

**A Life Cycle Model for the Creation of National Venture Capital Industries:  
The U.S. and Israeli Experiences\***

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Since its inception, the venture capital industry has experienced cycles. During the growth phase of each venture capital (VC) business cycle, local and national governments in various countries initiate policies aimed at establishing VC industries as part of a high-technology economic development strategy. Invariably, there is a proliferation of ill-advised policies similar to the ones tried during the previous phase. Not surprisingly, in a distressingly large number of cases, the “new” policies to foster VC meet with minimal success or fail outright. While the causes of failure are undoubtedly multiple, there is ample room for believing that often the policies were based on an incomplete understanding of the roots and dynamics that have led to the development of self-sustaining national VC industries. This paper uses historically informed case studies of Israel and the U.S. to develop an appreciative model of how the VC industries in these two nations came into being.<sup>1</sup> We believe that this perspective is the only one capable of providing both scholars and policy-makers with a grounded understanding of the emergence and development of the VC industries in these two nations.

National policy makers have repeatedly tried to establish VC industries. In general, government policies have had a supply-side orientation and conceptualized the lack of VC as a lack of money rather than as a need to create a new industry. Governments have made great efforts to increase the pool of VC through loosening regulations, reducing capital gain taxes, providing other tax benefits to investors, offering preferred loans and government guarantees, purchasing equity directly, and providing low-cost capital to VC funds (OECD 1996, 1997, 2000). These policies reflect a strong ‘neoclassical’ and static perspective. This perspective and a general lack of understanding that successful VC industries are embedded in a co-evolving environment has resulted in a remarkable

number of policy failures. We believe that a systemic and evolutionary perspective would provide both academe and policy makers a better grasp of the process by which VC evolves, and thereby result in more realistic models and superior policy.

Our model and understanding of this process is deliberately evolutionary and systemic. This suggests to us that life-cycle models may provide a more comprehensive understanding of the evolution of a VC industry. In this paper we adopt a modified product or, what are also known as industry life-cycle, model to explain how national VC activities come into being and become established as an industry (for discussion of these models, see Abernathy 1978; Abernathy and Utterback 1978; or, most recently, Klepper 1996). For us, the most important contribution of life-cycle models is the recognition of the phased or staged nature of industry emergence.

In this study we employ the U.S. and Israeli VC industries as case studies.<sup>2</sup> The U.S. is an important case because it is the birthplace and center of the VC industry. Further, it is the benchmark for other nations. Israel is a valuable case study, because it successfully established a VC industry more recently and more deliberately than did the U.S. Also, the Israeli case differs from that of the U.S., because government policy was critical for the establishment of the industry. Further, despite its recent crisis, the Israeli case proves that it is possible for follower nations with the right preconditions to develop a vibrant industry far more rapidly than did the U.S.

The main objective of the paper is to frame a detailed discussion of the evolution of the VC industry in the US and of Israel into a common theoretical perspective that could serve as a template for examining the emergence of VC in other nations. In the first section we review the previous research on venture capital covering both models for the operation of venture capital and various

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<sup>1</sup> On appreciative theorizing, see Nelson and Winter (1982) and Malerba et al. (2001).

<sup>2</sup> VC industries do not appear to be rivalrous, in the sense that one suffers, because of the success of another. It is just as likely that they reinforce each others. Certainly, Israel benefited from the existence of the U.S. industry.

writings examining the policy toward creating venture capital. In the second section we develop a theoretical framework based on the theory of Product Life Cycles (PLC) and show how it can be adopted to describe the evolution of VC. The resulting life-cycle model is then applied to the VC industries in the two nations in the third section. The fourth section examines the similarities and differences in the evolution of the U.S. and Israeli industries. The final section summarizes the findings and suggests that our framework can be applied to other nations to assess in which stage they are. Most important, we believe that an identification of the stage that a nation was in could lead to policy prescriptions that would be better matched to the state of the industry.

### **Previous Research**

Only in the last two decades has VC received sustained academic attention. Much of this research focused upon the firm, and not on the evolution of VC as an industry. In the management literature, there is voluminous research output on the criteria venture capitalists employ to evaluate possible investments, the types of assistance venture capitalists provide to portfolio firms, and various other aspects of the investment process (e.g., Barney et al. 1996; Bruno and Tyebjee 1986; Hall and Hofer 1993; MacMillan et al, 1985). The dominant paradigm for conceptualizing the relationship between VC firms and their portfolio firms has been agency theory (Gompers and Lerner 1999; Gupta and Sapienza, 1992; Kaplan and Stromberg 2001; Sahlman 1990). This literature focuses the contract mechanisms creating incentives for the entrepreneur that overcome adverse selection, entrepreneurial shirking, incomplete information (Akerlof, 1970; Myers and Majluf, 1984; Stiglitz and Weiss, 1981), and other problems associated with the financing of start-ups (Gompers and Lerner 1999; 2001).<sup>3</sup>

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<sup>3</sup> The difficulty of smoothly applying the principal-agent theoretical apparatus to the VC industry has encouraged some scholars to suggest alternatives. Operating within the principal-agent paradigm, Smith (1998) reverses the standard argument by postulating that the agent is the entrepreneur who accepts the venture capitalist's investment and is concerned that the venture capitalist might shirk or be opportunistic (Smith 1998). Cable and Shane (1997)

Beyond the agency research, there have been comparisons between VC financed firms and non-VC-financed firms. For example, Florida and Smith (1994) found the VC-backed SUs are more global than non-VC backed SUs. Other studies show that the presence of a venture capitalist on the board of an issuing firm serves to lower the total cost of issuing stock by reducing IPO under-pricing and underwriting costs (Stein and Bygrave 1990). Finkle (1998) found that firms with a top 20 venture capitalist on their board of directors had larger IPOs (Finkle 1998). Others have found that receiving VC lowers bank interest rates on loans, and enables firms to go public sooner (Barry 1990; Lerner and Gompers 1999; Megginson and Weiss 1991). VC-backed IPOs have better post-IPO performances, both in terms of stock price and growth rates (Jain and Kini 2000; Megginson and Weiss 1991). They also have higher growth rates in terms of total assets and revenues, and invest a larger fraction of total expenditures in R&D (Megginson and Mull 1991; Al-Suwailem 1995). This literature suggests that a venture capitalist investment improves a fledgling firm's performance.

There is also evidence that VC spurs technological innovation in terms of the number of patents per dollar invested (Kortum and Lerner 2000). Research shows that Israeli VC backed firms perform better than non-VC backed firms in terms of a higher rate of successful exits, younger age at IPO, higher IPO valuation, and more rapid sales growth (Avnimelech 2002; Bar 2002; Lucamat 2001).

The research of the past decade has provided a fairly complete outline of the mechanics of VC investing and the organization of the VC firm. In terms of a theory of VC, economists, for the most part, have accepted the principal-agent model as the most appropriate. Unfortunately, there has been

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suggest that game theory provides a superior explanation for the structuring of VC-entrepreneur relationships. This fits with recent work contending that the central problem for the venture capitalist is uncertainty about the technology, the competence of the management team, the product, and the market. Therefore, principal-agent issues are second-order problems (Dubocage and Rivaud-Danset 2001). In one of the few empirical studies of contracts between venture capitalists and entrepreneurs, Suchman (2000) found that they contained differing clauses protecting each party as one might expect in an asymmetrical partnership. More recently, scholars have proposed that procedural justice theory can explain the relationship between the venture capitalist and the entrepreneur as one in which trust and commitment are critical for reducing the need for costly formal mechanisms for managing the relationship (Sapienza and Korsgaard 1996; Wright and Robbie 1998).

less effort to develop a more historically grounded, evolutionary theory explaining the reasons for the creation and growth of VC as an investment practice and industry. Models based on the analysis of individual firms and their investment decisions cannot provide a model of an industry creation process.

Oddly enough, in both academic and policy communities, there has been little research on the demand for VC, either in terms of the quantity or the quality of investment opportunities. In other words, most attention has been on the supply side. Money was considered an adequate substitute for holistic consideration of the environment necessary to sustain VC. With few exceptions, the studies of government policies for VC creation have focused on capital gains tax reduction and on regulatory changes favoring VC investments by pension funds and other financial institutions.

The most popular recommendation has been capital gains tax reduction. However, Poterba (1989) found that changes in capital gains taxation rate had little influence on the supply of VC, because most VC investors are tax-exempt institutions. Gompers and Lerner (1999) found the same result, but speculated that increasing the differential between the income and capital gains tax rate might be more significant, because it would encourage corporate employees to leave to become entrepreneurs. The positive effect lower is due to the fact that the equity upside would be greater and less taxed thus key personnel might be more inclined to leave established firms for a SU even though the salary might be. These results are useful when considering tax policy, but the difficulty with this work is that it is narrowly construed. It assumes important variables, for example, the existence of an adequate number of high-quality deals, investors and entrepreneurs that understand the VC process, and predictable and amenable legal and financial systems. To be fair, Gompers and Lerner (1999) recognize the importance of adequate supplies of high-quality entrepreneurs and managers willing to join a fledgling SU, though they do not conceptualize the development of the VC industry as an evolutionary learning process.

By the late 1980's and early 1990's, the scant success of the first wave of government programs led to a general disappointment. Florida et al (1990 and 1994) argued that government programs aimed at developing sub-national VC industries in the U.S. had failed. The conundrum these sub-national programs faced; regardless of how well structured they were was the following: If the fund was established for a location that had not developed the background conditions necessary for success and it invested locally, then it was likely to make bad investments. On the other hand, it could deploy its capital to regions where there were good investments, but this would transfer the capital out of the target region. As a result, establishing VC funds in regions missing the background conditions led to disappointing results.

