. The extract on findings are paragraphs 12 – 17 of the Executive Summary.

information held by the two parties in most venture capital deals can vary significantly. The time and cost of achieving information symmetry and therefore achieving a mutually acceptable agreement can be prohibitive and therefore no deal is consummated. It is difficult to conclude confidently that such impasses constitute a market failure.

The logical point for the government to intervene would be to reduce transaction costs for participants. In the first instance, this is probably best achieved via direct assistance to those already involved in grooming and mentoring prospective businesses. The quality of this work is critical and therefore is best left in the hands of those with a clear incentive to complete the task accurately, promptly and skilfully – generally private sector businesses and individuals.

A key issue for any intervention is to avoid distorting the incentives and disciplines that are already becoming established within the venture capital market, and to avoid displacing current and potential players. This is especially important in a market that historically has been quite fragile.

New Zealand's venture capital market is maturing. Not fast enough for some and not soundly enough for others. The fundamental issue for this market is to build confidence amongst investors and entrepreneurs that the market will continue to develop effectively. The emergence of well-managed and successful private sector venture capital businesses is an important element in this process. Any government intervention in this market needs to be sensitive to generating distortions that could undermine confidence in the vigour and sustainability of venture capital firms."

4.3 Implementation of NZVIF

4.3.1 Goals of NZVIF

Shortly after the study referred to above the Government established the NZVIF with the purpose of accelerating the growth of the New Zealand venture capital market through co-investment with private investors and related market development activities. The NZVIF was established with four goals:⁴⁶

- To accelerate development of the venture capital industry by increasing the level of early stage investment activity in the New Zealand market;
- To develop a larger pool of people in New Zealand's venture capital market with skills and expertise in early stage investment;

⁴⁶ See CAB Min (01) 6/1 and NZVIF's "Statement of Corporate Intent, 1 July 2004 – 30 June 2009".

- To facilitate commercialisation of innovations from the Crown Research Institutes (CRIs), universities and the private sector; and
- To get more New Zealand businesses on paths to global success by increasing their access to international experts, networks and market knowledge.

4.3.2 Development path

The Government, following a review of venture capital investment programmes implemented in Australia, Singapore, U.S. and Israel, chose to model NZVIF along the lines of Israel's Yozma fund. It was felt that Israel's comparable size, distance to markets, similar challenges in attracting capital and its approach of developing the sector out of its emerging strength in science and technology made it an appropriate choice. This fitted well with Government aspirations to develop a venture capital sector on the basis of a strong domestic science and technology platform. In 2000 Yigal Ulrich, the founder of the Yozma Fund, came to New Zealand to advise on the design and implementation of what became NZVIF.

4.3.3 Features of Yozma adopted

Some features of the Yozma fund that were considered favourable and appropriate in the New Zealand context were as follows:

- The adoption of an equity based investment model. Other countries had sometimes supported business development by underwriting companies' debt. In the context of stimulating a venture capital market such an approach was not viewed as appropriate.
- A buy-out option for private investors. This provided the opportunity of making available Crown capital for reinvestment, and encouraging private co-investment by providing them the option to take a greater share of the up-side.
- A fund-of-fund model, whereby investment commitments are made to private venture capital fund managers. The fund managers take responsibility for making and managing investments, without political interference. This effectively distances the government from the commercial decision-making process and ensures that investment decisions are based on commercial imperatives.
- Co-investment alongside private investors. This serves to encourage private investors into the market (rather than displacing them) by improving portfolio diversification and thus reducing investment risk.
- Standard venture capital structures and commercial terms, for example fixed life funds with profit sharing to align manager and investor interests.

4.3.4 Features of Yozma discarded

Although many of the features of the Yozma Fund were adopted, others were discarded. The key differences between the NZVIF and Yozma Fund are as follows:

- The NZVIF investment ratio was less generous. While the Yozma fund provided \$1.00 for every \$1.50 of capital raised, the original NZVIF programme provided only \$1.00 for every \$2.00 raised in the private sector.
- The investment stages covered by the two funds were not identical. The Yozma fund was directed at all stages of venture capital. In contrast, the NZVIF design had initially specified only seed investments. Following advice from the Yozma fund to extend this for portfolio and risk management reasons, and indications from the market that this would be necessary in order to raise matching funds, the restriction was loosened to include early expansion investments.
- Yozma included generous tax provisions, to attract offshore diaspora investors. However, the New Zealand market raised concerns about tax issues at the very outset of NZVIF development. Little progress was made initially with respect to the key issue of tax “look-through” treatment for investors, but this has been addressed recently with the passage of the Limited Partnerships Act 2008 and associated tax legislation amendments.
- Adoption of different legal structures: in the Yozma funds a standard Delaware Limited Partnership structure was adopted, but in New Zealand a similar partnership structure was not available until the passage of the Limited Partnerships Act 2008. The preferred model until then for New Zealand venture capital fund managers was unincorporated joint ventures, a complication which may have retarded the capital formation process.

4.3.5 Institutional structure of NZVIF

Initially NZVIF sat within the Ministry of Research, Science & Technology (MoRST), with an Advisory Board. However, prior to any investments being made it was structured as a limited liability Crown Owned Company, which ensured the Crown could distance itself from risk and liability in respect of the investments made. This approach also ensured distance and independence from decisions on the allocation of funds to venture capital fund managers and from individual investment decisions.

The NZVIF is structured as follows:

- As a Crown Owned Company with an independent board of directors. Directors are selected for their venture capital and commercial experience.
- As a venture capital fund-of-funds, it invests in privately managed venture capital funds (known as VIF Venture Capital Funds).
- It invests in the VIF Venture Capital Funds on the same terms as private investors, except that (i) other investors in each Fund are provided with an option that is exercisable up to the end of the fifth year of the Fund to buy out the NZVIF investment on the basis of capital plus interest only (i.e. other investors can access any upside above this amount) and (ii) the Fund must operate within the investing profile across seed-start-up-early expansion as set out by NZVIF. It participates in investor governance decisions on the same terms as private investors, with the same voting rights. Investor governance arrangements reflect current market practice.

NZVIF's decision to invest in a particular Fund is made following completion of an extensive selection and due diligence process, undertaken on the Fund Manager, to determine whether the Fund proposal is "investment grade". Formal and detailed Fund Management and Co-investment Agreements, reflecting standard venture capital commercial practices, are then negotiated.

As outlined above, NZVIF plays an ongoing role in governance of the Funds invested in, through an Investor Advisory Committee. However, neither NZVIF nor private investors participate in the investment decision-making.

4.3.6 Establishment of VIF Venture Capital Funds

During the first investment round NZVIF played an active role, not only in raising local and international awareness of the NZVIF programme, but also in helping to educate the local investor market about venture capital as an asset class. An important part of the establishment process was to select the initial Funds through a competitive process.

This initial selection process (and subsequent ones) combines an in-house desktop assessment of all proposals received, with the selection of a shortlist of applicants who then proceed to a full due diligence process, including site visits, one on one interviews and reference checks, and validation of their investment track record. Initially this due diligence was conducted by Wilshire Australia Pty Ltd, an independent specialist private equity advisor. Nowadays it is undertaken by NZVIF management, in conjunction with third party advisors as required. A standard methodology and fixed criteria are used to assess and rank all applications received and to determine whether they are "investment grade". Following the completion of due diligence the NZVIF Board selects those applicants it wishes to negotiate investment terms with. Once Fund agreements are finalised, investment activity commences.

