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**STRENGTH OF MARKET FORCES AND THE SUCCESSFUL
EMERGENCE OF ISRAEL'S VENTURE CAPITAL INDUSTRY:
INSIGHTS FROM A POLICY-LED CASE OF STRUCTURAL
CHANGE***

Gil Avnimelech and Morris Teubal

Summary

Through a microeconomic *analysis of companies* in Israel's Venture Capital (VC) industry this paper aims to contribute to the discussion of targeted policies directed to the emergence of new industries, particularly but not only Venture Capital and High Tech industries. It integrates a firm-level dimension to previous work on VC Emergence which was wholly conducted at the industry or meso-economic level. The central contribution of the paper is the notion of 'Class A Market Forces' which our analysis shows characterized VC companies and VC-related activity during pre- and 'early' Venture Capital emergence in Israel. The paper argues that this 'high quality' feature of 'early' market agents in the area was an important factor in the successful policy-led emergence of Israel's VC industry. The theme is part of a wider agenda of analyzing two types of links and related co-evolutionary processes: those between Structural Change, particularly *policy-led* Structural Change, and Economic Growth; and in a more indirect fashion, between Economic Growth on the one hand and the successful implementation of high-impact targeted "industry emergence" policies on the other.

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SUMMARY AND CONCLUSIONS

Acronyms

SME-Small and Medium Sized Enterprise; SU-high tech Start Up company;

VC-Venture Capital, Venture Capital Company; PE-Private Equity, Private Equity Company; IC=Investment Company, LP-Limited Partnership (a form of VC and PE organisation)

ITP-Innovation and Technology Policy; S & T: Science and Technology; ICT-Information and Communications Technologies

SF-System Failure; SFj=Specific Cause j of SF

ILC-Industry Life Cycle;

S/E-System-Evolutionary or System of Innovation perspective; BS-Business Sector; SS-Supporting Structure

ROR: Rate of Return;

VS: Very Successful; MSP: Moderately Successful Plus; MS: Moderately Successful; LS: Less Successful

Pp: Private Performance, VC private performance

Ps: Social Impact, VC Social Impact (net of Pp).

A&T-Avnimelech and Teubal. AKT-Avnimelech, Kenney and Teubal

CA-Competitive Advantage; SCA-Sustainable CA

1. Introduction, Theoretical Background and Objectives

1.1 Motivation

1.1.1 Israel's Experience with Venture Capital

Previous work (A&T 2003, 2004a,b,c AKT 2004; Avnimelech 2004) has analyzed the process of emergence and development of Israel's **Venture Capital (VC)** Industry in terms of an **Industry Life Cycle (ILC)** perspective comprising five phases: Background conditions (1969-85); Pre-Emergence (1986-92); VC Industry Emergence Process (1993-2000); Restructuring (starting in 2001); and the Consolidation phase. The main event in this process is Emergence of the VC industry, which took place during 1993-2000. It was preceded by more than 20 years of development of favorable background conditions and pre-emergence events, many of them related to the penetration of R&D into Israel's business sector and appearance of a distinct high tech industry. The new industry involved *a new set of specialized agents* with strong connections with **high tech Startup companies (SU)** and with Global Markets.

VC emergence in Israel was a *policy-led process* in the sense that a deliberate & targeted policy directed to this objective (Yozma Program, see A&T 2003, 2004b) was implemented. Throughout, and also in a comparative analysis with the US's VC industry, VC has been analyzed as co-evolving with high tech particularly the SU segment that it finances (AKT, 2004). Thus accompanying the process of VC emergence was the transformation of Israel's high tech industry—from a military-dominated industry to a 'Silicon Valley-type high tech cluster' involving considerable VC and SU activity. Some of the major events in the above processes were:

- *Background Phase (1969-85)*: Generating R&D / Innovation capabilities in the business sector; leveraging R&D to acquire complementary assets for export market penetration; and adopting high tech business models to the new opportunities in the IT sectors;
- *Pre-Emergence (1986-92)*: Creation of early links with global product/technological and capital markets e.g. investment banks and NASDAQ; strong business experimentation and policy learning; creation of Demand for VC services (A&T 2003b, 2004c); and identification of the Israeli high tech cluster specific system failures;
- *VC Emergence phase (1993-2000)*: A cumulative processes with positive feedback, which engulfed the entire high tech cluster, and which involved a number sub-processes such as 1) changed structure of High Tech (relative shift to Software and to Communications- related inventions/innovations; 2) VC-SU co-evolution; 3) Domestic VC industry- Global capital markets interaction; 4) deepening of the high tech cluster and appearance of a wide spectrum

of ancillary services e.g. consultancies, accountants, legal experts, business services etc.; 5) collective learning & spillovers; 6) Economies of Scale in Entrepreneurship (Gompers, Lerner and Scharfstein 2002). These sub-processes both comprised and amplified the above-mentioned cumulative process and made it self-sustaining (see Avnimelech 2004).

The Israeli experience is quite unique in that it probably is the most successful instance of diffusion of the Silicon Valley model of Venture Capital beyond North America (A&T2004c, Bresnahan et al 2002, Carmell & de Fontenay 2003). That model focuses on VC oriented to *early stage investments in high tech SU*; and its diffusion to Israel took place in the context of Globalization of those Capital Markets focusing on IPOs of young technology companies. While in principle any SU in any country during the 1990s could float in NASDAQ, the possibility of building or transforming a new high tech cluster, which exploits the ICT revolution, may well have depended on the emergence of a capable VC industry. Only then would the possibility of connecting large numbers of innovative SU to global capital and product markets could become a reality.

1.1.2 Potential Relevance

The possibility of latching into the global IT revolution is probably the main reason why Israel's success in creating a VC industry could be relevant not only for advanced industrialized economies but also for Taiwan and Singapore, top-tier industrializing economies like India & China; and for an increasing number of developing countries wanting to develop their Software services industries. The general objective is to further clarify how Israel did it and what could be the lessons for other countries. Our analysis of the Israeli experience within a **Systems-Evolutionary (S/E)** perspective may generate lessons for *VC-directed policies of other countries* and for 'general' *targeted infant industry policies* in top tier industrializing economies. Israel's VC policies stand on their own as a separate class, due to their non-conventional configuration and high impact during the 1990s (A&T 2003, 2004a,b,c). This paper both further specifies why those policies succeeded and what lessons could be drawn for other countries wishing to develop VC and high tech industries.