The lack of effective policy advice can be seen in various reports issued by the OECD (1996, 1997, and 2000). They bemoaned an absence of well-developed exit mechanisms, and provided the usual policy recommendations that capital gains taxes be lowered, networks and information flows be strengthened, investment evaluation criteria be standardized, and stock market listing requirements be eased. These recommendations do not provide an understanding of the difficulty of creating a VC industry de novo. For example, Mason and Harrison (2002) critiqued the British government's proposal to increase the amount of VC available in less well-endowed areas, because of the lack of capability of start-ups in those regions to usefully absorb VC. Murray and Lott (1995) found that in the UK VC appeared to have a bias against high technology investing, though it was equally likely that there was a lack of good investment opportunities. From this and other research, it can be concluded that the lack of good investment opportunities, or, put the other way the lack of demand by bankable entrepreneurs is, at least as important, as a lack of VC.

The myriad failures of policy initiatives aimed at creating VC industries during the 1980s and most of the 1990s convinced many of the impossibility of deliberately creating environments within

which VC could play an important role in supporting high-technology growth. These conclusions were justified when the policy focus is restricted to VC alone. However, we suggest that the difficulties encountered in implementing policies for encouraging VC are due to their promulgation without an understanding of systemic and evolutionary nature of the industry (Avnimelech and Teubal 2003a,b,c). Such a perspective would simultaneously consider how to create large numbers of high quality start-ups, deal with organizational issues, and attract suitable professionals into the industry.

The high-technology bubble of the second half of the 1990s piqued interest in VC once again, as some believed that VC was the missing component for nations seeking to participate in the IT and Internet Revolutions. Success in establishing viable, SU-oriented VC firms in nations as diverse as Israel, Taiwan, India, and, to a lesser degree, Finland and Sweden, signaled that VC might not be unique to the U.S.<sup>4</sup> In line with this several authors attempted to identify factors contributing to the VC development. Black and Gilson (1998), for example, emphasized the importance of an equity-based rather than bank-based financial system for the growth of a VC industry. Along these lines, Jeng and Wells (2000) found that "an initial public offering market was important for the growth of a VC industry." The general conclusions reached by this line of research were that VC was more dynamic in stock market-centric economies than in bank-centric economies.

This exit-driven perspective was accepted uncritically globally and during the 1990s many nations established new stock markets with eased listing requirements to facilitate exits. Unfortunately, by 2003 a number of these such as the German Neuer Markt and Japan's JASDAQ had collapsed in scandal, while others were virtually moribund, e.g., France's Nouveau Marche, Italy's Nouvo Mercato, Hong Kong's GEM, and Malaysia's MESDAQ. Many of the new stock markets did not survive the avalanche of exits by bad firms. Hundreds of firms disappeared from the U.S. NASDAQ as Wall

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<sup>4</sup> On India, see Dossani and Kenney (2002). On Taiwan, see Kenney et al. 2002.

Street investment bankers were shown to operate on the edge of legality. Simple policies such as allowing the listing of any firm corrupts markets and corrupt markets collapse. Mistaking easy exits and the existence of stock markets for the creation of real firms is, perhaps, itself a sign of the hysteria that Kindleberger ( ) so vividly described.

## **2. A History-Friendly, Life-Cycle Model**

The comparative approach makes it possible to inductively extract the elements or variables by uncovering commonalities and differences. Our approach differs from quantitative studies comparing national venture capitalists systems such as Jeng and Wells (2000) in that we adopt an explicitly historical perspective that pays particular attention to institutions and the environment prior to the emergence of a measurable industry.

Our first premise is that the establishment and growth of VC as an institution is an evolutionary process. This evolution is not autarchic; rather it occurs in intimate interdependence with other environmental constituents. A vibrant VC industry is dependent upon a flow of investment opportunities capable of growing in value quickly enough to provide capital gains justifying the investment risks. These opportunities may be distant or remote, however the classical VC model today is of Silicon Valley, Route 128, or Israel where, at least, a community of venture capitalists have local offices, though there may also be VC exporting centers such as New York, Chicago, London, or Hong Kong (Florida and Kenney 1988a, 1988b). The business arenas and technological trajectories that have been the most fruitful for VC investing have been electronics and information processing EIP technologies and, to a lesser degree, the biomedical fields (Kenney and von Burg 1999).<sup>5</sup> For this reason, the VC industry has been intertwined with the development of the R&D and innovation capabilities in the national EIP industries. Conversely, the existence and growth of the VC industry has

reflexively helped define the entrepreneurial high-technology start-ups. Therefore a VC industry should be understood in relationship to particular forms of technological trajectories and start-ups.<sup>6</sup> Simply put, firms with suitable growth prospects are necessary for the survival of VC; no amount of government subsidies will be able to catalyze the development of a self-sustaining VC industry absent the proper investment opportunities.<sup>7</sup> Therefore, any model regarding the creation of a national VC industry requires a systemic perspective.

There is a strong path-dependency in the process by which a VC industry emerges and grows. After they are constituted the venture capitalists become actors that operate in and on their environment and can alter it to make it more conducive to their practice (Dossani and Kenney 2002).<sup>8</sup> This evolutionary trajectory, when set in motion, has the VCs, in dialectic with other constituents of the emerging system, participating in the stamping of the further development of their environment.<sup>9</sup> This can be powerful enough to create further resources, as the entrepreneurship-VC co-evolution provides niches for other actors such as specialized law firms or, put differently, assisted in the creation of a ecosystem or community dedicated to facilitating the VC-financed startup process (Bahrami and Evans 2000; Kenney and von Burg 1999).<sup>10</sup> Naturally, governmental entities also affect the environment in both positive and negative ways. Our processual perspective suggests the usefulness of life cycle models.

Life cycle models are attractive because they draw attention to the changes in an industry's dynamics as it matures. There are, of course, difficulties with life-cycle models because industries

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<sup>5</sup> On technological trajectories, see Dosi (1982).

<sup>6</sup> Robertson and Langlois (1995) argue that different technological trajectories give rise to different organizational relations .

<sup>7</sup> For a discussion of the necessity of having an industry that can generate fundable start-ups prior to the development of a vibrant VC industry, see Feldman (2001).

<sup>8</sup> The classic citations on path dependence are Arthur (1994) and David (1986).

<sup>9</sup> Garud and Karnoe (2001) term the "path creation."

<sup>10</sup> For more general discussions of this ecosystem formation process, see Astley and Fombrun (1987) and Fombrun (1986), Hunt and Aldrich (1998:272)

deviate from their metaphorical referent, living organisms. Moreover, periodization is always difficult and, at least at the margins, open to debate. Life cycle models typically argue that industries evolve from a phase during which the innovations are radical to one in which innovation becomes more incremental or evolutionary (Abernathy and Utterback 1978; Abernathy 1978; Klepper 1996). Eventually a dominant design emerges, and what was contingent and open comes to be experienced as mixed and becomes part of the environment facilitating common transactions (Tushman and Anderson 1990). For our examination of the VC industry, it was necessary to modify conventional product life cycle models, because they rarely consider the period prior to the actual emergence of the first entrants (for an exception, see Helfat and Lieberman 2002).

For our particular case study of the venture capital industry, we introduce three modifications. The first modification is that typical industry life-cycle models focus on single industries. In the case of VC it is necessary to explicitly consider how VC coevolves with the industries it funds. Drawing upon work by Maggioni (2002), we refer to modern ecological theory that argues that populations of organisms can only be understood within their context and further that the population can affect the selection environment.<sup>11</sup> Second, for VC a set of conditions that develop in the pre-emergence phase are critical for the creation of a successful industry, because they provide the resources necessary for the emergence to be successful. Finally, though we accept the notion of a consolidation phase, our interpretation of consolidation is slightly different, because this is where the organizational and institutional forms that will become dominant are validated or, as is possible, the natural VC industry fails and the resources are dispersed. The caveat is that a successful consolidation does not prevent

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<sup>11</sup> In the contemporary sociological literature influenced by the population ecology paradigm, the environment is treated much more like an invariant selection grid. For one of the early discussions of how firms operate to change their environment, see Florida and Kenney (1991).

new entrants in the next growth phase of the VC cycle.<sup>12</sup> Thus far, the VC industry has not exhibited the typical oligopolized dominant design phase. The model we develop has modest goals, it is meant to assist in understanding the establishment of a sustainable VC industry and its environment, and is not claimed to be generalizable to other industries.

### **The Venture Capital Life Cycle Model**

In this section, we discuss the five phases in our model of the VC life cycle depicted in Table One.

Table 1 about here

The first phase (background conditions phase) is where the conditions for developing a VC industry are evolving. This is not a teleological argument; it is quite possible and even likely that the conditions are not being consciously (or unconsciously) developed with the aim of creating a VC industry. When viewed in retrospect, it is possible to identify the beginnings of a high technology industry that includes start-ups. In the case of both Israel and the U.S., the military had a powerful early role through funding research and buying the products of the electronics and information processing (EIP) industries, which have been the most successful fields for venture capital funding.