Criteria sought in VIF Venture Capital Fund managers are that they:

- Comprise people with the skills and experience needed to qualify as "investment grade" managers.
- Have the potential to become world-class venture capital fund managers.
- Are fully aligned with the purpose and intent of the VIF programme.
- Have convincing investment strategies aligned with the early stage focus of the VIF programme.
- Can engage professionally with appropriate long-term investors and succeed in raising the required private co-investment.
- Can be expected over time to deliver the superior returns expected from an experienced and successful venture capital fund manager.

A monitoring and reporting framework is agreed with each VIF Venture Capital Fund manager. This enables NZVIF to collect the economic and financial data it needs for the required regular reports to shareholding Ministers on the performance of each Fund and

the impact of the VIF programme. This also enables NZVIF to monitor each Fund to ensure it is compliant with its investment agreement and investor governance requirements.

As of March 2009 there were six VIF Venture Capital Funds, with NZVIF capital commitments as follows.

Table 6: Current VIF Venture Capital Funds (as at 31 March 2009)

Fund	Vintage	NZVIF commitment	No. of investments
TMT Ventures	2003	NZ\$21m	10 ⁴⁷
No 8 Ventures	2003	NZ\$11.7m	8
Endeavour Capital	2004	NZ\$13m	16
iGlobe Treasury	2004	NZ\$10.3m	6
BioPacific Ventures	2006	NZ\$10m	6
Pioneer Capital	2007	NZ\$23.8m	6
Annex Fund	2009	NZ\$20m	4

4.3.7 Development of an Annex Fund

The global financial crisis has created an environment where it is increasingly difficult for high growth firms to raise the necessary capital to support their operations. Within the VIF Venture Capital Fund portfolios are a number of companies that are making good progress and are expanding into global markets. These companies are at a critical stage of their development and sustaining this growth requires further capital without which the companies will struggle to meet their potential.

⁴⁷ The number of investments reflects the number of companies that NZVIF has invested into through each fund. TMT Ventures and BioPacific Ventures both have mandates that are broader than the NZVIF mandate and NZVIF Fund is therefore a subset of a larger fund. The number of investments does not therefore reflect the investment activity of the broader funds.

Due to the scale and maturity of existing venture capital funds in the market and the quantum of capital that these companies are seeking to raise, the existing VIF Venture Capital Fund managers have limited capacity to provide further capital support. In response to these market conditions and approaches from existing Fund managers, the NZVIF has decided to allocate additional capital for follow-on investment in existing portfolio companies.

The mechanism by which this capital will be invested is via an Annex Fund that is available to existing VIF Venture Capital Fund managers. This commitment can be drawn on at the time a Fund makes a follow-on investment, provided they also attract third party co-investment.

The features of the Annex Fund are consistent with the requirements of the NZVIF mandate. Specifically NZVIF will:

- Invest via an Annex fund rather than make direct investments.
- Remain a passive investor, with all decisions made by the existing VIF Venture Capital Fund managers, with the terms set by third party investors.
- Match private sector capital on existing ratios and on the same terms.
- Encourage a portfolio approach by:
 - requiring the fund manager to invest in existing portfolio companies
 - limiting the amount of NZVIF capital available for any one company to \$2 million
 - limit the amount of NZVIF capital available to any VIF Venture Capital Fund to \$5 million

The Annex Fund was established in December 2008 and at the time of writing NZVIF had made seven investments through the Annex Fund.

4.3.8 Development of the Seed Co-Investment Fund

The Seed Co-investment Fund (Seed Fund), also operated by NZVIF, is an equity investment fund aimed at small to medium sized businesses at the seed and start-up stage of development which have strong potential for high growth.

The Government's objective for the Seed Fund is primarily market development by focusing on increasing seed and early stage investment activity (primarily the angel investor community) within New Zealand and providing investment into companies that are:

- Innovative and technology/R&D intensive firms seeking to develop unproven markets or technology;
- Firms with assets that are difficult to value (such as intellectual property); and

- Those firms who find access to funding difficult because they have a lack of readily available collateral, no steady cash flow to service debt, and no track record of business operation.

The Seed Fund commenced in July 2005 and provides \$40 million of matched 1:1 seed funding to support the further development of early-stage investment markets. It operates as a co-investment fund alongside selected Seed Co-Investment Partners.

The Seed Fund has established partnerships with nine Seed Co-Investment Partners and as at 31 March 2009 had made investments of \$6 million across 21 companies

4.3.9 Key Features of the Seed Co-investment Fund

The key features of the Seed Co-Investment Fund are as follows:

- A total of \$40 million is available for investment through the Fund over a 5-6 year period.
- The Fund co-invests alongside accredited investment partners.
- The Fund will operate for a period of 12 years in total, with an expected investment period of 5-6 years.
- Seed-stage and start-up investments are eligible for the Fund.
- Investment occurs alongside selected private investor groups ("approved Seed Co-Investors").
- NZVIF will invest up to \$4 million total per Seed Co-Investment Partner with the potential for a further \$4 million subject to a partnership review.
- Investments through the Fund are limited to a maximum investment of \$250,000 in any one company or group of companies, with the possibility of another \$250,000 in follow-on capital at the discretion of NZVIF.
- 50/50 matching private investment is required for the Fund to invest.
- The Fund acts as a direct investor on the same terms as the Seed Co-Investment Partner.
- Any investments must be made in New Zealand businesses. A New Zealand business is defined as having the majority of assets and employees in New Zealand at the time that the initial investment is made.
- The Fund excludes investment in financial intermediaries, property development, retailing, mining and hospitality industry businesses.

4.4 Other NZVIF initiatives

Since its inception NZVIF has undertaken several activities to promote and encourage the development of the venture capital sector. These are summarised in the table below (which was provided by NZVIF).

Table 7: NZVIF activities to promote the development of the venture capital market in New Zealand

		2003	2004	2005	2006	2007	2008	2009
NZVCA support	Sponsorship	√	√	√	√	√	√	√
	Council membership			√	√	√	√	√
Investor education	Conference presentations	√	√	√	√	√	√	√
	Investor seminars	√	√			√	√	√
	Targeted visits	√	√	√	√	√	√	√
Regulatory/Tax	Submissions to Government	√	√	√	√	√		
	NZVCA subcommittee					√	√	√
Investment documents	Standard term sheets/contracts	√				√	√	
Research/Market data	NZVCA monitor input	√					√	√
	Survey/research		√			√		√
Industry profile	Media articles	√	√	√	√	√	√	√

4.5 Current state of the NZ venture capital market

The historical discussion of the NZ venture capital market highlights both how new it is and how difficult it is likely to be to establish a sustainable venture capital market in New Zealand. We describe in this section the current state of this market, to the extent possible given information available. As noted before, the history of venture capital in New Zealand prior to 2002 is tied to the development of a very small number of private

equity and venture capital fund managers and the data on venture capital as a subset of private equity activity is not readily available or reliable.

4.5.1 NZ venture capital in international context

Figure 6 and Figure 7 below provide a snapshot of the venture capital investment in New Zealand relative to a range of other countries in 2004 (from our 2005 study) and 2007, with all amounts expressed as a percent of GDP.