Moreover some of the insights garnered from the Israeli case could be relevant for targeted infant industry policies in the current phase of the Globalization Process. The increasing importance of 'global markets' (and the high potential returns to innovation which this entails) and 'global competition' (implying high risks)

introduce new conditions for **Sustainable Competitive Advantage (SCA)** (see Porter 1998), particularly in those industries with ‘winner takes all’ situations. These new conditions are not unlike those facing Israel when it targeted a high-tech oriented VC industry during the early 1990s. That experience could be relevant whenever success in creating a new industry depends on a) generating a critical mass of resources, both financial and other; b); accessing sophisticated world class foreign agents and linking them with domestic ones and c) triggering a sufficiently potent self-sustained process of industry ‘emergence’. These factors emerge from our multi-phase ILC framework of analysis which emphasizes the critical transition points which **Innovation and Technology Policy (ITP)** might have to overcome in order to generate appropriate background and pre-conditions for a successful emergence process (A&T 2004c).

Related to the above we contend that given the dynamic and uncertain globalized environment, the existence of sophisticated and even profitable *domestic* market forces operating prior to the emergence of the formal industry or in related areas may actually enhance rather than diminish both the justification for implementing targeted policies and the probability that such policies will lead to industry emergence. On the face of it this would contradict both the theory of support of infant industries –where the prior existence of ‘strong’ market forces would seem to pre-empt the need for policy (Stoneman, 1987); and the underpinnings of a simple ‘market failure’ justification for policy e.g. relevance of the “R&D additionality” criterion.

1.2. Theoretical Background

1.2.1 Infant industries and Structural perspective to Economic Growth

The Structural Perspective to economic growth and development contends that periods of deep structural change particularly *knowledge based structural change* not only accompany but also actually *cause* rapid economic growth¹. This view underlies Kuznets’s characterization of *Modern Economic Growth*, which he contrasts with pre-modern growth. Compared to the previous era, Modern Economic Growth involves on the one hand-a higher rate of growth of output per capita; and on the other- both a higher rate of change in the structure of output and a higher rates of accumulation of production- relevant knowledge. The latter two are interrelated; and both are causes of

¹ Kuznets (1971) has documented in detail the economic growth implications of the rise of the automobile-related cluster of industries in the US during 1880–1920. His interpretation of the link is clearly structural.

the higher rate of growth of output. In some respects this perspective fits very well with the experience of Israel during the 1990s where the relatively high rate of growth of ‘high tech output’ not only accompanied but also to some extent (maybe less than warranted) ‘caused’ the relatively high rate of growth of the economy as a whole. Moreover, the growth of high tech itself during the 1990s can only be explained in terms of a structural/evolutionary perspective. This because there is strong evidence that the engine of high tech transformation in Israel towards the Silicon Valley model during the 1990s was the rapid growth of VC– what we have called the process of VC industry emergence (A&T 2003, 2004a). Thus in Israel the predicted effect of structural change on growth occurs at two levels: the economy level and the high tech cluster level.

At the microeconomic level a modern Structural Perspective to economic growth and development relies on an Evolutionary Perspective with its emphasis on agent heterogeneity and on dynamic processes involving variation, selection and reproduction/inheritance of inventions, firms, organizations, etc. (Nelson & Winter 1982, Saviotti 1997, Coriat & Dosi 1998, Metcalfe et al 2003). The resultant multi-level structural-evolutionary analytical framework contrasts with the neoclassical perspective (e.g. Solow 1956 and other models), which either abstract from structural change altogether or considers it an *outcome* rather than a cause of growth. In such models, the rising *per capita* income associated with growth (a ‘demand’ effect) and the effects of capital accumulation on country comparative advantage (a ‘supply’ effect) induces changes in the relative weights of different industries in overall output.

Justman & Teubal (1991) presented an analysis and survey of the structural perspective to economic growth and development up to the end of 1980s. The authors conclude that the “growth process may be punctuated by periods of discrete shifts in resource allocation (creative destruction) and growth acceleration rather than being smooth throughout”. Also, “market failures may be pervasive due to problems of human capital accumulation, critical mass and discrete choice among alternative paths growth paths”. Thus “... successful growth may require an adequate industrial and technological policy, particularly at nodes of structural change”². The large numbers of failures in infant industry promotion in industrializing economies (see Bell et al 1984) suggests that structural change based economic growth was neither automatic nor assured.

² Some elements of this approach are common to some variants of ‘Modern Growth Theory’ (see Roemer 1986).

Recent work on the Industry Life Cycle perspective to the VC evolution of Israel and the US adds an additional dimension to the nature and impact of structural change (see A&T 2003; AKT 2004). It suggests that creation of a sophisticated and dynamic SU oriented high tech cluster-an important form of structural change- should be linked to *VC emergence*, a process led by a cumulative dynamic with positive feedback. VC emergence will be successful only if it overcomes a series of obstacles due to resource constraints, capabilities, the institutional set up and other factors. Creation of the industry is a *discrete outcome* involving the presence of a significant number of new companies operating in a newly created market; a measure of stability in its structure and a set of coherent institutions. Due to the potential pervasiveness of System (rather than Market) failures, creation of a new industry-even one with a potential SCA- is *not* an automatic process (it may or may not occur even in the presence of strong background conditions and of temporary increases in industry output).

The above suggests a number of important normative points which could be important in the new high risk-high return globalized environment mentioned above. First, the main objective of an infant industry development policy should be 'industry emergence' itself an outcome of a cumulative process of growth with positive feedback; second: the goals of policy should be achieving a 'critical mass' of capabilities and activity that triggers such process within a reasonable period of time; third: the timing of such policies and the overall context of their application should be carefully assessed and chosen. All of these aspects have been present in the Israeli VC industry case; and they will be highlighted in this paper,

1.2.2 Venture Capital

Until the very recent years, with some notable exceptions, the literature on Venture Capital does not deal directly with the processes of Venture Capital Emergence or alternatively, why some countries have and others have not developed VC industries. Most of the existing literature analyzes the VC contracts and the operation of VC at the company and industry/market levels (Wright and Reggie 1998) or in terms of VCs added value and the Venture Capital Cycle (Gompers and Lerner 1999; 2001). While these works cover some aspects of a dynamic analysis of the industry, the focus is on static analysis. Typical areas covered are a) the functional roles of VC companies and how they overcome information asymmetries and other market failures associated with the financing of high tech SU companies by traditional financial institutions like banks;

b) the cash and non cash contribution of VC companies to their portfolio companies; c) the nature of contracts with investors on the one hand (Limited Partners when the VC company takes the Limited Partnership form) and with portfolio companies on the other³; etc.