The second phase, which we term “pre-emergence”, begins with the earliest VC investments, and at its end VC has become an identifiable activity. This pre-emergence phase resembles the fluid phase of the product life cycle described by Abernathy and Utterback (1978). During this period, a number of start-ups have successful public offerings demonstrating the viability and profitability of entrepreneurship. Business opportunities have also expanded apace. At the beginning of this period

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<sup>12</sup> Here, we borrow the title of the Gompers and Lerner (1999) book. However, the cycle they were referring to was the cycle in which venture capitalists raise money, invest in firms, and then reap the capital gains. In our case, we are referring to the “boom-bust” cycle that closely resembles in form and character a typical business cycle. This has characterized the VC industry since its inception.

there are only a few VC organizations, and no accepted organizational form has yet emerged, but by the end of the period VC is recognizable as an institution different from other financial institutions. During this phase, there are often already a smattering of venture capitalists and angels investing. Some may be successful, but the institutions, existing industry and its links with markets; and even their technological capability are not sufficiently mature for rapid growth. During this ground preparation period, it often appears as though little is actually occurring in terms of formal VC activity. No less important, culturally there is increasing acceptance of high-technology entrepreneurship as a viable career path. Also, frequently there are some successful investments that by the end of the phase will serve a motivation for entrepreneurs and fledgling venture capitalists. During this period, the process is particularly vulnerable to exogenous shocks such as stock market downturns. Too severe a shock could easily truncate the development of the industry; however both the U.S. and Israeli industries survived this early stage.

The emergence phase is the period during which the industry takes a coherent form. During this period direct national government policies can play a significant role. During this phase, VC expands rapidly, and there is often experimentation with different organizational forms. There is also much experimentation and collective and interactive learning with respect to VC strategies, procedures, and organization. By the end of the period, the organizational forms and VC practice has become defined. By the end of the emergence period the VC has grown sufficiently to encourage the early development of specialized professional services such as law firms, accountants, and investment banks comfortable with high-technology offerings supporting start-ups and VC (Kenney and von Burg 1999; 2000).

This optimistic rapid growth in the emergence phase, then gives way to a crisis phase. Here, we are not referring to the regular VC business cycle downturn or what Lerner (2002) has termed “investment overshooting.” The crisis shakes the industry to its core. Industry survival of this phase is

not necessarily guaranteed. To survive the industry must restructure itself and create VC industry restructuring is part of the crisis phase. By the end of this period, a dominant design is emerging to be validated during the consolidation period.

If the VC industry survives and consolidates, a process that is not a given, then the survivors are usually extremely well managed and become the industry leaders. For example, of the leading U.S. VC firms, nearly all are survivors of the 1970s downturn. The emergence of dominant design in the VC industry however does not mean that new entrants are excluded. In fact, there have been many new entrants and they also can survive and prosper. The point is that after this consolidation venture capital has become an integral part of the national innovation system—it is effectively a part of the environment.

### **3. Case Studies**

These case studies provide a “parallel” historical account of the evolution of the venture capital industry in the U.S. and Israel. From the outset, we acknowledge that the time frames for the various phases differs dramatically between the two nations. The reason for this is that U.S. was the pioneer and thus had no models from which to learn. Put differently, as Gershenkron (1962) observed the earliest entrant on a development path is often the slowest, because of the inefficient experimental learning process, whereby the pioneer will experience many dead-ends that can be avoided by latter entrants. Thus the U.S. case was far slower than that of Israel.

There are, of course, many other differences between the two nations that are too numerous to list. There are possibly some cultural similarities as both at settler states made up largely of immigrants.<sup>13</sup> Israel is a unique settler state in that from its inception it received many highly educated

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<sup>13</sup> We do not minimize the role of the indigenous peoples in either nation. However, in both cases they have been largely banished from the mainstream of the two nation’s economies.

Jews from around Europe, and was able to create top-notch educational institutions from its inception, thereby providing it with significant human capital. Also, for Israel the learning process was certainly eased, because it is tightly linked through personal networks and extremely close corporate and governmental relations. Despite these differences, especially in terms of the evolutionary periods, we believe that the phased nature of the evolution of the venture capital industry in the two nations bears significant similarities.

*The U.S.*

*The Background Conditions' Phase (1930-45)*

The Great Depression signaled a period of profound change in the U.S. political economy, unleashing enormous social tension and creating pressure for new institutional frameworks and policies for the support of small businesses (Kenney and Rao 2003). The election of Franklin Roosevelt and the inauguration of the New Deal ushered in this transformation. With this an extended debate about how to assist small businesses ignited. As part of the New Deal, Congress enacted legislation to curb securities fraud and conflicts of interests in financial institutions. One of the most important of these was the Glass-Steagall Act of 1933 that split investment banking from commercial banking. An unintended consequence of this was that banks were no longer able to recycle savings into equities especially those of small unlisted firms. Also, Congress passed the Securities Act of 1934 creating the Securities and Exchange Commission and tightening regulations on issuing stock thereby further disrupting the access to capital for small firms. This legislation combined with increased taxes and the general malaise to choke off nearly all sources of capital for small businesses. The situation for small businesses was dire indeed, and there was much interest in how to support them.

In the late 1930s the concept of something termed “venture capital” began to be discussed among the East Coast financial and political elite. However, there was little clarity about exactly how VC would operate, and who should furnish the capital. The discussion of a specialized financial intermediary or venture capitalist to VC as a new method for support small businesses abated with the onset of World War Two. The discussion was renewed in 1943 as it became increasingly clear that the War would end with allied victory.

Contemporaneously, during World War Two, the U.S. military became convinced of the importance of technology for its future. This was reinforced with the onset of the Cold War because U.S. military thinking emphasized weapon quality instead of quantity – a position no doubt encouraged by the defense industry. Aerospace applications emphasizing small size and lightweight, led to great interest in electronics and microwave applications such as radar (Leslie 2000). Cost was no object particularly with the ubiquitous cost-plus contracts. As a result, the government and the prime contractors were willing to purchase unique high-technology products from smaller firms at very high premiums. These small teams of engineers could establish these firms with relatively small sums of capital and if their product was successful they could grow rapidly and experience rapid appreciation in the value of their equity.

#### *The Pre-emergence Phase, 1945-1957*

At the end of World War Two, the discussion of how to support small businesses resumed both within and outside the government, even as the first VC firms were established. There were two organizational forms created. The first form was VC firms formed by wealthy individuals and families and included Rockefeller Brothers, J. H. Whitney & Company, and Payson and Trask.<sup>14</sup> The second

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<sup>14</sup> There were a number of others formed, but little information about them is available and they had little influence on the industry.

organizational form was American Research and Development (ARD), which was established in Boston in 1946. ARD was the outcome of an intense effort by Boston's leading businesspersons to create an organization to back firms with strong growth prospects. Its founders included businesspersons and professors and administrators from MIT and Harvard. ARD raised funds through a public stock offering, and thus was the first non-family VC fund. Through ARD's investments were scattered across industries, a significant portion of them were in technology, and a number of them were MIT-related (Liles 1977; Etzkowitz 1993).

These four organizations, joined more sporadically by investment banks, brokerage firms, insurance firms, and other financial institutions primary formal investors in small firms. In the larger environment, the GI Bill, NSF, NIH, and the Department of Defense were creating the postwar research universities, and massively expanding research output and creating a large technically capable workforce. Moreover, in the federal government some Congresspersons were being convinced that financial support for small businesses, especially those capable of growing rapidly was a socially desirable. These pioneering VC firms showed sufficient promise to encourage others to consider entering the industry. Beginning in the early 1950s, in the San Francisco Bay Area a number of informal, but serial, investors had begun investing in young technology-based start-ups. Still, there was only a minimal amount of VC available.

Though the few existing firms were the only VCs operating at the time and no new firms had entered, a fledgling SU environment was maturing. Whitney and Rockefeller experienced significant success in high technology, aerospace-related investments. ARD had modest, but acceptable, returns. Meanwhile, the technology base grew significantly and these were an increasing number of high technology SUs. Semiconductors and computers were becoming important, though incumbent firms such as IBM, RCA, and Westinghouse largely controlled these businesses, some start-ups achieved

success and rapid growth. Further, there was evidence of the value of earlier start-ups. For example, Hewlett Packard raised money by successfully listing in the 1950s thereby proving that profitable exit was possible, and other EIP firms such as Varian also growing rapidly.

By the end of this preemergence phase, there was a growing number of EIP start-ups and a few venture capital firms that had experienced some success during the twelve years. However, the groundwork in terms of the developing EIP trajectory, a dawning recognition on the part of existing venture capitalists that EIP technologies offered unique opportunities for capital gains, and government recognition of the need to provide support for small, fast-growing business was evolving.

### *The Emergence Phase (1958-72)*

The emergence of the venture capital industry as a societally significant organizational for truly began in 1958, and was intimately related with a number of other macro-social events. In 1958, the Russians launched Sputnik, which took the U.S. government by surprise, and the response was the mobilization of universities and corporations alike in a crash effort to develop an American space program. As a result, R&D spending and government purchasing particularly in advanced aerospace fields especially experienced massive increases. For aerospace applications, miniaturization and increased processing power were paramount and the high-technology EIP market expanded dramatically.

These markets and the rapid technological evolution in EIP led to the formation of two very important firms.<sup>15</sup> First, in 1958 ARD invested \$70,000 in an MIT-related spinout, Digital Equipment Corporation (DEC), which would be the first significant minicomputer firm. DEC grew exponentially and by 1970 the initial investment of \$70,000 was worth more than \$400 million—a gain that proved to be a powerful attractant for investors and ambitious prospective venture capitalists and. The

minicomputer industry spawned dozens of lucrative Boston area spin-offs and became the industry that fueled the Boston VC industry (Kenney and von Burg 2000). After the birth of the minicomputer industry, no longer would an established firm easily monopolize new segments of computer-related industries as IBM was able to with mainframes. From here on, SUs would commercialize nearly all the new computing-derived electronics products. In effect, this was the birth of a new national innovation system paradigm that became increasingly influential in the U.S. political economy.