Figure 6: Annual investment (2004) in venture capital (seed and start-up) as a percent of GDP

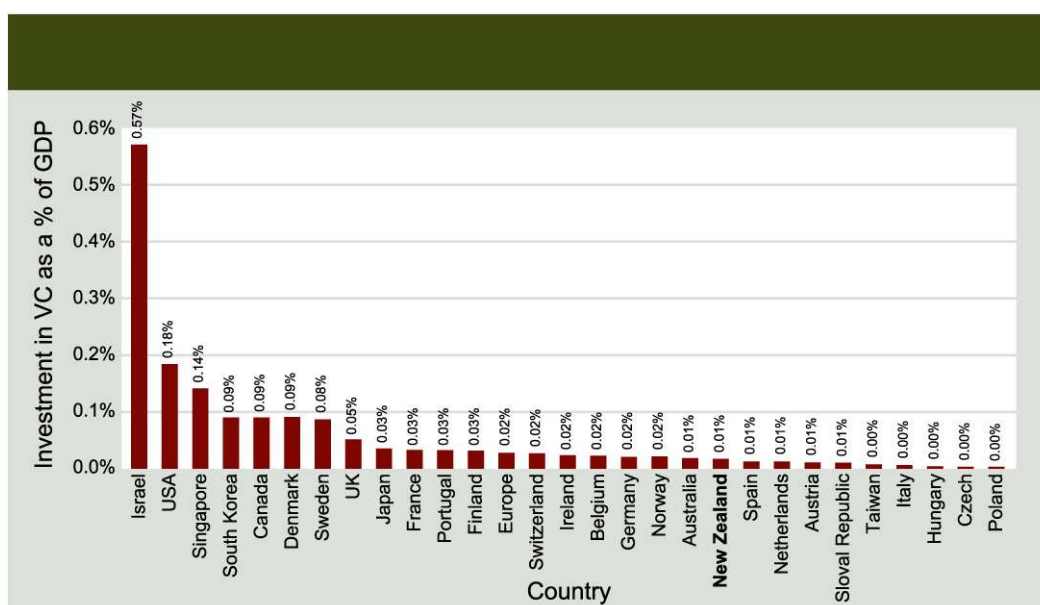
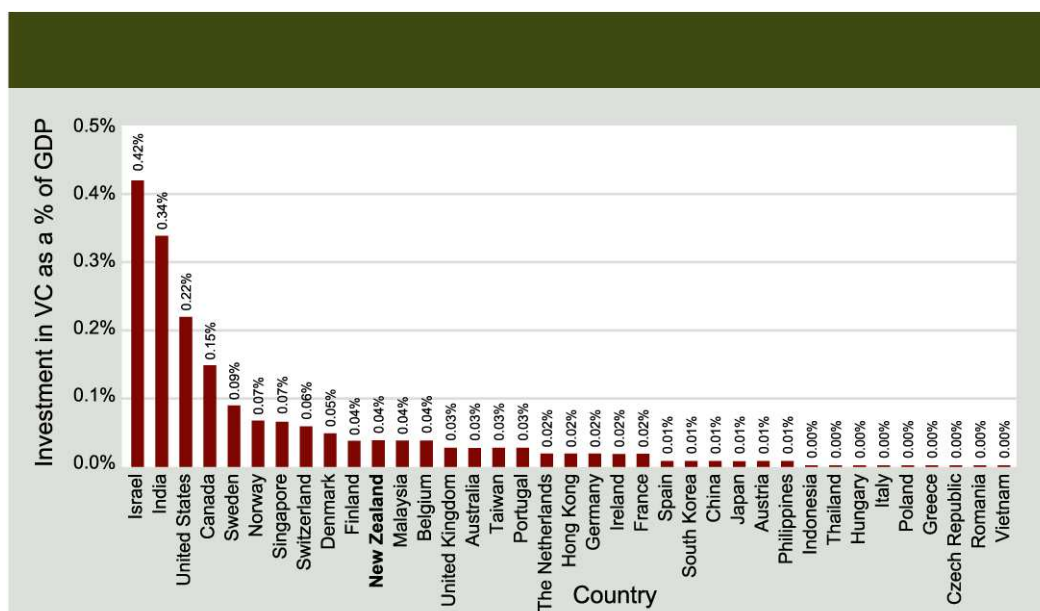


Figure 7: Annual investment (2007) in venture capital (seed and start-up) as a percent of GDP⁴⁸



We note that the level of venture capital investment in 2007 was substantially higher than in 2004 (0.04% versus 0.01%), and New Zealand's ranking shifted up the international ranks considerably.

In Table 8 below we provide, for illustration purposes, the level of investment that would be required if New Zealand were to increase its investment in venture capital to a level comparable to other countries in the OECD, such as Canada, Sweden and Norway.⁴⁹ For example, if New Zealand were to increase its level of investment to that of Sweden it would need to invest \$85 million annually. Similarly if New Zealand's level of investment relative to GDP were to reach that of Canada, it would require an almost three-and-half fold increase (\$192 million) in investment relative to its current level of \$54 million.

⁴⁸ See Appendix 2 for the data sources for this graph and for Figure 8.

⁴⁹ For the purposes of this table, New Zealand's GDP for 2007 has been used. As GDP increase the level of investment required would have to increase to achieve the same proportion.

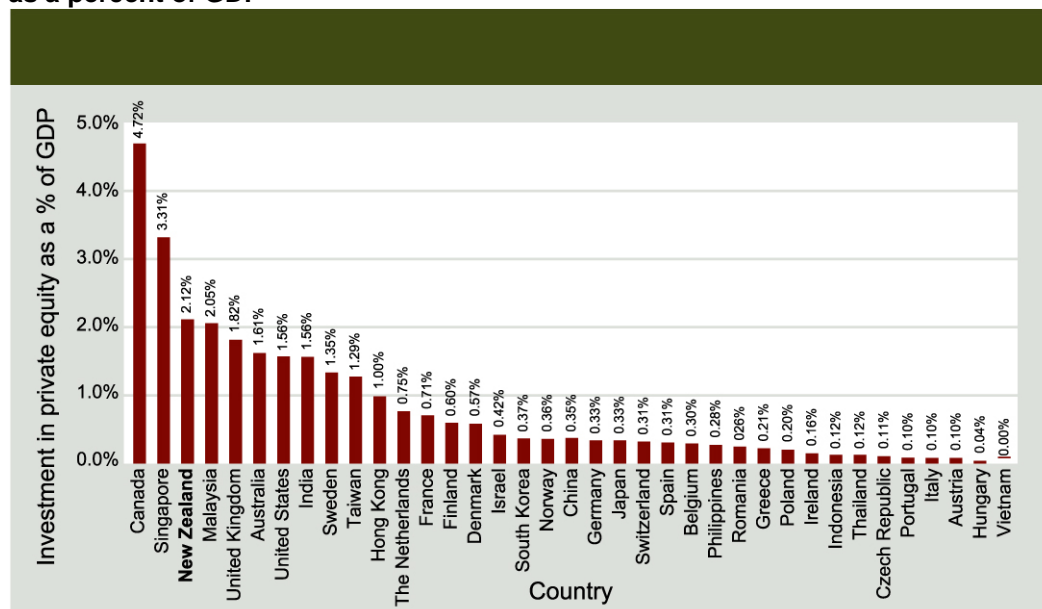
Table 8: Levels of annual investment required in New Zealand to reach levels as a percent of GDP in selected other countries

Venture capital as a percent of GDP	Countries at similar level of investment (VC/GDP) as at 2007	Venture capital investment (\$m) per annum required by New Zealand
0.04%	New Zealand, Finland	\$54
0.05%	Denmark	\$64
0.06%	Switzerland	\$77
0.07%	Singapore, Norway	\$90
0.08%	-	\$102
0.09%	Sweden	\$115
0.10%	-	\$128
0.11%	-	\$141
0.12%	-	\$154
0.13%	-	\$167
0.14%	-	\$179
0.15%	Canada	\$192

Figure 8 below provides a similar country comparison but for all forms of private equity investments, as a percent of GDP, for 2007. We note New Zealand had an unusually high value of private equity investment in this year, relative to previous years.⁵⁰

⁵⁰ See New Zealand Venture Capital Association, (2008). *The New Zealand Private Equity and Venture Capital Monitor, First Half Year results – January to June 2008*, page 2.