1.2.3 Venture Capital Policy

A 1997 OECD report states that “OECD Governments are investing an estimated \$3B per year of risk finance in small, innovative firms ... governments are mounting programs to fill ‘funding gaps’ that prevent small businesses from obtaining sufficient capital” (see also OECD 2000, p.35). The report mentions three broad directions of policy: government direct supply of capital to firms; providing financial incentives to venture capital investments; and broadening investment rules. It also mentions the controversies surrounding these schemes namely their impact on private capital sources (“crowding out”). Similarly the 2000 OECD report lists ‘supply side measures’ in support of VC though it is recognized that these may only have minor effects on the venture capital market without assurance of demand. These measures include *promotion of private VC investment* through a range of policies and framework conditions-including through the rules on which types of investors e.g. pension funds may carry out venture capital investments⁴; *development of an active second tier capital market*; *direct equity investments by Governments* -generally targeted to firms in the early stage of development where the risk profile is too high to attract private capital; and *equity guarantee programs* (a few Governments only). That report also states that ‘critiques argue that Government policies ...displace or retard the development of private sector venture capital’. However it also argues that past experience showed that governments could play a useful venture capital role if such schemes are properly conceived and designed.

Other OECD reports emphasize the role of governments in promoting or building *business angel networks*, with the UK having the most developed schemes in this regard⁵; *creation of an European IPO market*; *funding of pre-finance appraisals*

³ See Black and Gilson 1998, Gilson 2002, Kaplan and Stromberg (2001,2) and Isaksson et al 2004

⁴ In a 1996 OECD report it is stated that a number of countries have introduced tax incentives to encourage private individuals to invest in unquoted companies. For example the UK introduced the *Business Expansion Scheme* in 1983 and replaced it by three new schemes: the *Enterprise Initiative Scheme*; *Capital Gains Tax-Re-investment Relief*; and *Venture Capital Trusts*. Similar schemes were implemented in Canada and where about to be implemented in Sweden. It was stated that some of these schemes were successful in raising substantial amounts of finance (OECD 1996, p.11). The report also identifies key issues in the design of such schemes.

⁵ For a VC review of the UK see OECD 2003. Similar reviews were done for Canada, Israel and Korea.

and evaluations as a means of reducing transactions costs; and *stimulating dynamic entrepreneurship* (OECD 1996).

Comment

Our short review of VC policies in OECD countries shows that VC directed policies seem to have been based on VC as a ‘pool of money’ rather than an ‘industry’ view; on static rather than evolutionary or **Systems- Evolutionary (S/E)** analysis; and on a non precise definition of what VC is and is not ⁶. This was also largely the case with Academic research devoted to VC policies. Three strands of such research are exceptions to this statement: the first is represented by the work of Gilson 2003, Black & Gilson 1998, Fiedler & Hellmann 2001 and Becker & Hellmann 2002 who have analyzed the German experience; the second is Gilson’s work on engineering a VC market; and the third is our previous work on Israel’s VC industry and VC policy (especially the Yozma Program see A&T 2003; 2004b,c).

1.2.4 Gilson et al work on Engineering a VC Market

According to Gilson 2003 the central lesson from the successful US experience in generating a VC market is “the extremely effective *contracting structure* that covers the entire VC cycle starting with the initial VC fund, its investments in portfolio companies, the latter’s exit and VC’s cash and non-cash recycling”. Gilson asks whether this model could be replicated elsewhere and if so who, and in particular whether the Government, could engineer the process of creating a VC market.⁷ His analysis assumes that the foundational structure of capital markets (e.g. honest investment banks, effective auditing structures, transparency of information flows, etc) already exists.

According to Gilson, creation of a VC market is a difficult coordination problem, which he terms *simultaneity*. Three factors are required: entrepreneurs/SU companies, existing or to be created; investors with funds who are also willing to invest in high risk/high return investments; and a specialized intermediary (the VC

⁶ In Sweden and the Netherlands the implementation of VC policies oriented to early stage finance of SU was accompanied by a gradual shift of the focus to later stage finance (personal communication).

⁷ Gilson does not ask a question which arises naturally in evolutionary or institutional approaches namely whether there exists a set of functionally equivalent institutional alternatives to the LP form of organization which characterizes the US system including the nature of the contracting process both with investors and with portfolio companies. This is an important limitation of his ‘normative’ analysis, given the potentially uneven fitness across countries of the above VC-related institutional structure with the overall institutional framework. The need of mutually adapting VC organizational, governance and contractual forms on the one hand and the overall institutional framework on the other may be more general than is implied by his analysis.

management company or fund) to serve as a *nexus of sophisticated contracts*. His analysis also assumes that given two of these conditions, the third will follow endogenously. He also states that the Government is a natural engineer since it is the only agent that has an incentive to invest in the required public good ⁸but its role should only be catalytic. More specifically, the Government 'should induce the development of the necessary specialized institutions and should provide it with seed capital, which in the US was in an important measure provided by Pension Funds'. Once the Government undertakes these two functions they will endogenously induce high tech entrepreneurship and the founding of the required numbers of SU companies. Gilson's template for engineering a VC market is shown below.

Box 1: Gilson's Template For Engineering A VC Market

- *The Government should issue a request for proposals for privately managed VC funds*
- *The Government should then select a subset which are run by competing & competent professionals*
- *The organization and structure of the VC funds and the VC-SU contracts should broadly track the US pattern- e.g. a fixed term for the new intermediaries which could induce the recycling after a few years both of the cash and non-cash contributions of VC companies towards a new set of young and inexperienced entrepreneurs/SU.*
- *Initially at least and to compensate for the lack of a 'reputation market' fund owners/managers should make significant investments in their funds much beyond the 1% share of VC capital which is common in the US and like Chile's CORFO program which invests 15%⁹*
- *Government should be a passive investor in these financial intermediaries*

The above conditions would assure that there are strong incentives to the Government sponsored VC companies to succeed: to seek out promising entrepreneurs; and to monitor and provide added value or non-cash resources. This would stand in stark contrast to the negative experience of Germany's failed WFG program which was implemented during the 1970s and 1980s (Becker and Hellmann 2002; Fiedler and Gilson 2001, pp. 4-5; and Gilson 2003, pp32-5).