Even as the minicomputer was born in Boston, in 1957 a group of eight Bay Area engineers left an earlier start-up, Shockley Semiconductor, to launch a venture that would be called Fairchild Semiconductor, which took its name from its largest investor, Sherman Fairchild of Fairchild Industries (Braun and MacDonald 1982). This investment was arranged by a New York City investment banker, Arthur Rock, who later became a star venture capitalist. In 1958 the first integrated circuit was developed. Four years, the first engineers and scientists began resigning from Fairchild and forming new semiconductor firms. This exodus formed the basis of “Silicon Valley,” and provided the fledgling venture capitalists a continuing flow of investment opportunities.

In Palo Alto, an important organizational innovation the limited partnership form was first used in 1958 by Draper, Gaither, and Anderson (DGA). DGA raised funds from wealthy families including the Rockefellers, and was moderately successful, though it was closed in the mid 1960s. DGA’s legacy was the limited partnership as an organizational form, which proved to be very congenial for VC investing. In 1961, the second limited partnership was created when Arthur Rock joined Thomas Davis to form Davis and Rock (D&R) that received investment from the Fairchild entrepreneurs. D&R was important, because it was enormously successful and due to their investment in D&R further knit together the interests of key technologists and investors. In 1965 a former ARD executive formed the first Boston limited partnership, Greylock, and inspired other ARD executives to create limited

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15 This section draws heavily upon Kenney and von Burg (1999).

partnerships. By the end of the 1960s, the limited partnership had become the dominant organizational form for venture investing.

But even as the fledging limited partnerships were being formed, the federal government was legislating a federally-assisted program to provide funds for small businesses. In 1958 Congress approved legislation authorizing the Small Business Administration to license Small Business Investment Corporations (SBICs). At the time many believed that legislation establishing the SBIC program was more important than DGA's pioneering of the limited partnership form. The SBIC program provided for three major organizational forms: a private SBIC that was funded by private individuals, a public SBIC whose capital was raised in a stock offering, and a financial institution-operated SBIC whose capital was contributed by a financial institution or institutions (Bean 1996). The privately owned SBIC was ideologically the most attractive; because it was meant to create an entirely new class of financial intermediaries specialized in supporting new businesses. The publicly owned SBICs sold stock to the public, and those monies were to be invested in small firms. The SBICs would be the largest and most significant contributors to the VC growth in the 1960s. For commercial banks, forming an SBIC allowed them to circumvent Depression Era laws prohibiting equity ownership of greater than 5 percent in industrial firms (Bean 1996). Though all banks were interested in utilizing the SBIC Act, many local and regional banks who dealt with smaller businesses found the Act attractive, as it provided a vehicle for investing in growing local firms (Kenney and Rao 2003).

The SBICs were to be meant to provide capital for start-ups or business expansions. However, from its inception it suffered because it was an ill-defined program. The sole criteria for receiving an SBIC license was that the applicant had to have at least \$150,000 in paid-in capital. The resultant SBIC then received the following benefits: The government provided leverage on a two to one matching basis in

the form of 15-year loans and 20-year subordinated debentures at a favorable 5 percent interest rate. There were also various tax incentives. In return the SBICs were meant to provide small businesses with either loans or a loan with debentures convertible to common stock. The most important problem was that even with debentures the SBIC charged the investment interest recipient, something that SUs could ill-afford because during their infant stage they are in a money consuming mode.

Because the original legislation was a source of low-cost monies with few limitations in addition to the young venture capitalists, it attracted licensees from a wide variety of industries including real estate, product distributors, and simply unscrupulous individuals. By the mid 1960s, the SBICs were plagued by self-dealing, fraud, mismanagement, and various other ills. In response, the SBA tightened regulations, instituted inspections, and became far more bureaucratic. By the early 1970s, the successful SBICs turned in their SBIC licenses, and either began managing their own personal monies that had increased dramatically during the “go-go” 1960s, or raised VC funds through limited partnerships. The SBIC program thus operated as an important bridge providing individuals with low-cost funds and enabling part-time investors to professionalize their VC practices; build their reputations, track records and capabilities; and develop linkages with possible investors.

This was validated in 1969 when Edward Heizer raised the first megafund of \$81 million from 35 institutional investors, though he used the standard corporation as his model. However, at the end of 1960s there was a stock market downturn that adversely affected SUs and their investors. And yet, at the end of this period VC was recognized as a part of the U.S. economic landscape and a cadre of seasoned venture capitalists had been created. The EIP industries were growing explosively, and spinouts were becoming accepted as a career path. Still, though exits were possible, it was not easy. New York Stock Exchange listing was difficult, because of the stringent listing requirements. The Over the Counter market experienced thin trading and attracted little attention from investors and

brokerage firms alike. By the early 1970s, a small but vibrant ecosystem of VCs and entrepreneurs had been emerged and become entrenched in the U.S. political economy.

### *Crisis (Early 1970s through Late 1970s)*

The 1970s was a crisis decade for venture capitalists. The difficulties were, in large measure, due to macroeconomic disruption and included a stock market crisis, the lingering Vietnam War, the first oil crisis, the Nixon impeachment, and in 1979 yet another oil-crisis accompanied by stagflation. In terms of technological development the scene was more promising. In the 1970s, the rapid pace of integrated circuit development made possible the personal computer (Freiberger and Swaine 1984). The development of recombinant DNA techniques created the basis for a biotechnology industry that would be VC financed (Kenney 1986). Simultaneously, the SBIC program had declined in significance and is captured in the 1974 decision of the SBIC industry newsletter to rename itself Venture Capital and discontinue coverage of the SBICs. In the crisis, the limited partnership form would emerge as the dominant organizational form.

The greatest threat to the VC industry was government legislation that was prompted by the collapse of a large number of corporate and union pension funds, some of which had been looted by insiders. Public outrage prompted Congress to pass the Employee Retirement Investment Security Act (ERISA) in 1974, which extended the “prudent man” rule to private pension funds and placed criminal liability upon pension fund managers for “imprudent” behavior (Longstreth 1986). Legal interpretations of ERISA indicated that fund managers investing in risky assets such as VC might be personally liable should the investments fail. With the difficult economic environment and the threat of prosecution, institutional commitments to VC virtually ended. Venture capitalists were the unintended victims of a congressional effort to halt pension fund fraud.

By the end of the 1960s, VCs had become aware of their common interests. So, in 1973 the National Venture Capital Association was formed as a lobbying organization. With the passage of ERISA the fledgling NVCA began lobbying the Administration and Congress for a loosening of its legal requirements. Here, the NVCA was assisted by new developments in understanding asset management called “modern portfolio theory.” By 1976 the NVCA lobbying effort gathered political support and met with some success. Though ERISA was never repealed, under congressional pressure slowly the Federal government agencies responsible for enforcing the law gradually relaxed their regulations. By 1978, the loosening had progressed to the point at which pension funds, even public ones, again began investing in VC partnerships as limited partners. The importance of this relaxation is confirmed by Gompers and Lerner (1999) finding that ERISA loosening was more significant than lowering capital gains taxes in explaining VC industry growth.

The exit side also changed during this period. In 1971, the National Association of Securities Dealers established the NASDAQ electronic quotation system that was meant to provide bid-and-offer prices for OTC securities. However, NASDAQ quickly began to allow trades over its system. Partly because of its historical legacy in OTC securities and in an effort to attract listings, the NASDAQ had less stringent listing requirements than did the NYSE, and was more solicitous of small firms' needs. For example, the NASDAQ would list more recently formed firms that had less sales and were not yet profitable. Intel's decision to list its stock on the NASDAQ in October 1971 inaugurated an enduring relationship between the NASDAQ and VC-financed firms. In other words, it could be used by young firms as a vehicle to mobilize capital, and liquefy the firm's' owners' stakes.

The general U.S. economy experienced a crisis that began in the early 1970s and really struck venture capital with the passage of ERISA. Venture capitalists were trapped in a situation in which exits were impossible because of the collapse of the stock markets, and raising capital was blocked

because institutional investors were effectively blocked from investing. Existing venture capitalists made few investments, and those seeking to raise new funds found it extremely difficult. Luckily, even as the crisis was underway the technological trajectory in the EIP industries was creating enormous new opportunities especially in regards to the development of the enabling technologies for desktop computing. The EIP technologies were joined by the birth of the biotechnology industry, which gave venture capitalists an entirely new technical realm that had characteristics amenable to VC funding. Moreover, the formation of the NVCA provided venture capitalists with a lobbying arm in Washington that was able to represent their interests and spearheaded the reopening of institutional and pension fund investing in VC.

#### *Restructuring and Consolidation (Late 1970s and early 1980s)*

The consolidation of the VC industry as a sustainable element in the U.S. national system innovation began in the late 1970s and accelerated in the early 1980s. With the establishment of the NVCA in Washington, DC, the industry had its own voice. One signal that VC had arrived on the political scene was a series of Congressional hearings from 1982 through 1984 that explicitly lauded the role of VC in the U.S. economy. From the political perspective, venture capitalists were now an interest group. The SBICs were now irrelevant for supporting high-growth startups in the core high-technology regions of Silicon Valley, Route 128, and Austin.<sup>16</sup>

In earlier hearings beginning in 1976, VCs were represented, but were not accorded recognition as an important part of the economy. Of particular significance for the growth in the late 1970s and early 1980s were the very successful listings of Genentech and Apple Computer in 1980 as the

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<sup>16</sup> There were other governmental programs such as the Small Business Innovation Research Act passed in 1982 that at the margins may have provided some minimal assistance to venture capital. Also, in 1980 the Bayh-Dole Act to facilitate the licensing of government-funded university research was passed, however its importance to VC is debatable (Mowery et al. 2004).

biotechnology, personal computer and peripherals, and then the computer networking industries generated multiple successful listings. The rise of these firms was important in another way; it heralded the reorientation of U.S. high technology industry away from its dependence on government and military markets and toward civilian markets. Ultimately, this would result in civilian electronics technology being superior to that available to the military.