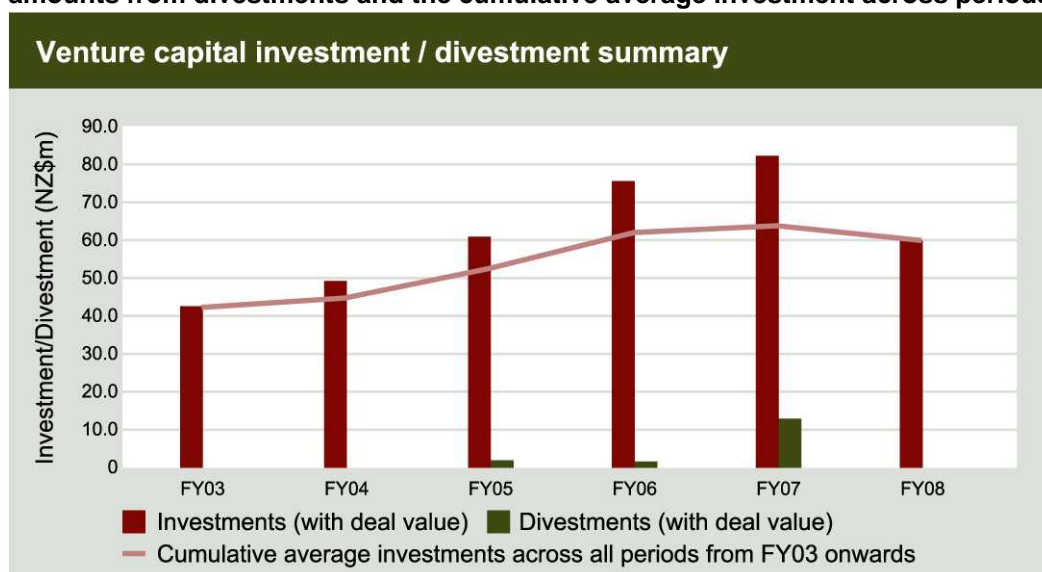
Figure 8: Annual investment (2007) in private equity (inclusive of venture capital) as a percent of GDP



4.5.2 Trends in overall NZ venture capital

Figure 9, taken from the NZVCA Monitor, sets out the trend in venture capital investing from 2003 to 2008 (years are calendar years) in terms of amounts invested, amounts from divestments, and the average (cumulative) investment across periods to date.

Figure 9: Trend in venture capital investing from 2003-2008 (amounts invested, amounts from divestments and the cumulative average investment across periods)



Source: NZ PE & VC Monitor 2008

4.5.3 Information on the VIF Venture Capital Funds

NZVIF provided us the information in Table 9 on the VIF Venture Capital Funds portfolio, as at 31 March 2009.

Table 9: Information on VIF Venture Capital Funds Portfolio as at 31 March 2009

VIF Venture Capital Funds Portfolio							
	2003	2004	2005	2006	2007	2008	2009 ⁵¹
Number of VIF VC Funds	4	4	5	5	6	6	6
Amount committed By NZVIF to VIF VC Funds	\$50m	\$50m	\$60m	\$60m	\$82m	\$97m	\$110m
Number of companies invested in through VIF VC Funds	4	15	30	36	44	47	48
Number of seed and start up investments	1	10	20	25	30	32	33
Cumulative amount invested through the VIF VC Funds (NZVIF & private sector)	\$12m	\$40m	\$75m	\$114m	\$158m	\$206m	\$218m
Number of key investment personnel in VIF VC Funds	10	13	16	16	19	19	19
Number of deals from Crown Research Institutes & Universities	0	4	7	9	10	11	11
Number of companies exporting	2	6	13	15	24	26	28
Number of companies attracting offshore capital	2	4	5	9	13	15	16

⁵¹ Up to 31 March 2009

Figure 10 and Figure 11 below set out the investments by the VIF Venture Capital Funds in terms of stage and sector as at 31 March 2009, and Figure 12 the pattern of new versus follow-on investments over their life to December 2008

Figure 10: NZVIC Venture Capital Portfolio: Stage by value (as at 31 March 2009)

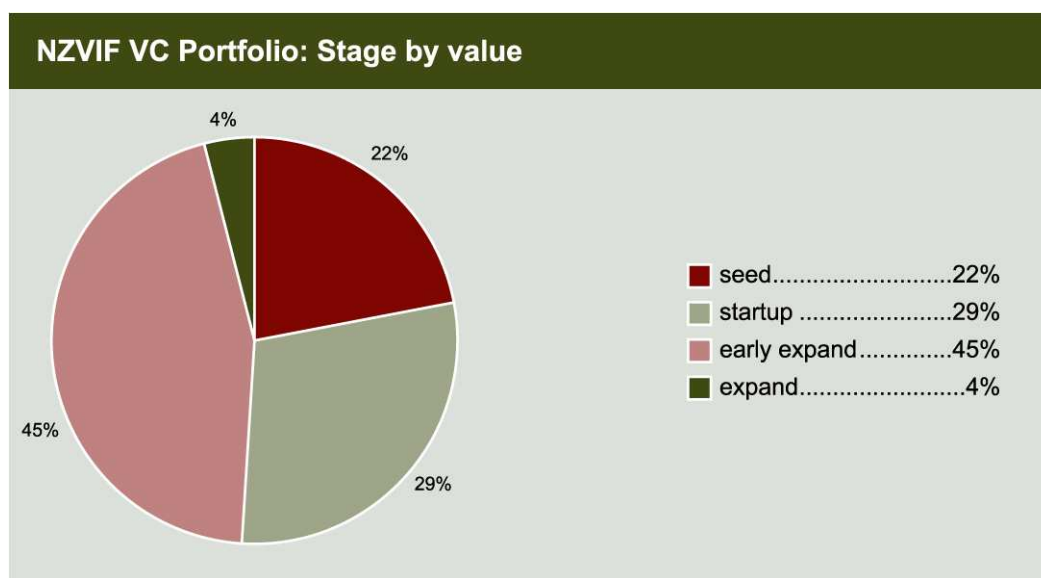


Figure 11: NZVIC Venture Capital Portfolio: Sector by value (as at 31 March 2009)