Gilson does recognize that his template for engineering a VC market is based on the assumption that the supply of entrepreneurs is responsive to venture funding and to the appropriate financial institutions. He partially dismisses the arguments that lack of entrepreneurial culture could block creation of an entrepreneurial or SU sector (one interpretation of the German failure according to the Becker & Hellmann and

⁸ There clearly is such a good but it has not been specified by Gilson

⁹ This is supposed to create a better alignment of VC fund owners/managers incentives with those of investors.

Fiedler & Hellmann papers), by assuming that the first successes with VC would endogenously attract or 'reveal' new entrepreneurs¹⁰.

1.2.5 Critique of Gilson's Analysis

The theoretical framework proposed by Gilson and associates which emphasizes the organizational, governance and contractual structure of the privately owned/managed VCs sponsored by Government programs is indeed a very useful and revealing one. It has been applied to the German case, a fact that has added important insights about the 'background and pre-conditions' required for emergence of a VC industry.

However, our attempt to consider VC as an industry to be analyzed in Systems/Evolutionary terms; and our view of Policy as being systematically integrated into the positive side of the story-- pushes the theory even more in the right direction. We start with a main feature of the Systems-Evolutionary perspective: the emphasis on 'emergence processes'. In Israel's case Venture Capital emergence was, at least implicitly, a strategic priority of the country and of the transformation of its System of Innovation (A&T 2003, 2004c) with ITP being directed to overcome the system failures, which stood in the way of achieving this priority. Furthermore recognition that a successful VC emergence process requires a rapid process of cumulative growth of VC with positive feedback lead us to analyze the pre-conditions for a high impact targeted policy to be successful. These include a number of factors or processes: a measure of R&D/Innovation capabilities which in Israel was the outcome of ITP implemented prior to Yozma; the creation of 'demand' for the future VC industry-also the result of prior policies which assured the existence of about 300 SU by 1993; and the fact- the central point of this paper-that high quality 'market forces' were involved in the process¹¹. Thus VC policy failures may be due not only to the institutional and contractual factors mentioned by Gilson and others but also to other factors whose existence or non-existence would, at least in part, be the result of other policies-some prior to VC policy and others contemporaneous to it.

Our S/E perspective and our analysis of the VC Industry Life Cycle also suggests that an appropriate VC policy should recognize the potential importance both of simultaneity of actions/ states and their sequencing. Gilson's view is that once there

¹⁰ Gilson is aware of the complexity of contexts so that 'different countries may respond quite differently to the same engineering efforts'. But no effort is made to further his analysis in this direction.

¹¹ We term this 'existence of Class A market forces'.

are investors and intermediaries (VC) then the remaining factor-entrepreneurs-will emerge endogenously. Our view, in contrast, is that a critical mass of SU should exist prior to targeting VC i.e. *sequencing rather than simultaneity*; otherwise the new industry will not take off. This view is supported both by Israel's successful Yozma program and by the failure of VC policies of many other countries e.g. Chile's CORFO program which was predicted to succeed but which failed (due to lack of deal flow).

1.3 Israel's Model of Venture Capital (and High Tech)

1.3.1 Definition of VC and PE

VC companies are “independently managed dedicated pools of capital that focus on equity or equity-linked investments in privately held, high growth companies” (Lerner 1999, p. 349). This definition allows for two variants, a narrow and a broad one. The *narrow or strict definition of VC* which is the relevant one for characterizing Israel's VC industry involves a ‘dominant’ orientation to the *early stage* finance of *high tech SU* companies; while the broad definition, which is Lerner's, allows for a non-high tech and non early phase focus (although they should still focus on high growth companies). Private Equity is even a broader category since it *also* allows for non-Venture equity investments (i.e. not related to high growth companies) especially in private companies such as leveraged buy-outs and buy-ins, consolidations, mezzanine, distressed debt investments, etc. Thus PE companies encompass both VC companies and other financial institutions whose dominant activity is late phase equity investments especially in non high tech industry and services¹². A common form of organization of VC is the Limited Partnership (LP) form, which is also common for PE whatever the definition used¹³.

¹² The U.S. definitions of VC & PE described above contrasts with those used in Europe, at least till 2003. Under the EU definition used then VC was a broader category than PE. In their 1998 article Wright & Robbie state that the term VC is “increasingly being used in firms undergoing ‘radical restructuring’ rather than referring to ‘new firms’ (Wright & Robbie 1998 p. 522).

¹³ The paper focuses on the *organized* VC market and, to some extent, on the *organized* PE market. It comprises “professionally managed equity investments in the unregistered securities of private and public companies” (Fenn et al. 1995, p.2) undertaken by *specialized companies*. PE & VC encompass other markets that are distinct from the organized market e.g. angel capital and the informal PE market (Fenn et al. 1995). The paper also emphasizes *independent companies* that are companies, which are not the VC or PE arms of financial institutions or large corporations.

1.3.2 Distinctive Features of Israel's VC industry

BOX 2: Distinctive Features Of Israel's VC Industry

<p>Highest VC investments as a share of GNP (OECD 2003d) - 1.3% during 1998-2001. This contrasts with France, Germany, the US and the EU for this period (Dubocage and Rivaud-Dansee 2002, p.31).</p>
<p>High Share of VC investments are 'Early Phase' i.e. a relatively strict definition of VC - over 50% (OECD 2003d). This contrasts with European VC/PE industries where 6% of annual European VC investments were early phase while 46% were management buy outs and buy ins according to a EVCA 1996 report (this means that PE and even non-venture PE WAS dominant in Europe). As a share of GNP <i>early phase investments</i> in Europe increased from 0.020% in 1998 to 0.074% during 2000; and those of the US from 0.083% to 0.251% (Dubocage and Rivaud-Dansee 2002). This share might be as much as 3 or 10 times lower than in Israel. The lower share of early phase in Europe compared to the US and Israel could be related to the fact that in contrast to the US (and presumably Israel) the ROR to early phase is lower than for later phase investments (Wright and Robbie pp. 552-4).</p>
<p>A substantial share of VC entrepreneurs with S&T backgrounds and/or with high tech experience - many if not most VC and PE entrepreneurs in Europe have financial, economics and business backgrounds rather than S&T backgrounds and/or High Tech experience.</p>
<p>90% of funds coming from foreign sources- this contrasts with the US where the share of foreign investors in capital raised during 1995-99 was 3% (OECD 2000)</p>
<p>Negligible investments by domestic Pension Funds – only 0.1-0.2% of the Israeli Pension Funds & Insurance Company's assets are investments in VCs (OECD 2003d) which contrasts with between 3-5% in the US and Europe. 50% of total capital raised for the 1995-99 period in the US and 22.6% in Europe came from Pension Funds. Only in part could this could be attributed to Israel's VC industry focus on early phase investments. Apart from de-regulation of Pension Funds' investments (a process taking place as of late), an important factor still is the conservative strategic outlook of Israeli Pension Funds.</p>
<p>Other Characteristics: LP form; strong capabilities for early stage support of SU; and a strategy mostly directed to this early phase. Related to this: Israel's VC industry benefits from a very large pool of SU, and the highest number of IPOs in NASDAQ (most VC backed) after the US and Canada.</p>
<p>The VC industry co-evolved with high tech, particularly the SU segment of high tech industry- as during consolidation of Silicon Valley's tech cluster around the SU Semiconductor companies (who where to a large extent venture capital backed) during the late 1960's and early 1970's. This was also the period of emergence of the US VC industry (AKT, 2004).</p>