The limited partnership had become the dominant organizational form, and it controlled the NVCA. Even as the limited partnership became the dominant form, institutional investors began to accept VC as a portfolio asset class worthy of a permanent allocation. This created an enormous source of funds, and pension funds and institutions became the dominant investors in the limited partnerships. The rise in the amount of private venture capital after 1978 can be seen in Figure One. This increase is attributable to the growth in the limited partnership format. Not surprisingly, VC firms grew in size, both in terms of committed capital and number of partners. In regional terms, there was also a change as the flow of pension fund monies into Silicon Valley VC funds freed the region from dependence upon New York and Chicago investors (Florida and Kenney 1988a, b; Kenney and Florida 2000).

By the mid 1980s, the exit process for VC-funded firms on the NASDAQ was routinized, and a cadre of small investment banks in San Francisco developed a lucrative practice in managing these offerings. Through time the fortunes of the NASDAQ, VC, and high-technology firms SUs coevolved into a self-reinforcing, virtuous circle of growth.

By the end of the 1970s, the U.S. VC industry had consolidated and now was a part of the U.S. national innovation system. The industry would never again be threatened. In fact, it was now celebrated and even becoming iconic. New “funds of funds” emerged in the early 1980s that pooled smaller institutional investors’ monies to invest in a basket of funds, thereby turning monitoring over

to specialized intermediaries. These intermediaries demanded and were able to receive more standardized performance measures and, contemporaneously, statistical sources on venture capital investing were improved. In geographical terms, the center of the industry had moved irrevocably to the San Francisco Bay Area where consistently more than 30 percent of total investment took place, while Route 128 gathered another 9-10 percent.

The new structure and features of the VC industry, its embeddedness in the wider U.S. innovation system, the new institutional and regulatory framework, and the links with policy makers meant that the U.S. VC industry was sustainable in even the most difficult markets. From this point onward, though the industry remained cyclical, it was now a part of the U.S. national innovation system. The private venture capital system was now supported by both political parties, and increasingly was considered as a core component for U.S. competitiveness.

## **Israel**<sup>17</sup>

The Israeli VC industry was established far more rapidly than it was in the U.S. And yet, the Israeli industry exhibits a similar set of phases, and the co-evolutionary processes also are similar. There are also significant differences. As a follower, Israel knew that it was possible to have a VC industry -- something the U.S. pioneers had to discover. Further, Israel could draw upon the knowledge and connections of Israelis living in the U.S. and successful American Jewish venture capitalists such as Fred Adler and Alan Patricof. These international connections would prove extremely valuable.

### *The Background Conditions Phase (1970-89)*

The development of VC in Israel is rooted in a pre-existing high technology sector that had amassed considerable innovative capabilities during the prior two decades. A few events herald the

beginning of this phase including the Six Day War and the French embargo that led to a national strategic decision to develop a domestic military R&D capability. This led to sharp increases in military R&D spending and investment. Another decision was to leverage Israel's basic science capabilities into applied science capabilities (Kachalsky Report 1968), and led to the establishment of the Office of the Chief Scientist (OCS) at the Ministry of Industry and Trade in 1969. The OCS extended R&D grants to individual enterprises in a neutral, bottom-up fashion. These policies were a part of a consciously orchestrated collective learning process (Teubal 1983, 1993), that included the development of R&D and innovation in the business sector, and cumulated in the establishment of a distinctive high-technology sector. Another significant event was the investment by multinationals in R&D laboratories in Israel, e.g. Motorola in 1964, IBM in 1972, Intel in 1974, and Hitachi in 1978; and investment by multinationals in semiconductor and electronics manufacturing facilities in Israel, e.g. Vishay in 1965, National Semiconductor in 1979 and Intel in 1985.

The R&D capabilities accumulated during the 1970s stimulated the emergence of Israel's software industry in the early 1980s. It also indirectly contributed to the first round of independent start-ups; some of which were financed by external investors and were not direct spin-offs of existing companies or business groups. Furthering this growth was a special *ad hoc* limited partnership program that during 1980-86 channeled U.S. investors' resources to a total of 54 start-ups.<sup>18</sup> By complementing the over-stretched OCS budget these additional resources (estimated at between \$40-\$80 million) made a significant contribution to the development of Israeli high technology.

In 1977, the BIRD Foundation (Israel-U.S. Binational Industrial R&D Foundation) was established and it made its first investment in 1981. This foundation was a critical mechanism for

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17 For additional information see Avnimelech and Teubal 2002, 2003a,b,c.

18 Under this program a LP with US investors was created for each SU. This should not be confused with the LP organization form of VC company organization that became the dominant VC form in the 1990s.

Israeli companies to establish partnerships with U.S. high-tech companies contribute to Israel's high tech firms' reputation in the U.S. and strengthen Israel and U.S. industrial links.

A major milestone in Israel's VC industry was the founding of Athena, the first formal Israeli VC firm in 1985. Further, from 1980 to 1985, a number of incumbent or established firms had IPOs on the NASDAQ (mostly OTC). These IPOs both reflected and reinforced a growing link with U.S. investment banks such as Lehman Brothers. To provide an understanding of the magnitude of this linkage, between 1984 and 1988, Israeli technology firms raised \$300 million on the NASDAQ. During the same period the total capital raised by all Israeli firms on the Tel Aviv stock exchange was only \$500 million.

On the policy side, the 1984 R&D law allowed consistent increases in OCS funding of business sector R&D, and it recognized software as an industry that could receive OCS R&D support. It also indirectly facilitated restructuring of the defense-dominated electronics industry in the second half of the 80s. By funding spin-off companies that undertook civilian R&D, at the macroeconomic level, stabilization policies and capital market liberalization were implemented. By the end of the 1980s the business environment improved dramatically. To encourage investment inflows, foreign investors were allowed full convertibility enabling the unfettered repatriation of principal and dividends.

The situation on the international scene also improved. By the end of the 1980s, the regulations for non-North American firms listing on the NASDAQ had been eased.<sup>19</sup> Thus, business links with U.S. firms and with U.S. capital markets continued to deepen, as a number of Israeli entrepreneurs took their start-ups public on the NASDAQ. This maturation of the Israeli technology scene led policy makers and business persons to consider strategies for establishing a domestic VC industry.

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<sup>19</sup> In the 1980s, unprofitable foreign SUs could not be listed. This was liberalized further in the 1990s.

### *The Pre-Emergence Phase (1989-92)*

At the end of the 1980s, the technical, social, and economic assets and knowledge were now available in Israel to be mobilized for a more organized effort to establish a VC industry. The restructuring of the military industries during the second half of the 1980s had sparked an expansion of civilian-oriented, high-technology activity. The software industry had grown from less than \$1 million in 1980 to \$350 million in 1990, of which 20 percent were exports. The number of start-ups being established had increased from several per year to several tens per year. Fourteen high-technology start-ups that had been established after 1980 went public in the U.S., mostly on the NASDAQ, including at least one that had not yet achieved profitability.

The labor market was also changing. In the early 1990s, there was an immigration of thousands of engineers from the former Soviet Union. Contemporaneously, the defense industry was laying-off hundreds of engineers. These events contributed to a wave of new firm formation; however 60 percent of these firms subsequently failed. The government attributed this to an inability to raise additional capital for marketing, and suggested that there was a capital gap and an absence of sufficient marketing capabilities (JIM 1986). The government also believed that there was a bias toward technology rather than marketability in the OCS R&D Grants approval process.

The earlier problems catalyzed a process of experimentation and learning by both business sector and government. Treasury and OCS officials believed that despite massive government support for R&D, both market failure and systemic failure was blocking the successful creation and maturation of start-ups. Officials decided that this was the result not only of insufficient sources of follow-up financing, but also weak management capabilities and technological development that did not have a market focus. The response was to gradually shift policy objectives from R&D promotion to the enhancement of SU formation, survival, and growth. In the early 1990s, a large number of new

government programs were launched including the moderately successful Technology Incubator Program in 1991 and the Magnet Program in 1992. Even while the Treasury was searching for ways of supporting start-ups, Yigal Erlich, the head of OCS, was considering measures to make OCS support more effective (Erlich 1998, 2000). His diagnosis was that the weak links in the system were both financial and marketing management and concluded that this deficiency could be remedied by the establishment of a VC industry.

The first significant direct government effort to create a VC industry was the 1992 Inbal Program. Its central purpose was to stimulate the creation of publicly traded VC funds by using a newly formed government insurance company Inbal. Inbal would guarantee these VC funds that would trade on the Tel Aviv Stock Exchange (TASE) at up to 70% of initial capital assets. In all four funds were established. However, neither the funds nor the Inbal program were successful, suffering from the same problem that had contributed to the demise of the publicly held SBICs in the U.S., namely onerous bureaucratic oversight procedures, the necessity of submitting time-consuming periodic reports, and the fact that holding companies often trade at a discount to the value of their securities. For these reasons, few competent venture capitalists were attracted to the program. Today, the remaining funds in the program and all of the (former) Inbal Funds are managed by one holding company.