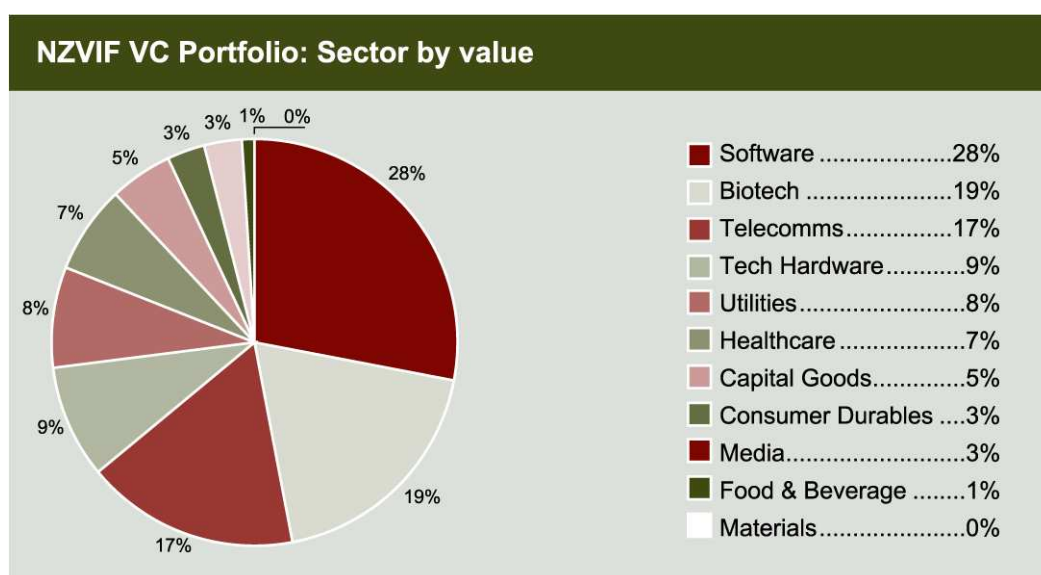


Figure 12: NZVIF Venture Capital Funds' pattern of new and follow-up investment (up to December 2008)

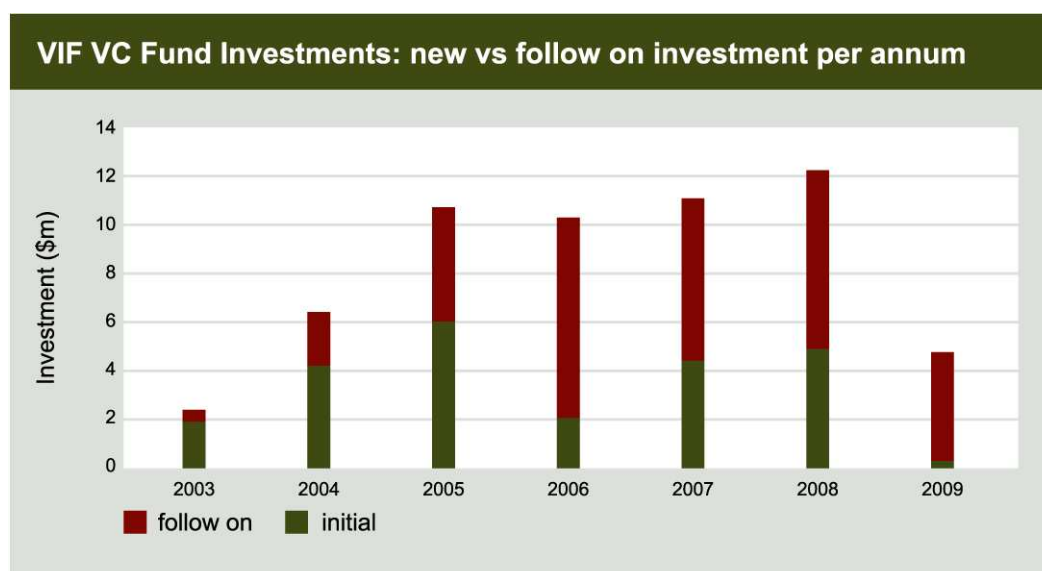


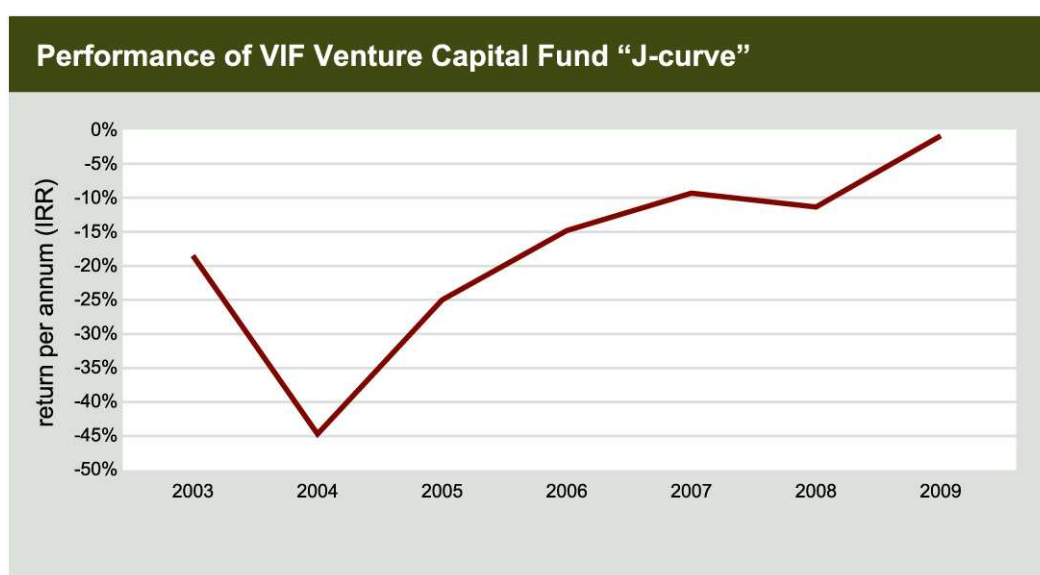
Table 10 below sets out the performance to 31 March 2009 of the NZVIF investment in VIF VC Funds.

Table 10: Performance of NZVIF Venture Capital Fund Portfolio (as at 31 March 2009)

Performance of NZVIF investment in VIF VC Funds							
	2003	2004	2005	2006	2007	2008	2009
Cumulative total investment by NZVIF in VIF VC Funds	3.8	11.4	24.2	36.2	51.1	65.1	70.6
Distributions received by NZVIF from realisation of investments	0	0	1.5	0	0.3	0	3.0
Value of NZVIF investment in VIF VC Funds as at 31 March 2009 (net of management fees)	1.8	7.2	17.9	25.7	36.3	52.1	64.4
Value + distributions, divided by total investment, as a %	0.47	0.63	0.80	0.75	0.75	0.83	0.98

Figure 13 sets out graphically the performance to date of the VIF Venture Capital Funds portfolio. By its nature the returns to individual venture capital funds over their life are very difficult to forecast, and this is made more difficult in the New Zealand context as there is no history of venture capital to assist such forecasts. Historically, however, venture capital returns have followed what is termed a “J-curve,” where a period of negative returns are replaced by positive ones, reflecting the harvesting of successful investments over time. In the case of the portfolio of VIF Venture Capital Funds its value as at March 2009, taking into account distributions to date and net of management fees, is just under the amount invested.

Figure 13: Performance of VIF Venture Capital Funds



5 Conclusions

Venture capital has the potential to contribute very significantly to New Zealand's economic growth, and to the level of innovation and efficiency of its young and emerging businesses, as it is an important complement to other aspects of New Zealand's innovation and growth systems (e.g. to publicly and privately funded R&D, university and CRI research programmes, and so forth).

However, developing a viable venture capital industry is a long term task, and is not easy. It requires prolonged commitment from those involved directly and from policy makers. Over recent years the growth in New Zealand's venture capital activity is encouraging but modest. The VIF Venture Capital Funds are growing slowly and at this stage their value is just under the amount invested. Few divestments have been made and none of the options to buy out the Crown's stake in these Funds within the first five years have been exercised (these options have now lapsed for four of the six Funds).