1.3.3 Structure of Israel's VC and PE Industries

Table 1: Capital Raised According to different types of PE Organization in Israel

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Private VCs	49	27	172	112	135	309	620	594	1552	3682	1304	76	118
Yozma VCs	0	0	149	40	15	0	52	0	0	0	0	0	0
Non-Yozma	49	27	33	72	120	309	568	594	1552	3682	1304	76	118
Public VCs	0	54	22	0	0	0	29	8	44	185	6	86	0
Inbal VCs	0	54	22	0	0	0	0	0	0	0	0	0	0
Non-Inbal	0	0	0	0	0	0	29	8	44	185	6	86	0
LP PE Funds	0	45	128	242	6	24	56	67	108	89	0	110	435
IC / HC	9	34	40	20	25	80	134	141	149	601	83	0	5
Total PE	58	160	372	374	166	413	839	810	1853	4557	1393	272	558

Source: IVA (1997-2004). IC/HC – Investment/Holding companies; Public VC- Publicly Traded VC; Private VCs – LP VCs; LP PE - Non-VC Private Equity LP funds (directed to late stages or/and non-ICT firms)

Table 1 shows the changing structure of Israel's PE (including Investment Companies) and VC industry since 1991. The first VC category of Table 1 is Private Limited Partnerships VC companies; these are divided into two sub-categories. *Yozma Funds*, which are private, hybrid funds organized under the auspices of the Yozma Program and managed by private management companies (their strategy is explicitly focused on early phase investments in high tech SU¹⁴); and the second sub-category *Private VCs* which comprise 'Other/non-Yozma-related' LP VCs. The Second major category- Public VCs- comprises funds traded in the Tel Aviv Stock Exchange. This category is also divided into two sub-categories- *Inbal VCs* and *non-Inbal VCs*. Yozma Funds started in 1993 with a \$100M Government contribution (\$70M in 1993, \$16M in 1994, \$6M in 1995 and \$8M in 1997), which leveraged another \$156M from private sources (\$79M in 1993, \$24M in 1994, \$7M in 1995 and \$44M in 1997).

Yozma Funds not only did not 'crowd out' Private VC (a few of which existed before 1993) but positively stimulated this category of funds which through accelerated growth became the mainstay of Israel's VC industry. This provides support to the thesis that Yozma 'triggered' a cumulative process of growth of Israel's VC industry; and that this industry focused on 'early phase investments' in high tech SU. Note also the relative insignificance of the publicly traded component of Israel's VC industry which were less focused in early phase and in new IT sectors: while such companies were created in the wake of the Inbal program which preceded Yozma their share was never significant beyond 1992/3 and continuously declined thereafter (excepting perhaps during the bubble of 1999-2000).

A final point concerns the relative weight of LP PE Funds and IC/HC in the overall market. We can observe a very interesting phenomena in which the emergence of the early stage and ICT oriented VC industry 'crowded out' the late stage and/or mid tech oriented LP PE funds segment (from an average of 46% of the entire PE market in the years 1992-4 to an average of 3.6% of the entire PE market in the years 1995-2001). We believe that this occurred due to the fact that those two segments competed for the same resources of capital and therefore in the short/mid term the relative success of one of them 'crowded out' the other one¹⁵. In the

¹⁴ Capital Raised for each one of these VCs refers to their Yozma Fund only, not to other funds raised by the same company (e.g. follow up funds).

¹⁵ We have reasons to believe that in the UK an opposite phenomena occurred were the relative success of the late stage PE segment 'crowded out' the early stage VC segment (Mouray, G., Lecture at the University of Pavia 2001).

Investment/Holding companies segment we do not observe the phenomena due to the fact that these segment are not competing for the same sources of capital.

1.3.3 VC-SU Co-evolution

VC-SU co-evolution was identified as a central axis in the cumulative process leading to VC emergence (A&T 2004a; Avnimelech 2004). The interaction between the two types of agents was both direct and indirect. Direct interactions parallel supply-demand effects & user-producer links in young markets e.g. VC & SU *entry*; and interactive learning. Indirect links also occur through the wider cluster via one or more component sub-processes of cumulateness¹⁶. The data is, broadly speaking, consistent with at least three steps in the VC-SU co-evolutionary process:

Pre-Emergence (1985-92): the numbers of SU companies operating then and the small share of those which were VC-backed (& the limited amount of VC capital and activity then) suggests the existence by 1992 of an '*unsatisfied SU demand for VC services*';

Emergence (1993-2000): The rapid policy response (through Yozma) to such a deficit led to a quantum jump in VC capital raised and, due to the availability of a pool of skilled potential VC *entrepreneurs*, to a corresponding increase in VC activity. This in turn led to a '*temporary excess supply of VC services*'. As a result we observe not only an increased share of SU, which were VC-backed but also significant increases in gross additions to SU during 1995-6. These were either a reaction to the 'excess supply of VC services' or the expectation that new SU foundations would easily find *new* VC sources of finance if required (for empirical support see Avnimelech 2004).

Increasingly Synchronous Growth: Starting in 1996 SU demand for VC services and VC 'supply' become increasingly synchronies i.e. rapid mutual adjustment. Presumably this reflects the onset of mutually consistent expectations. Throughout the rest of the decade, the share of SU that are VC-backed increases (up to about 70%) although there are always will be SUs who are not VC backed.

¹⁶ For example, entrepreneurs from VC portfolio companies would frequently become consultants to the VC or even partners (VC interviews during the years 1999-2001).