Inbal was a supply side support mechanism that insured against the downside. However, there were no mechanisms for attracting professional venture capitalists and value added investors and the funds were exposed to the tyranny of the stock market with its short-term thinking. Astonishingly, advocates of this program had not learned from the earlier experiences in the U.S. and recreated many of the problems of the failed SBIC model. The failure of the Inbal Program, convinced government policy makers that they needed to develop a new strategy.

### *The Emergence Phase (1993-2000)*

The second significant government initiative to create a VC industry was the Yozma Program that began operations in 1993. Rather than the inward-looking Inbal Program, Yozma meant to create a competitive industry with critical mass by integrating and learning from foreign limited partners and integrating Israeli venture capitalists into an international network. Yozma was a \$100 million government-owned VC fund with two functions: The first function was to operate as a fund of funds investing \$80 million in ten private VC funds, i.e., \$8 million in each fund. As a condition for receiving this \$8 million (40 percent), it had to be matched with \$12 million in private funds. Further, the Israelis managing each of these ten funds would have to attract a reputable foreign VC fund or foreign financial institution to also invest. Finally, the government retained \$20 million to create the government-owned Yozma Venture Fund which invested directly in early stage SU. The total government investment of \$100 million leveraged another \$150 million of foreign funds.<sup>20</sup>

The Yozma program promoted the establishment of private Israeli limited partnership VC funds dedicated to investing in young Israeli SUs. Being paired with the foreign venture capitalists provided the Israeli firms an opportunity to learn. The financial commitment by foreign venture capitalists operated as a quality check on the Israelis applying for the government funds and assured continued monitoring. In this way, the Yozma program favored entry of professional managers or of individuals with VC-related abilities. To provide a strong upside incentive, for 5 years the private funds had a call option on government shares at cost plus 5-7 percent annual interest – a lucrative incentive for both the Israeli and foreign partner. The Yozma-spawned VC funds invested in over 200 SUs.

The most salient aspect of the Yozma program was its emphasis on learning. The first

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<sup>20</sup> Two of the funds raised more private capital than required and began at \$35 million each.

dimension of this learning occurred through the interaction with the foreign investors. The second dimension was through the participation of the Yozma Venture Fund managers (Yigal Erlich and other OCS officers) in the board meetings of all Yozma funds. Not only did they learn through participation, but also there is evidence that they stimulated co-investment among Yozma funds. Further, personal links assured that much informal interaction between the fund managers took place.

The success of the Yozma program is not in doubt. VC investment increased from \$5 million in 1990 to \$3.3 billion in 2000. During the same period the number of foreign investment banks operating in Israel increased from one to 26 (Bar et al 2001). The accumulated number of SUs created was more than 2000; total capital raised by venture capitalists was approximately \$10 billion, the total capital raised in capital markets reached about \$15 billion, and there was an additional \$20 billion in mergers and acquisitions.

One indicator of Yozma Funds' success in triggering industry growth is their expansion that took the form of much larger follow-on funds that received no support from the Yozma Program. This contrasts with Inbal funds that found it very difficult to raise additional funds. The follow-on funds managed by the Yozma-related VC firms were approximately \$5.5 billion in 2000 and accounted for approximately 55 percent of the total VC pool under management. Moreover, during 2001-2003 (the crisis years) the Yozma descendants exhibited the highest rate of survival and were the most active VCs. The final measure of success of the program was the establishment of a number of non-Yozma funds drawn by the example of the large capital gains achieved by the Yozma funds.

In 1996, the Israeli Venture Capital Association was created. To further publicize the success of the Israeli VC industry, starting in 1996 three significant international conferences were held annually to introduce Israeli start-ups to national and international investors. In the heated SU environment of the late 1990s, there was a proliferation of corporate VCs and angel networks. Also, professional

service firms such as accountants and attorneys, and PR firms specializing in high-technology were formed.

The Yozma Program with its early successful exits catalyzed the Emergence phase through its role in generating critical mass and improving coordination between different agents in the cluster that accelerated VC and SU activity and learning. It also created a reputation effect that had global value. In interviews, many believed that the fact that, through Yozma, the Government of Israel was willing to invest directly and indirectly in start-ups was an important profitability confidence signal to investors (Erlich 1998, 2000). The second and no less important reason concerns the preparatory process that was underway during the Pre-emergence Phase. It created the environment within which the Yozma could trigger the entry of venture capitalists. There had been successful exits, Israeli entrepreneurs understood the SU process, and there were technological areas in which Israelis were global-class.

Yozma's design ensured that successes should be highly profitable, while failure would be subsidized only to the extent that the government investments were lost. This encouraged Israeli venture capitalists to exert considerable effort in firms with great potential for success while presumably more quickly terminating less successful investments. With a number of significant successes, Israel developed a reputation for having highly profitable start-ups, which attracted both international and domestic investors. This set in motion a path-dependent, positive feedback loop (Avnimelech 2002).<sup>21</sup> The linkage of Israeli venture capitalists to reputable foreign partners brought linkages to the product markets in other nations, these were vital for the growth of the portfolio firms and provided linkages to foreign stock markets especially NASDAQ.<sup>22</sup> It is possible to speculate that

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21 The classic citations for path dependence are David (1986) and Arthur (1994).

22 Growing links with investment banks facilitated Israeli IPOs. These IPOs not only generated resources to access complementary assets for marketing into global product markets but also created exit opportunities for the entrepreneurs and their investors.

had these early funds and investments been unsuccessful that there would have been far less interest in the Israeli market and this might have truncated the process of VC industry emergence. In effect, initial success leads to the development of a reputation that can result in a sustainable competitive advantage in the VC industry. Early success enhanced the VCs reputations, and attracted value adding investors and assisted in raising capital for the follow-up fund.

A central component of the cumulative process triggered by Yozma was VC-SU co-evolution (Avnimelech and Teubal 2003b). The enhanced VC activity spurred additional start-ups; and additional start-ups spurred further VC activity. Underlying it there were a number of processes, some of which spurred by specific individuals. Thus the VC firm Star coevolved with Rad, a group that initiated its entrepreneurial activities in 1982 and acquired prominence during the 1990s. As was the case in the U.S., successful SU founders became VC partners. Often, the founders of portfolio companies participated in the funding decisions for new VC investments. The VC firms organized CEO forums to assist in networking and information transfer. These initiatives assisted in creating supply-demand interactions. This virtuous circle of enhanced capabilities and networking contributed to the further success of venture capitalists and enhanced value adding services to start-ups. By 2000, Israel had one of the most successful VC-funded, start-up ecosystems in the world.

### *Crisis and Restructuring (2001-?)*

The Israeli venture capitalists did not invest so heavily in dot.com start-ups, so, the initial dot.com stock collapse did not immediately affect Israel. However, the collapse of high technology stocks in 2001 was far more serious. The current crisis in the world technology and VC industries has had a severe impact on Israeli VC. This has been exacerbated by the fact that already during the late 1990s the Israeli economy was experiencing declining growth. The reduction of demand for

technology products, the crisis of trust in global capital markets, the closing of IPO markets, and the generalized internal political turmoil has negatively affected the Israeli environment for SUs and VC. The Israeli situation may be more severe than in other countries, not only because of the political and economic situation, but also because Israeli venture capitalists were highly concentrated in early-stage investing and the Israeli high tech cluster is biased toward small companies, which are always the most seriously affected in a downturn. There has been a decline in the amount of capital under management, VC partnerships are involved in distress mergers, and (both by portfolio firms and VC partnerships) funds have been closed. This has resulted in a near collapse of early-stage investing.

### *The Potential for Consolidation*

Consolidation is, perhaps, the most critical phase. Israel benefited enormously from the long VC upswing of the 1990s. In contrast to many nations whose VC industry only emerged in the late 1990s, Israel did have a relatively long growth period during which it generated critical capabilities. The Israeli industry is quite entrenched; however it is too early to be certain the industry will survive. Quite naturally, the ability of the industry to consolidate is dependent upon how long the downturn continues. From our examination of the U.S. industry, we would predict that this consolidation would create a set of stable actors and lead to the creation of a dominant organizational form that might differ somewhat in terms of characteristics (contracts, management procedures and routines, etc.) from the U.S. model.

There has been a clear process of self-selection within the Israeli VC industry since 2001. Moreover, among the surviving VCs is a process of strengthening strategic differentiation, e.g., the creation of few leading VC strategic groups (Avnimelech, 2003).

While the Israeli VC organization and individuals received international recognition this is not

indicative of an ongoing process of loosening of the local component despite some increase in the scope of out-of-Israel Israeli VC activity. For example, recently Israeli VC managers have been chosen to manage a Korean government VC fund. Also, the Singapore-based global VC firm Vertex has appointed its Israeli partners to manage its European network. Also, Israeli partners have achieved important positions in two other global VC firms, Apax and Star. While it is difficult to predict the final configuration of the post-crisis VC industry there are strong reasons to believe that the capabilities accumulated and the scope of internationalization achieved will shape the course the events. What is clear is that Israeli start-ups will not soon experience the favorable environment of the 1990s again.

#### **4. Reflecting upon the U.S. and Israeli Cases**

Our historical analysis provides the background for examining the commonalties and differences. **Table Two** aligns the phases and lists the important developments in each phase. In the first section, the commonalties in the development process are outlined. In the second section, the obviously significant differences between the two nations are discussed.

#### **Table Two Here**

##### *Commonalties*

The factors common to the U.S. and Israel are grouped together in Table Two. In the Background Conditions Phase, the important commonalties are defense spending and general R&D investment by the government. In the U.S., World War Two developed linkages between universities and industry. In the case of Israel, U.S. high-technology enterprises began manufacturing there and the BIRD program created links between Israeli and U.S. high

technology firms. The most salient commonality was the role of the government in creating linkages between university R&D and industry, and in funding high technology procurement. Finally in both countries new financial mechanisms were created either to finance SMEs (US) or which had the effect of supporting small, R&D performing companies (Israel).