In our 2005 study of New Zealand's venture capital market we recommended the government maintain its policy to support the venture capital market through the NZVIF and its associated VIF Venture Capital Funds, as we considered this structure to be appropriate to the task. We remain of this view for reasons outlined in this report.

In our view the government should maintain a steady and predictable policy with respect to the development of a venture capital market. The global financial crisis will have slowed the ability of the VIF Venture Capital Funds to grow and exit their investee businesses over the medium term. In reality, given that four of them are now more than half way through their 10 year terms and face these added difficulties, these Fund managers may find it challenging to raise further funds without government assistance. This suggests that government support is likely to be necessary for at least the next generation of funds. If this is accepted, it suggests the government should be viewing its involvement in this sector for at least another fifteen years (assuming each generation of fund is about ten years).

In our 2005 study the underlying policy themes of our recommendations were for government to:

- Create and nurture a policy environment that is conducive to venture investment, entrepreneurship, and the commercialisation of technology.
- Be patient and persistent. The historical record teaches that building a venture capital industry takes many years.
- Listen to the market, and design interventions to dovetail with and support the development of conventional venture capital institutions and arrangements.

We consider these policy themes remain just as relevant and important now as they were then if New Zealand is to develop a viable New Zealand venture capital market.

Bibliography

AusIndustry, (2005). "Summary of Aus Industry Products", www.ausindustry.gov.au (last viewed 27/07/05).

AusIndustry, (2005). "Interim Evaluation of the Innovation Investment Fund," www.ausindustry.gov.au (last viewed 27/07/05).

AusIndustry. "Commercialising Emerging Technologies (COMET) Interim Evaluation," www.ausindustry.gov.au (last viewed 27/07/05).

Australian Bureau of Statistics, (2004). "Venture Capital 2003-04," 5678.0.

Avnimelech, G., Kenney, M. and Teubal, M., (2004). "Building Venture Capital Industries: Understanding the U.S. and Israeli Experience," BRIE Working Paper 160, March 2.

Becker, G.S., (1983). "A Theory of Competition Among Pressure Groups for Political Influence," *Quarterly Journal of Economics*, 93(3): 371-400.

Brash, D., (1991). "The DFC Failure – Lessons for Banking Supervision," *Reserve Bank Bulletin*, 54(1).

Carragher, A. and Kelly, D., (1998). "An Evaluative Comparison of the Canadian and American Private Equity Markets," *Journal of Private Equity*, 1(3).

Chemmanur, T., Krishnan, K., (2008). "How Does Venture Capital Financing Improve Efficiency in Private Firms? A Look Beneath the Surface," Center for Economic Studies Working Papers.

Cohen, L.R. and Noll, R.G., (1991). *The Technology Pork Barrel*. Brookings Institution Press.

Cope, G., (2005). "Issues and Policy Framework for the Development of Self-Sustainable Venture Capital Markets in Europe," *University of Luxembourg*.

Da Rin, M. and Penas, M.F., (2007). "The Effect of Venture Capital on Innovation Strategies," *NBER Working Papers*.

Department of Industry, Tourism and Resources, (2005). "Pooled Development Funds (PDF) Program Fact Sheet," www.industry.gov.au (last viewed 27/07/05).

Department of Industry, Tourism and Resources, (2005). "Pre-Seed Fund," www.industry.gov.au (last viewed 27/07/05).

Dimov, D.P. and Murray, G.C., (2005). "Venture Capital Investments in Seed Companies," Submitted to *Journal of Business Venturing*, February 2005.

Ernst & Young and New Zealand Venture Capital Association, (2008). *The New Zealand Private Equity and Venture Capital Monitor 2008*.

Fenn, G.W., Liang, N. and Prowse, S., (1995). "The Economics of the Private Equity Market." In *Staff Studies*: Board of Governors of the Federal Reserve System (U.S.).

Freear, John, and William Jr Wetzel (1990). "Who Bankrolls High-Tech Entrepreneurs?" *Journal of Business Venturing* 5, no. 2 (1990): 77-89.

Gilson, R.J. and Black B., (1999). "Does Venture Capital Require an Active Stock Market?" *Journal of Applied Corporate Finance*, 11(4): 36-48.

Gompers, P., (1995). "Optimal Investment, Monitoring, and the Staging of Venture Capital," *Journal of Finance*, 5(5): 1461 – 1489.

Gompers, P. and Lerner J., (1998). "What Drives Venture Fundraising?" in Winston, C., Baily, N.B. & Reiss, P.C. (eds.), *Brookings Papers on Economic Activity: Microeconomics*, pp.149-192.

Gompers, P. and Lerner J., 2001. *The Money of Invention: How Venture Capital Creates New Wealth*. Harvard Business School Press.

Gompers, P. and Lerner J., 1999. *The Venture Capital Cycle*. MIT Press.

Griliches, Z., (1992). "The Search for R&D Spillovers," *Scandinavian Journal of Economics*, 94(suppl.): S29-S47.

Hao, K.Y. and Jaffe A.B., (1993). "Effect of Liquidity on Firms' R&D Spending," *Economics of Innovation and New Technology*, 2: 275–82

Hellmann, T. and Puri, M., (2000). "The Interaction between Product Market and Financing Strategy: The Role of Venture Capital," *Review of Financial Studies*, 13(4): 959-84.

Himmelberg, C.P. and Petersen, B.C., (1994). "R&D and Internal Finance: A Panel Study of Small Firms in High-Tech Industries," *Review of Economics and Statistics*, 76(1): 38-51.

Hochberg, Y.V., Ljungqvist, A. & Lu, Y., (2007). "Whom You Know Matters: Venture Capital Networks and Investment Performance," *Journal of Finance* 62(1): 251-301.

Horn M., (1995). *The Political Economy of Public Administration – Institutional Choice in the Public Sector*, Cambridge University Press.

Hubbard, R.G., (1998). "Capital-Market Imperfections and Investment," *Journal of Economic Literature*, 36(1): 193-225

Infometrics Ltd., (2004). "New Zealand's Angel Capital Market: The Supply Side," Report to Ministry of Economic Development.

Infometrics Ltd., (2000). "New Zealand's Venture Capital Market: A Study Commissioned by the New Zealand Treasury", *New Zealand Treasury Working Paper*.

Jaffe, A.B., (1996). "Economic Analysis of Research Spillovers: Implications for the Advanced Technology Program," *Economic Assessment Office, The Advanced Technology Program, National Institutes of Standards and Technology, U.S. Department of Commerce*.

Jeng, L.A. and Wells, P.C., (2000). "The Determinants of Venture Capital Funding: Evidence Across Countries," *Journal of Corporate Finance*, 6: 241-289.

Jewkes, J., Sawers, D. and Stillerman, R., (1958). *The Sources of Invention*. St. Martin's.

Keuschnigg, C., (2003). "Optimal Public Policy for Venture Capital Backed Innovation," *University of St. Gallen. Discussion Paper* (2003-09).

Koh, F. and Koh, W., (2002). "Venture Capital and Economic Growth: An Industry Overview and Singapore's Experience," Singapore Management University: *SMU Economics and Statistics Working Paper Series*, (21-2002).

Kortum, S. and Lerner, J., (2000). "Assessing the Contribution of Venture Capital to Innovation," *RAND Journal of Economics*, 31(4): 674-692.

Kortum, S. and Lerner J., (1998). "Does Venture Capital Spur Innovation?" *NBER Working Papers*.

KPMG, 2003. "Investigation of Innovation and Venture Funding Alignment: Review of the Consequences of the Offshore Sale of Three New Zealand Companies."