1.4 Specific Objectives

Previous research on Israel's VC industry emergence process focused at the *industry* or *meso- economic or industry* level of analysis. In this paper we undertake a *microeconomic analysis* of VC companies particularly those active during the pre- and early emergence periods. This will provide additional insights on the nature of the emergence process and on why Yozma succeeded. *The focus is to understand the state of 'market forces' just prior to and during early emergence.* These are the agents, which would or would not enable the cumulative process on which VC emergence depended to take place. We define ***Class A market conditions*** as those agents which *potentially* could support a successful cumulative process of emergence once a triggering mechanism e.g. achieving critical mass of resources is activated. ***Class A market forces*** on the other hand are those agents whose strong profitability resulted from such a process (with the triggering mechanisms acting upon or co-evolving with ***Class A conditions***).

The *specific objectives* of this paper are

- Identify and Measure VC Company *Private* Performance and *Social* Impact (indirect contribution to the emergence and transformation of high tech clusters) of an important segment of VC companies, particularly those founded during pre- and early VC emergence.
- Establish whether ***Class A market*** forces prevailed during the pre- and early emergence phases in Israel and the implications of this for VC emergence.
- Analyze whether ***Class A conditions***, rather than weakening the case for Government intervention, strengthened the justification for implementing Yozma (the targeted policy directed to VC emergence) and the probability that such a policy would be successful.
- Implications of ***Class A market conditions & forces*** for targeted policies in other industries and countries.

2. Data, Methodology and Indicators

2.1 The Sample

We interviewed 20 VC Companies, which were established prior to 1999 including (10) of the (11) Yozma Funds (excluding Medica- a VC specialized in biotechnology and therefore having unique characteristics); and other significant Israeli VC Companies (in terms of size or impact on the cluster). We gathered information regarding their operation, evolution and performance (See table 2). The concentration of 'Yozma Funds' in our sample follows from our interest in the process of

Emergence of the VC industry (where Yozma funds were critical-see Table 1) and from our interest in the role of policy in that process.

The sample comprises companies founded during the pre-emergence phase (1986-92: 5 companies) and the first two sub-phases of VC industry emergence: early-emergence (1993-94) - 7 companies; and mid-emergence (1995-98) 8 companies. The 20 VC management companies included in the sample managed 71 VC funds with total capital under management of more than \$7 billion (about 65% of total capital under management in Israel's VC industry at December 2003).

Table 2: VC Companies' Sample: Descriptive Statistics

VC	Foundation	# of Funds	Capital Under Management (M\$)	Capital till 99
VC-01	1989	11 (89-01)	1000 (89-93: 57, 94-98: 300, 99-01: 650)	357
VC-02	1991	3 (91, 97, 01)	96 (50, 5, 41)	55
VC-03	1992	13 (93-01)	630 (92-5: 49; 96-8: 157; 99-01:424)	206
VC-04	1992	3 (92, 98, 00)	316 (45, 60, 211)	105
VC-05	1992	2 (92, 97)	140 (24, 116)	68
VC-06	1993	3 (93, 96, 00)	280 (20, 75, 185)	95
VC-07	1993	3 (93, 97, 00)	346 (36, 110, 200)	146
VC-08	1993	1 (93)	33 (33)	33
VC-09	1993	4 (93, 96, 00)	700(20, 125, 500)	145
VC-10	1993	2 (93, 98, 00)	185 (33, 62, 90)	95
VC-11	1993	3 (93, 98, 01)	160 (20, 80, 60)	100
VC-12	1994	4 (94, 97, 99,	605 (20, 75, 160, 350)	95
VC-13	1995	3 (95, 99, 01)	740 (40, 100, 600)	140
VC-14	1995	2 (95, 00)	72 (20, 52)	20
VC-15	1995	4 (95, 96, 98,	257 (6, 11, 40, 200)	57
VC-16	1996	2 (96, 99)	353 (90, 263)	90
VC-17	1997	2 (97, 00)	205 (55, 150)	55
VC-18	1997	3 (97, 01)	246 (86, 160)	86
VC-19	1998	2 (98, 00)	353 (100, 253)	103
VC-20	1998	2 (98, 01)	180 (80, 100)	80
Total	89-98	71	7035	2130
Average		3.6	349	106

Table 1 show that the VC Companies in the sample have on average 3.6 funds (Median- 3 funds). These funds were usually established successively one during each sub-phase of emergence of the VC industry (1993-6; 1997-8; 1999-2000). Average capital under management in the VC management companies of the sample was \$100M at 1998 and \$350M at 2002. A gross estimate of the annual ROR of these VC companies is about 20%.

2.2 Methodology and Variables

Assembly of information for this research project was done during 1999-2004. As mentioned above a main objective was to explain VC industry emergence and this made us select a sample with a large proportion of VC companies managing Yozma

Funds and other VCs who were founded relatively early and who seemed to have a significant influence on subsequent developments. We undertook in-depth interviews of the 20 VC Companies and gathered extensive information on them from other private and public sources. With this data we generated measures of VC private performance and social impact; and we subsequently grouped VC companies into Categories of Success both with respect to Private Performance and to Social Impact.

VC Performance Indicators

The private nature of VC investments means that there is a generalized absence of publicly available information. Write & Robbie in their 1998 article also mention that there is little rigorous analysis of VC performance out of the US due to the newness of markets (where VC portfolios have not yet reached maturity), problems of access to adequate data and the non-transparency of the calculations undertaken by national VC associations (Write and Robbie 1998, pp. 553-4; 563)¹⁷. These observations apply to the situation in Israel where the industry is about 10 years old. Given the approximately 7-10 years VC cycle only the first Funds raised by VC companies during 1989-95 would have completed the "exiting" process while other funds would only complete it in the future. Thus only a subset of VC companies and funds could be included in a full analysis of 'VC Performance'; and, even within this group, a **Rate of Return (ROR)** calculation for each VC was not possible.

Problems of information are only one reason for searching for *indicators* of VC performance rather than relying exclusively on ROR measures. This because VC performance depends not only on capabilities (both those involved in overcoming problems of 'asymmetric information' and other capabilities) but also on luck. Under these conditions, Write and Robbie suggest the use of in depth 'qualitative' research methods. In this paper we will use a mix of qualitative and quantitative methods, which will enable us rank VC companies according to *performance indicators*. More specifically we will try to identify and use both 'absolute' success indicators, which capture some scale effects but on the other hand could be very sensitive to random events (such as *one* very successful IPO), as well as 'relative' indicators which are less sensitive to luck while emphasizing capabilities and effort (some of which have not yet been materialized). The VC company and VC fund private performance

¹⁷ This also explains the paucity of rigorous academic studies on the performance of VC investments (Wright and Reggie, 1998).

indicators used in this paper are: absolute number of exits; and exit success ratio (number of exits divided by number of portfolio companies-see Table 3).