The Pre-emergence Phase in the two countries has many similarities. For both nations the pre-emergence phase was their take-off periods in electronics (in Israel, of civilian-oriented electronics). There were also an increasing number of SUs, a few of which successfully listed on the stock markets, and a concomitant greater acceptance of entrepreneurship as a career path. Both nations had VC organizations, but there was not yet an industry. In Israel this phase was quite short as the Israeli high-technology firms benefited from a quickened growth of high-technology industries around the world. The U.S., on the other hand, had a prolonged process of searching for the right industries in which to invest.

In the Emergence Phase, in both nations there was either directed government action to develop a VC industry or unintended effects from other programs. The Yozma Program was very successful, whereas the SBIC Program had a more mixed record. However, it is true that the SBIC program was a recognition by the Federal government of the need for assistance to small businesses, and especially SUs. Most important, both the SBIC and Yozma programs were structured to limit direct government involvement in the investment decision. There were both structured so as to ensure that private investors captured the capital gains. Finally, in both nations, by the end of the period the limited partnership (LP) had become the dominant organizational form.

Both nations also experienced a Crisis Phase during which the industry was rocked to its foundations and experienced a severe shake-out. This is not a typical downturns that afflicts

all industries, but rather more resembles an existential crisis. The U.S. underwent this crisis from 1974 to approximately 1978. Israel is currently in the midst of such a crisis. In the case of the U.S., the general difficulties that the stock market experienced from 1969 through the Oil Crisis of 1973 were dramatically exacerbated when the U.S. Congress passed ERISA. For the next four years, almost no VC could be raised. The current Israeli crisis is different, and has to do with its insertion into the global high-technology economy. However, the outcome is similar. VC firms are unable to secure follow-on funds, and thus must merge, liquidate, or dramatically downsize. This is testing the current Israeli model, which is overwhelmingly biased toward early-stage investments and foreign investors in Israeli VC firms.

The Consolidation Phase in the U.S. began in approximately the late 1970s. The limited partnership funded by pension funds and other institutions became the dominant organizational form. Contracts between entrepreneurs and venture capitalists became increasingly standardized. Also, the center of the VC industry shifted to Silicon Valley, and the industry would never be fundamentally challenged. In the case of Israel, the outcome is less sure. However, we believe that the Israeli industry's consolidation, if successful, will include Israeli partners becoming far more active in operating global VC firms. They will, quite naturally, access Israeli deals, but they will no longer be so dependent on early stage deals in Israel alone.

### *Differences*

However, the process of creating a VC industry may also be shortening, as the Israeli industry was created far more quickly than that of the U.S. Not surprisingly, the background conditions for the development of VC were also quite different. There are also significant differences between the two nations. The first is the very much longer time periods in the U.S. case. Also, the U.S. VC industry

operates largely autocratically and, though it receives significant foreign investment, it does not require foreign investment or involvement. In contrast, Israel is dependent upon global markets. As reference to Table Two indicates, having already experienced at least four cycles, the U.S. industry is more mature than is the Israeli one.

A very significant difference between the U.S. and Israel relates to the role of government in the creation of their respective VC industries. The emergence of VC in the U.S. was market-led, although the government played an important role through creating conducive conditions. The only direct role was the SBIC legislation. Probably the most important government role was support for electronics and biomedical R&D in the university and industry and, especially prior to the 1980s massive price-insensitive spending on high-technology weaponry that created a market for early computers and semiconductors. The U.S. government also reduced capital gains taxes and permitted limited partnerships able to pass-through capital gains without taxation. Finally, with the loosening of ERISA again it allowed pension funds and other institutional investors to invest in VC limited partnerships, which created an enormous source of capital.

In contrast to the U.S. experience, VC emergence in Israel was ‘policy-led.’ The Yozma Program was critical.<sup>23</sup> The Yozma program assured the onset of a cumulative process of growth. Significantly, it did this by an incentive program that increased the gains for successful venture capitalists. However, the Yozma Program could never have been as successful were it not for the civilian-oriented innovation and technology policy that was implemented during the preconditions and pre-emergence phases. The R&D grants program begun in 1969 was central for the creation of the high technology sector during the 1980s. Also, the Israeli government introduced a program to stimulate innovation links between U.S. and Israeli firms. In other words, Israel took advantage of the

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<sup>23</sup> This is the view of most observers of and actors in the Israeli scene. A minority holds the view that market forces by themselves would have led to the creation of the industry. For an analysis, see Avnimelech and Teubal 2003d .

learning that had already occurred in the U.S. This contrasts significantly with many nations that attempt to create VC industries without reference to already successful models.

The other major difference between Israel and the U.S. is the fact that the U.S. VC industry and high technology firms are the global leaders. The early phases in the U.S. were far longer than Israel's because pioneers are unable to learn from others, and thus must experience many more failures. Even in 2004 only the U.S. has a VC industry consolidated.<sup>24</sup> With the possible exception of mobile telephones, all of the major technology firms must have a presence in Silicon Valley and most of the significant VC firms in the world have some presence in Silicon Valley. The U.S. VC industry benefits from these links, however its survival does not depend on their existence. In contrast, Israel's VC industry is interconnected and depends upon its links to the U.S.

## **5. Discussion and Conclusion**

Nearly all previous research has examined the "practice" of venture investing; this paper changed the focus to VC as an institution. We have suggested that VC emerged in co-evolution with a start-up culture and specific industries, especially those in the IT sector. The institutional approach focuses on the factors that permit VC to emerge as an institution. The practice approach assumes the system and environment, and in this way is static in that it does not recognize that the system and environment are evolving. Therefore, though it does provide insight into the practice of venture investing, it is limited in that it cannot answer questions about the forces and conditions that allow a VC industry to develop in the first place.

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<sup>24</sup> It is possible to argue that the VC industry in the United Kingdom has consolidated as it has a history that, depending upon one's interpretation, is as old as that of the U.S. However, the UK investors have been oriented toward private equity. SUs remain a very small portion of the entire UK VC industry. There has been little study of why UK venture capitalists only seem to invest in SUs during global technology bubbles, and then invariably retreat to private equity.

The VC industry cannot be understood when separated from the evolution of the start-ups and the EIP technologies. The start-ups that venture capitalists can fund are a vanishingly small subset of all start-ups. The start-ups themselves have evolved to be more “VC-friendly,” in terms of business plans, the acceptance by entrepreneurs that seasoned managers will be required, and understanding of the role of venture capitalists. We also found that the EIP technologies were critical to the development of VC. Our research would suggest that any cross-national study that omits some measurement of R&D, especially in the EIP technologies and, to a lesser degree, biology will have difficulty explaining the development of VC internationally. In fact, a fruitful area for further research would be the role VC has had in affecting the way in which these technologies have been commercialized.<sup>25</sup> Thus the early airplane and electronics technologies created a space within which VC could form, but the formation and maturation of VC reflexively created an environment for entrepreneurship and the further growth of VC.

For policy-makers our results indicate that VC should have great difficulty developing a local investment market in nations without the requisite background conditions. Whereas researchers with a background in finance and policymakers have suggested that the creation of exit opportunities is the critical feature. Our study suggests that it will not be so easy, technical capabilities in the EIP technologies will have to be created. These creations need not be entirely autarchic. Consistent with the role of ethnic networks in the growth of Taiwanese and Indian high tech, the case of Israel demonstrates the importance of Americans of Jewish descent in assisting in the access both technologies and of the tacit knowledge of how things were done in the U.S. However, in both nations the state invested in domestic human capital formation in universities and research institutes. Finally, in the case of Israel the government established the Yozma Program that attracted foreign investors,

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<sup>25</sup> See Kenney (1986) for the argument that VC played a fundamental role in the U.S. commercialization of biotechnology through independent start-ups, rather than the technology being internalized in the research

not merely for their capital, but also for their knowledge. The Program was deliberately organized to transfer learning from abroad and train Israeli venture capitalists. Yozma's success and the SBIC's early assistance to fledgling U.S. venture capitalists indicate that government's can have a positive impact on the possibility of developing a VC industry.

This study of the evolution of the VC industry in two nations has identified two distinct patterns of VC evolution and of successful VC emergence. The US's pattern of evolution is that of the *innovator* country; and emergence of the industry during the 60s was to a large extent a *market led process* despite the important and even crucial direct and indirect effects of policy. Israel's pattern is that of a *successful imitator*, and its VC emergence process was *policy led*. Not all of the background conditions required for VC emergence in the US had to be developed autonomously, although the existence of significant R&D activity and R&D capabilities was crucial. What was also crucial for Israel were links with the US that country being the locus of global product and capital markets for technology companies. Links were also crucial to access the knowledge required for the successful operation of a VC industry; and this was one of the main objectives of Yozma (Israel's targeted VC emergence policy). The Israeli case shows that Globalization may definitely accelerate the development of VC industries in Peripheral economies, although materializing this potential poses unexpected challenges to policy makers (Avnimelech and Teubal 2003c,d)

Our study also provided a blueprint for how one might approach a larger multinational study. Undertaking a study with more nations included could provide a greater insight into the determinants for creating VC industries. For example, we have emphasized the EIP technologies, are their nations where they have not been necessary? From a policy perspective this is a very important question, because many nations have policies predicated upon a belief that biotechnology can be the industrial driver for the creation of a VC industry. Or, at least, that these two industries can grow symbiotically.

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laboratories of the multinational pharmaceutical firms.