Lerner, J., (1999). "The Government as Venture Capitalist: The Long-Run Impact of the SBIR Program," *Journal of Business*, 72: 285-318.

Lerner, J., (1994). "The Syndication of Venture Capital Investments," *Financial Management*, 23(Autumn): 16-27.

Lerner, J., Moore, D. and Shepherd, S., (2005). "A Study of New Zealand's Venture Capital Market and Implications for Public Policy: To the Ministry of Research, Science & Technology," LECG.

Lindsey, L., (2008). "Blurring Firm Boundaries: The Role of Venture Capital in Strategic Alliances," *Journal of Finance*, 63(3), 1137-1168.

Mansfield, E. *et al.*, (1977). "Social and Private Rates of Return from Industrial Innovations," *Quarterly Journal of Economics*, 91(2): 221-240.

Maula, M. and Murray, G., (2003). “Finnish Industry Investment Ltd.: An International Evaluation,” Ministry of Trade and Industry.

Mayer, C., Schoors, K. and Yafeh, Y., (2003). “Sources of Funds and Investment Activities of Venture Capital Funds: Evidence from Germany, Israel, Japan and the U.K.,” *NBER Working Papers*.

Ministry of Economic Development, (2004). “Attracting Intellectual Foreign Direct Investment.”

Ministry of Economic Development, (2003). “Growth and Innovation Framework: Benchmark Indicators Report 2003.”

Mollica M.A., Zingales L., “The Impact of Venture Capital on Innovation and the Creation of New Business,” unpublished on the SSRN website, October 2007

New Zealand Venture Investment Fund Ltd, *Statement of Corporate Intent*, 1 July 2004 – 30 June 2009

Noone, C.M. and Rubel, S.M., (1970). *SBICs: Pioneers in Organized Venture Capital*. Capital Publishing Co.

OECD, (2005). “Main Science and Technology Indicators,” Volume 2005/01.

OECD, (2004). “Science, Technology and Industry Outlook 2004.”

OECD (2004), “Science Technology Industry - Venture capital: Trends and Policy Recommendations,” *OECD project on Growth Follow-up: Micro-Policies for Growth and Productivity*.

OECD, (2003). “Venture Capital Policy Review: Canada,” *STI Working Paper* (2003/4).

OECD, (2003). “Venture capital policy review: Denmark,” *STI Working Papers* (2003/10).

OECD, (2003). “Venture capital policy review: Israel,” *STI Working Papers* (2003/3).

OECD, (2003). “Venture capital policy review: Norway,” *STI Working Papers* (2003/17).

OECD, (2003). “Venture capital policy review: Portugal,” *STI Working Papers* (2003/19).

OECD, (2003). “Venture capital policy review: Spain,” *STI Working Papers* (2003/18).

OECD, (2003). “Venture capital policy review: Sweden,” *STI Working Papers* (2003/11).

- Olson, M., (1965). *The Logic of Collective Action*. Harvard University Press.
- Peltzman, S., (1976). "Toward a More General Theory of Regulation," *Journal of Law & Economics*, 19(2): 211-240.
- Poterba, J. M, (1989). "Venture Capital and Capital Gains Taxation," in Summers, L. (ed.) *Tax Policy and the Economy: Volume 3* 47-68. (pp. 47-68). MIT Press.
- PricewaterhouseCoopers, (2002). "Global Private Equity 2002: A Review of the Global Private Equity and Venture Capital Markets."
- PricewaterhouseCoopers, (2003). "Bank Lending Practices to Small and Medium Sized Firms," Report to the Ministry of Economic Development.
- Puri, M. and Zarutskie, R., (2008). "On the Lifecycle Dynamics of Venture-Capital and Non-Venture-Capital-Finance Firms," *NBER Working Papers*.
- Romain, A. and van Pottelsberghe B., (2004). "The Economic Impact of Venture Capital," Deutsche Bundesbank, *Discussion Paper Series 1* (18/2004).
- Scott G., (2001). *Public Sector Management in New Zealand: Lessons and Challenges*. Centre for Law and Economics, Australian National University
- Singapore Economic Development Bank, (1995). "More Venture Capital Funds Managed in Singapore," www.sedb.com.sg (last viewed 24/08/05).
- Singapore Economic Development Bank, (1996). "VC Industry Poised for Higher Growth," www.singapore-inc.com (last viewed 24/08/05)
- Sorensen, M., 2006. "How Smart is Smart Money? A Two-Sided Matching Model of Venture Capital," *Journal of Finance*, 62(6). 2725-2762.
- Sorenson, O. and Stuart, T.E., (2001), "Syndication Networks and the Spatial Distribution of Venture Capital Investment," *American Journal of Sociology*, 106(6): 1546-1588.
- Statistics New Zealand, (2005). "Business Finance Survey: 2004."
- Statistics New Zealand, (2004). "Research and Development Survey: 2004."
- Statistics New Zealand, (2003). "Innovation Survey: 2003."
- Statistics New Zealand. *Biotechnology 2003/2004*.
- Stigler, G.J., (1971). "The Theory of Economic Regulation," *Bell Journal of Economics*, 2(1): 3-21.

Thompson Reuters, (2008). *Thompson Reuters & the Australian Private Equity & Venture Capital Association Limited Yearbook 2008*. AVCAL/Thompson Reuters.

Trajtenberg, M., (2001). "R&D Policy in Israel: An Overview and Reassessment," in Feldman M. and Link A. (eds.) *Innovation policy in the knowledge based economy* (pp. 409- 454). Springer.

Vihko R., Castells M., Georghiou L., Jalkanen S., Meyer-Krahmer F., Vuoko P. and Grohn M., (2002). "Evaluation of Sitra 2002," Sitra, Helsinki.

Wallsten, S.J., (2000). "The Effects of Government-Industry R&D Programs on Private R&D," *RAND Journal of Economics*, 31(1): 82-100.

Glossary⁵²

Seed: An investee company is at the seed stage of its development if the investment will enable development, testing and preparation of a product or service to the point that it is feasible to start business operations.

Start-up: An investee company is at the start-up stage of its development if the investment will enable actual business operations to get underway. This includes further development of the company's product(s) and initial production and marketing.

Early stage: Refers to seed and start-up.

Early Expansion: An investee firm is at the early expansion stage of its development if the investment provides capital to initiate or expand commercial production and marketing but where the company is normally still cash flow negative.

Venture Capital:⁵³ Defined as a subset of private equity, and that portion that is focused on equity or equity-linked investments in privately held, high growth companies in their seed, start-up and early expansion phases of development.

Private Equity: Private equity funds are pools of capital specialising in venture capital, business expansions, leveraged and management buyouts, mezzanine investments, distressed debt, and related investments. Internationally these pools of capital are typically organised as partnerships and are not listed and traded in the security markets and hence the term "private equity".

⁵² The definitions for seed, start-up and early expansion have been taken from NZVIF (see www.nzvif.co.nz).

⁵³ The definition of venture capital and private equity varies from region to region. This is the definition used in this study and is consistent with that used in the U.S.

Appendix 1: Recommendations from 2005 study

In our 2005 study we recommended the government undertake certain stage setting and direct intervention initiatives (see pages 8 – 14 of that study). We summarise these below and note our understanding of progress to date against each (in bold italics)

Stage setting initiatives

Encourage entrepreneurship

- Identify ways to improve the flow of innovation from universities and CRIs to the market place. This should include reviewing the incentives and impediments CRIs and universities face to pursue the commercialisation of research, with a view to strengthening their incentives and removing impediments. Government policies in this area and in relation to the NZVIF programme need to be aligned as they are complementary.