A central concern of the paper is to assess the *Social Impact* of VC companies. This is a distinctive aspect, which to our knowledge has not yet been considered in the literature. It follows directly from our striving to understand VC industry emergence where, like frequently happens with new industries, early entrants could generate information, knowledge and other spillovers which benefit subsequent entrants. In an imperfect capital market setting a VC's social impact primarily depends on absolute measures of social impact. In our paper these are related to: 1) Reputation effects- they might be stronger when accumulated by larger entities; 2) Networking- most global investors would not invest in a small VC even if it has a high ROR due to high monitoring and transactions costs; 3) VC contribution to the critical mass which triggers VC emergence; and 4) Pioneering activities by which we mean variation leading to selection and diffusion of new functionally tested features of the industry, its organization, behavior and strategy.

After calculating these indicators for each VC we end up classifying the 20 VC companies into four 'private performance' groups and four 'social impact' groups. Each group belongs to one of the following index categories: **Very Successful (VS)**, **Moderately Successful Plus (MSP)**, **Moderately successful (MS)**, and **Less Successful (LS)**. We then determine the correlation between VC **companies' private performance (Pp)** and their **social impact (Ps)** and analyze implications for the emergence process and for the role of policy.

Table 3: VC Exits and Investments (funds initiated till 1998/9)

VC	<i>Date of Funds Initiation</i>	# Exits	# IPOs	# M&As****	# No. of portfolio companies	Total Exits' Value
VC-01	89, -, 96,	38 (24, -, 14)	24 (16, -, 8)	14 (8, -, 6)	140 (70,-, 60)	\$7500
VC-02	91, -, -,	8 (8, -, -)	4 (4, -, -)	4 (4, -, -)	30 (30, -, -)	\$1800
VC-03	92, 96, 98,	19 (-, 14, 5)	14 (-, 10, 4)	5 (-, 4, 1)	60 (-, 40, 20)	\$9000
VC-04	92, -, 98,	14 (7, -, 7)	6 (3, -, 3)	8 (4, -, 4)	40 (17, -, 23)	\$4700
VC-05	92, -, 97,	15 (10, -, 5)	7 (6, -, 1)	8 (4, -, 4)	46 (18, -, 28)	\$3200
VC-06	-, 93, 96,	12 (-, 9, 3)	8 (-, 5, 3)	4 (-, 4, 0)	55 (-, 13, 26)	\$4800
VC-07	-, 93, 98,	17 (-, 9, 8)	7 (-, 6, 1)	10 (-, 3, 7)	56 (-, 36, 20)	\$2800
VC-08	-, 93, -,	5 (-, 5, -)	3 (-, 3, -)	2 (-, 2, -)	24 (-, 24, -)	\$450
VC-09	-, 93, 96	17 (-, 10, 7)	10 (-, 6, 4)	7 (-, 4, 3)	58 (-, 24, 34)	\$2900
VC-10	-, 93, 98	4 (-, 4, 0)	2 (-, 2, 0)	2 (-, 2, 0)	37 (-, 22, 15)	\$500
VC-11	-, 93, 98	10 (-, 7, 3)	2 (-, 2, 0)	8 (-, 5, 3)	45 (-, 20, 25)	\$1400
VC-12	-, 94, 97	11 (-, 9, 2)	7 (-, 7, 0)	4 (-, 2, 2)	39 (-, 17, 22)	\$4000
VC-13	-, 95, 99	6 (-, 5, 1)	5 (-, 4, 1)	1 (-, 1, 0)	34 (-, 16, 18)	\$1750
VC-14	-, 95, -,	4 (-, 4, -)	1 (-, 1, -)	3 (-, 3, -)	25 (-, 25, -)	\$350
VC-15	-, 95, 98	3 (-, 2, 1)	1 (-, 1, 0)	2 (-, 1, 1)	33 (-, 19, 14)	\$800
VC-16	-, 96, -,	4 (-, 4, -)	2 (-, 2, -)	2 (-, 2, -)	20 (-, 20, -)	\$2800
VC-17	-, -, 97,	9 (-, -, 9)	2 (-, -, 2)	7 (-, -, 7)	36 (-, -, 36)	\$2300
VC-18	-, -, 97,	11 (-, -, 11)	6 (-, -, 6)	5 (-, -, 5)	27 (-, -, 27)	\$2200
VC-19	-, -, 98,	3 (-, -, 3)	3 (-, -, 2)	0 (-, -, 1)	14 (-, -, 14)	\$1400
VC-20	-, -, 98,	3 (-, -, 3)	2 (-, -, 2)	1 (-, -, 1)	21 (-, -, 21)	\$340
Total	33 (4, 12, 17)	214 (40,92,81)	120 (21, 54, 45)	94 (19,38, 37)		
Mean		10.7 (10, 7.8, 4.6)	6 (5.3, 4.6, 2.6)	4.7 (4.8, 3.3, 3)	50 (20, 23, 15)	\$2670

* Some of the founders/organizations had prior VC-related activity, which is not presented here.

** A company is counted only for the first fund of the VC Company that invested in it. Frequently several VC funds managed by the same management company invested in the same SU; this may lead to under-estimation of second and third VC fund portfolio companies with implications for the estimation of their performance.

*** We distinguished VC Company's funds according to initiation date in relation to the following VC industry phase or sub-phases 89-92, 93-5; 96-8.

**** Each phase average is calculated by division of the total exits related to the phase with the actual number of funds initiated during this phase, while the total average is calculated by total exits divided by 20. For this reason the average of all 3 phase don't sum up to the total average.

2.3 VC Private Performance¹⁸

Table 3 indicates investment and exit data for the 20 VC Companies. The data in parenthesis in columns 3-6 indicate the figures corresponding to individual funds of the VC companies, whose date of initial operation are shown in column 2. The average number of Exits per VC Company for periods 1, 2 and 3 Funds is 10; 7.6; and 4.8 respectively. This strong difference between mean exits of period 1, 2 and 3 Funds reflects the shorter length of operation for period 3 (& 2) funds. Despite this the overall number of exits in periods 2 & 3 is more than twice (for each period) the number of exits in period 1 (92 and 81 compared with 40)—this relates to the growth in size of the VC industry and the accumulation of capabilities in the VC and high tech cluster.