Another issue to be tested by a larger multinational study is whether the development of VC can be understood as progressing through phases. Related to this would be studies of nations in which a VC efflorescence was followed by its disappearance, as was the case in Germany in the 1980s; or change to a private equity industry as in the UK. If we understood the process of failure, it might be possible to develop private strategies and government policies to ensure the survival of the industry, until the next upturn.

The final lesson of this paper is that probably most important for both nations was the willingness of the government to invest in domestic human capital formation in universities and research institutes. At particular moments, after the human capabilities have already been formed, more directed policies can have a beneficial effect as was the case in the Yozma Program that attracted foreign investors, not merely for their capital, but, perhaps, more importantly for their knowledge. Governments are not always wise as the Inbal Program also showed. However, the Israeli government was able to learn, probably helped by its close connections with U.S. venture capitalists and investment bankers. The U.S. case was more mixed. The investment in research was clearly very important. The SBIC Program had positive benefits in the first decade by providing support for some entrepreneurs, assisting in the capital accumulation by a number of persons who would go on to be in important venture capitalists, and especially in offering “training” wheels for fledgling venture capitalists. On the other hand, the ERISA laws were an unmitigated disaster that took about five years to undo. VC is a fragile institution and governments can unknowingly damage it in the pursuit of other public policy goals. Still Yozma's success and the SBIC's early assistance to fledgling U.S. venture capitalists indicate that carefully planned government policies that draw upon previous

mistakes and lessons learned in other nations can have a positive impact on the development of a VC industry.

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Table 1: Phases in the Successful Evolution of a Venture Capital Industry

<b>Background Conditions Phase</b>	<ul style="list-style-type: none"> <li>• Creation of high technology industry and R&amp;D/ innovation capabilities</li> <li>• Concern for the financing of SME not necessarily high technology SU</li> <li>• Growing acceptance of technological entrepreneurship and a new model of high technology innovation involving SME</li> </ul>
<b>Pre-Emergence Phase</b>	<ul style="list-style-type: none"> <li>• A technological revolution</li> <li>• Growth of informal VC and some formal VC funds</li> <li>• Increasing numbers of SU → excess demand for VC services</li> <li>• Experimentation (variation) and learning (selection); no stable distribution of VC forms</li> </ul>
<b>Emergence Phase</b>	<ul style="list-style-type: none"> <li>• High rate of growth of VC and SU activity</li> <li>• VC-SU co-evolution process; strong collective and onset of cumulative process</li> <li>• Increased competition and overshooting</li> <li>• Entry of less skilled VC managers/firms and SU companies</li> </ul>
<b>Crisis Phase</b>	<ul style="list-style-type: none"> <li>• A deep crisis that may be caused by a one or combination of factors including stock market downturn causing an inability to have IPO (sometimes termed “overshooting,” negative government actions (ERISA), more general economic downturn, etc.</li> <li>• Exit of VC funds and closure of SUs, while SUs suffer liquidity problems</li> <li>• General loss of confidence in the industry</li> </ul>
<b>Consolidation Phase</b>	<ul style="list-style-type: none"> <li>• The VC industry restructures with the help of collective institutions</li> <li>• New institutions (formal and informal) emerge</li> <li>• New government policies are implemented</li> </ul>

Source: Author’s compilation

Table Two: The Evolutionary Phases in the Israeli and the U.S. VC Industries

PLC Phase	Israel	U.S.
<b>General</b>	<ul style="list-style-type: none"> <li>• VC is an ‘infant’ (follower) industry</li> <li>• Dependence on the U.S. VC industry</li> <li>• Length of pre-emergence and emergence phases-11 years</li> <li>• VC emergence is policy-led</li> <li>• VC industry has not yet consolidated</li> </ul>	<ul style="list-style-type: none"> <li>• The VC industry was ‘invented’ in the U.S.: U.S. industry global leader and represents a benchmark to other VC industries.</li> <li>• Length of pre-emergence and emergence phases-26 years</li> <li>• VC emergence - ‘market led’</li> <li>• Consolidation during early 1980s</li> </ul>
<b>Background Conditions Phase</b>	<ul style="list-style-type: none"> <li>• <b>1970-89</b></li> <li>• An exogenous technological revolution</li> <li>• Growth of R&amp;D capabilities</li> <li>• Liberalization of capital market and macroeconomic stabilization</li> <li>• U.S. high-technology MNEs entering Israel</li> <li>• First formal VC company in Israel creates the new SU ‘model’</li> <li>• <b><u>Policy</u></b></li> <li>• Explicit grants to R&amp;D becomes government policy</li> <li>• BIRD Program promoting R&amp;D links with the US</li> </ul>	<ul style="list-style-type: none"> <li>• <b>1930-45</b></li> <li>• High technology is the airplane and early electronics industries</li> <li>• World War Two creates demand for high technologies. Universities drawn into war effort as R&amp;D providers</li> <li>• Linkages between universities and industry</li> <li>• Increasing awareness of the need to support SMEs</li> <li>• Discussion of need for VC</li> <li>• <b><u>Policy</u></b></li> <li>• Huge government R&amp;D investment</li> <li>• Small high technology firms receive military subcontracts</li> </ul>
<b>Pre-Emergence Phase</b>	<ul style="list-style-type: none"> <li>• <b>1989-92</b></li> <li>• Continuation of technological revolution</li> <li>• Strong immigration of qualified personnel</li> <li>• Entry of a few VC and establishment of early SUs</li> <li>• <b><u>Policy</u></b></li> <li>• Government insurance to public VC-Inbal program (1992); initiation of technological incubator and magnet programs</li> <li>• Changes in taxation and corporate law</li> </ul>	<ul style="list-style-type: none"> <li>• <b>1945-57</b></li> <li>• Creation of professionally managed VC organizations linked to wealthy families</li> <li>• First formal non family-funded VC organization ARD is formed</li> <li>• Increased acceptance of entrepreneurship as a career path</li> <li>• U.S. high technology firms globally dominant</li> <li>• Attraction of top-notch foreign students to U.S. universities</li> <li>• <b><u>Policy</u></b></li> <li>• GI bill creates an enormous wave of well-educated</li> </ul>

	<ul style="list-style-type: none"> <li>• Continuation of R&amp;D grants and BIRD programs</li> </ul>	<p>graduates</p> <ul style="list-style-type: none"> <li>• Continued large investment in R&amp;D</li> </ul>
<b>Emergence Phase</b>	<ul style="list-style-type: none"> <li>• <b>1993-2000</b></li> <li>• Possibility of IPOs in NASDAQ of non North American non-profitable yet high quality SUs</li> <li>• New opportunities in software, networking, Communications, etc.</li> <li>• LP the dominant form of VC organization</li> <li>• Establishment of IVA(1996)</li> <li>• <b>Policy</b></li> <li>• Targeted policy directed at VC emergence (Yozma-1993)</li> <li>• Continuation of R&amp;D grants, technology incubators and magnet programs</li> </ul>	<ul style="list-style-type: none"> <li>• <b>1958-72</b></li> <li>• First LP VC organization, DGA, (founded 1958)</li> <li>• Increase in SU formation</li> <li>• Opportunities in integrated circuits, minicomputers - <u>endogenous</u> to the U.S.</li> <li>• Establishment of NASDAQ in 1971 and listing of Intel</li> <li>• Gradually the LP format increases in prominence</li> <li>• Fraud in SBIC program</li> <li>• VCs leave SBIC program to begin LPs</li> <li>• <b>Policy</b></li> <li>• SBIC support</li> <li>• Massive increase in R&amp;D investment</li> <li>• Large scale purchases of electronics equipment by military</li> </ul>
<b>Crisis Phase</b>	<ul style="list-style-type: none"> <li>• <b>2000-?</b></li> <li>• Collapse of stock market bubble</li> <li>• World capital market and high technology crisis</li> <li>• Significant reduction in capital raised</li> <li>• VC exits closed 2001-3</li> <li>• Negative impact of second Intifada</li> <li>• Global technology downturn</li> <li>• Lack of IPO or M&amp;A exits</li> <li>• Retrenchment, significant reduction in engineers' salaries</li> <li>• Interaction between different agents in the high technology cluster</li> <li>• <b>Policy</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>1972-80</b></li> <li>• 1973 NVCA established and lobbies for policy changes</li> <li>• 1974 extension of 'prudent man' rule to pension funds leads to a disappearance of commitments to VC</li> <li>• 1974-1978 very little capital raised</li> </ul>

	<ul style="list-style-type: none"> <li>• Non taxation of foreign investors</li> <li>• Attempts at encouraging local pension funds to invest in VC</li> <li>• Government sponsored seed VC fund</li> <li>• Specific measures targeted to Biotechnology (Nofar program and technology incubators) and Nanotech</li> <li>• Reductions in R&amp;D grants support</li> <li>• Beginning of strategic thinking</li> </ul>	
<p><b>Consolidation Phase</b></p>	<ul style="list-style-type: none"> <li>• <b>2003-</b></li> <li>• VC managers successful abroad</li> </ul>	<ul style="list-style-type: none"> <li>• <b>1980-</b></li> <li>• Private equity becomes a permanent portfolio asset class for institutional investors</li> <li>• Pension funds and other institutions become largest investors</li> <li>• Successful Genentech and Apple Computer IPOs</li> <li>• Reorientation of high technology industry from military to civilian applications</li> <li>• LP format becomes dominant, and increasingly only legitimate form</li> <li>• <b><u>Policy</u></b></li> <li>• 1978 relaxation of ERISA regulations begins and pension funds again invest in VC</li> <li>• Reductions in capital gains taxation</li> </ul>

Source: Author's compilation