No explicit progress that we are aware of.

Tax and regulatory settings

- Implement a limited partnership arrangement with tax flow-through as already announced, and ensure the detail of this arrangement is tested with those conversant with international norms.

Completed.

- Remove the tax impediments to trans-Tasman capital flows. This is an issue much wider than venture capital, but it is an important element in assisting the New Zealand venture capital market to access greater scale with respect to capital raising and investing.

On-going tax issue.

- Clarify the capital/revenue distinction for income tax purposes as it applies to venture capital activity and ensure that investing in venture capital is not tax disadvantaged relative to common investment alternatives, and that it complies with international norms from a non-domestic investor's perspective.

Partially addressed as part of the limited partnership legislation, but capital/revenue distinction still an issue.

Improve information and education on the market

- Provide financial support to develop further an information base on the New Zealand venture capital market by an organisation that is well placed to undertake this development and to maintain this information base over time (e.g. the NZVCA).

The Ministry of Development has provided funding to establish and maintain the dataset underpinning “The New Zealand Private Equity and Venture Capital Monitor” published by the New Venture capital Association and Ernst & Young.

- Support the education and showcasing of New Zealand venture capital opportunities to local and international institutional investors.

The NZVIF continues to undertake this activity.

Harness and grow international connections

- Continue to use international linkages forged by government and its agencies to assist New Zealand venture capital funds and investee firms to form international links, and for international investors to link with New Zealand opportunities. Ensure these services are aligned with the requirements of market participants.

Investment New Zealand initiated work in this area in 2009 in conjunction with NZVCA.

- Support the international showcasing of the New Zealand venture capital market by organisations well placed to do this.

Investment New Zealand initiated work in this area in 2009 in conjunction with NZVCA.

Other initiatives***Encourage entrepreneurship***

- Use public events to promote the importance of entrepreneurship and innovation to New Zealand’s economic well-being and to celebrate successes, and support such events staged by organisations well placed to deliver these messages.

A broad range of privately sponsored (corporate) events, otherwise no progress.

- Encourage the inclusion of entrepreneurship courses in a wide range of tertiary programmes, including in technology-based programmes.

No explicit progress that we are aware of.

Tax and regulatory settings

- Ensure that tax losses generated in the early stages of a business' development can be offset against future taxable income even if shareholders change in the interim.

No explicit progress that we are aware of.

- Ensure the sale of patents is taxed in a manner consistent with the sale of any other capital asset.

No explicit progress that we are aware of.

- Align the GST treatment of equity investment funds (including venture capital funds) with that of other financial service providers. Explore ways of reducing the compliance costs arising from the requirements of the Securities Act and of unlisted firms issuing employee share options, with a view to ensuring that this form of remuneration is straightforward for small firms to implement.

GST issue has been addressed.

Harness and grow international connections

- Support networks and associations that connect New Zealanders living overseas with the New Zealand business community (e.g. the KEA network), and make use of these networks and the individuals within them when formulating policy that requires an international perspective.

No explicit progress that we are aware of.

- Provide scholarships or secondments to promising New Zealand students or professionals to locate for a period in off-shore organisations (e.g. universities or venture capital firms) to learn from and create networks within more developed venture capital markets.

No explicit progress that we are aware of.

Direct interventions

- Develop a medium-term plan for the VIF VC Fund component of the NZVIF programme. This needs to address the level of funds available to this programme over the medium term (e.g. the next 3-5 years) and the terms on which funds are to be made available (e.g. the matching rule and buy-out terms).

No explicit progress that we are aware of.

- Avoid the temptation to meddle in the allocation of funds through the NZVIF structure, by for example the government determining which sectors to target (as the expertise and incentives to allocate funds across sectors and within them lies with the venture capital fund managers, not the government).

Independence from government of NZVIF decision-making has been retained to date.

- Ensure alignment between other government support mechanisms for venturing firms and the NZVIF programme and consider shifting funds from the other programmes to the NZVIF programme. The NZVIF programme has been designed specifically for delivering government support to the venture capital market. Competing programmes that provide low (or zero) cost capital to the same potential recipient firms will undermine the NZVIF programme and the development of the venture capital market, as they do not incorporate the same commercial rigour.

No explicit progress that we are aware of.

- Strengthen the role of NZVIF to educate the local and international investor market on New Zealand venture capital market opportunities and extend this to the development of an investor-partnering programme aimed at attracting local and international institutional investors to this asset class.

The Seed Co-Investment Fund is a step in this direction, but more needs to be done to attract local and international institutions to invest in New Zealand venture capital.

- Ensure the NZVIF performance is evaluated periodically at two levels; its effectiveness as a programme overall, and the performance of the market participants involved in it.

No explicit review as yet, although venture capital programme review is underway.

Appendix 2: Data sources

In this appendix we document the data sources for various tables and figures in the body of the report.

Table 2 compares the relative status of selected venture backed and non-venture backed firms. Tables 3 & 4 document the age of firms from their founding to their IPO date. The data for these tables are from Prof. Josh Lerner's tabulation of unpublished data from SDC Venture Economics, with supplemental information from Compustat and the Center for Research into Securities Prices (CRSP) databases.

Figure 3, 4 & 5 set out relationships between the levels of venture capital investment in OECD countries relative to gross expenditure on R & D, the number of triadic patents, and the number of science and engineering articles. Figures 7 & 8 graph the annual investment in venture capital, and in private equity (inclusive of venture capital), as a percent of GDP by country. Table 8 sets out the levels of annual investment in venture capital that would be required in New Zealand to reach the levels of selected other countries. The data for these figures and tables were sourced from:

- EVCA Yearbook for European countries' venture capital investment.
- NVCA Yearbook for venture capital investment in United States.
- Asian Venture Capital Journal & Asian Private Equity 300 for venture capital investment in Asia.
- Israeli Venture Capital Association website for venture capital investment in Israel.
- Canadian Venture Capital Association website for venture capital investment in Canada.
- OECD Main Science and Technology Indicators Report & OECD Science, Technology and Industry Outlook for information on gross expenditure on R&D, number of S&E articles and triadic patents per million inhabitants.
- CIA world fact book for GDP information for all countries.
- IMF exchange rate archive for currency exchange rates.

It is noted that in relation to venture capital investment calculations for these tables and figures:

- European data was "seed and start-up" investing for each country in 2007.
- U.S. data was venture capital investment in 2007 as recorded in the NVCA yearbook.

- Asia data was private equity for each nation in the 12 months ending December 2007⁵⁴ times the share of all Asia investing that was seed and start-up investing.
- Canadian data was “seed and start-up” investing in 2007.
- Israeli data was venture investment in 2007.

It is noted that in relation to private equity investment (venture capital and other) calculations:

- European data was total venture investment for each country in 2007.
- U.S. data was the sum of venture capital investment and funds raised by buy-out funds in 2007.
- Asia data was private equity investment for each nation in 2007.
- Canadian data was sum of “seed and start-up” investing and funds raised by buy-out funds in 2007.
- Israeli data was venture investment in 2007.

⁵⁴ We did not have data on the seed + start-up/ all private equity ratio for Asia in 2007, but we had it for 2006. We interpolated this from the European ratio in 2007. From studying the trend in Europe from 2006 to 2007, it is estimated that this ratio had shrunk to about 1/3 from 2006 to 2007. Therefore we reduced the 2006 ratio by 1/3 in order to get the 2007 ratio for Asia.