A final point worth mentioning is that-despite that the average size of funds launched between the first (1993-95) and second (1996-98) VC emergence sub-phases increased by over 200%- there was only a small increase in the mean number of investments (25 against 23). This means a significantly higher size of each investment and more VC rounds prior the exit. This suggests the existence of stronger competition as the industry developed.

2.3.1 "Absolute" VC Private Performance (Pp) Categories

Younger VC companies have fewer exits in part because their activity is still in the pipeline and therefore a simple ranking will be misleading. To overcome this problem we define *Exit Threshold Levels* (VC companies and funds) for each Category of Private Performance -VS, MSP, MS and LS. These threshold levels are lower the earlier the company foundation or fund initiation date. The computed indicators enable us to group each VC Company into the four VC private performance categories of Box 3.

Box 3: Absolute VC Company Performance- Categories and Companies

<u>Performance Category</u>	<u>VC Companies</u>
VS -6 companies	VC-3; VC-7; VC-16; VC-9; VC-1; VC-18;
MSP 5 companies	VC-6; VC-4; VC-12; VC-5; VC-11;
MS -6 companies	VC-13; VC-19; VC-20; VC-8; VC-17; VC-2;
LS -3 companies	VC-14; VC-15; VC-10;

¹⁸ Due to the length and complexity of the ranking measures and analysis we didn't add them to this paper. For details on the measures and calculations (which there outcomes are reported in this section) see A&T 2004d.

2.3.2 "Relative" Private Performance Categories

A simple *relative* indicator of VC Company performance is the *Success Ratio* defined as number of Exits over number of Portfolio Companies. These ratios can be calculated from the data in Table 2. Since the average number of Portfolio Companies per VC Company approximates 50 and that of exits is 10.7, the Success Ratio for the sample of VC companies, as a whole is 21%. Needless to say that the Success Ratio is only a rough indicator of VC company performance since each exit has a different ROR. As with numbers of exits, important differences can be found in the Success Ratio between the first and the subsequent VC company funds.

We also calculated another relative ratio, which is the total *value* of all VC Company's exits divided by the total *capital* under management. This ratio is not an ROR- it refers to the capital multiple i.e. \$50M investment that achieve \$1,350M will be presented as 27 (the average in the sample)¹⁹.

Box 4: "Relative" VC Private Performance Categories and Companies

VS-5 companies: VC-3; VC-16; VC-4; VC-5; VC-9

MSP -7 companies: VC-19; VC-6; VC-7; VC-12; VC-1; VC-2; VC-18

MS-4 companies: VC-13; VC-8; VC-17; VC-11

LS-4 companies: VC-14; VC-20; VC-15; VC-10

2.3.3 Overall VC Private Performance

The computed data on the two *Success Ratios* for each VC fund & VC Company plus information of Phase or sub-phase of VC company foundation enable us to assign VC Companies into the 4 Performance Categories (see Box 5 which is based on a simple average of the two indices). As with absolute exits, there are threshold levels of the success ratio for each category (the earlier the initiation date, phase or sub-phase is the higher the threshold level is).

Box 5: Overall VC Private Performance Pp Groups

VS-6 companies: VC-3; VC-7; VC-16; VC-9; VC-1; VC-18;

MSP-4 companies: VC-6; VC-4; VC-12; VC-5;

MS-7 companies: VC-13; VC-19; VC-20; VC-8; VC-17; VC-2; VC-11;

LS-3 companies: VC-14; VC-15; VC-10;

¹⁹ In order to get the funds ROR we need to know the actual VC share in those portfolio companies that had an exit; and the accurate dates both of the VC investment rounds and of liquation of shares. In addition, we should add the value of "fire-sales" and of secondary sales of the VCs (not presented here).

2.4 The Social Impact (Ps) of VC Companies

A major component of the *social* impact or performance of VC companies is their Private Performance, which we have discussed in the previous section. Our focus here is on the additional, non-private performance aspects of social VC Company impact (*externalities*- Ps). For our purposes we define three Specific (social) Impacts:

- ‘VC/Cluster Reputation effects’, and ‘Networking effects’,
- ‘Selection/Diffusion of New Variety’, and
- ‘Contribution to Critical Mass’.

The sources or variables affecting each one of these impacts are varied and our intention is neither to list all of them nor to fully trace here the mechanisms linking sources to impacts (For fuller descriptions see A&T 2004d). As with Pp we first build four ‘simple’ indicators of the social impact of VC companies- one for each specific impact- and then aggregate to get an *overall* social impact indicator for each VC Company. Each *simple* indicator is constructed from a small number of sources/variables; from these we assign an *index of strength* for each VC firm. As with private performance there are four possibilities: **VS, MSP, MS** and **LS**.

2.4.1 Combining the ‘Reputation’ and ‘Networking’ Simple indicators

The relevant ‘source’ variables for each VC Company include *Best Company Exits* and *Participation of Reputable Investors* (e.g. well known Strategic Investors such as AOL, Intel, or Siemens which act as Limited Partner of local VC Management Companies). The ‘mechanisms’ linking them to a reputation & networking ‘social impact’ include *enhanced VC Company Reputation*, which then spills over to the VC/High Tech industry as a whole. Another mechanism linking a source variable to the reputation & networking social impact is *VC Company Networks*. Since a VC is a central node in overlapping networks (Florida & Kenney 1988) adding a new added value investor (limited partner) to a VC’s network may facilitate other agents’ access to that investor. Thus the new limited partner may become a strategic partner-investor of companies in the VC’s portfolio; he may develop links with other VCs that co-invest with the VC in question; and, through the cumulative effects of these and other similar impacts—he may decide to establish an office in Israel.

Box 6 presents the grouping of the VC sample according to a combined Reputation & Network social impact index.

Box 6: VC Reputation & Networks Social Impacts: Categories and Companies

Categories	VC companies
VS- 5 companies	VC-3, VC-4, VC-12, VC-9, VC-1.
MSP-6 companies	VC-19, VC-6, VC-7, VC-16, VC-5, VC-18.
MS-5 companies	VC-13, VC-15, VC-17, VC-2, VC-11.
LS-4 companies	VC-14, VC-20, VC-8, VC-10.

2.4.2 The Selection/Diffusion Social Impact Indicator

This social impact derives from *VC Pioneering Activities* i.e. a broad category of actions or events leading to the introduction of new important information into the system or a new model of organization, strategy, behavior etc. These, which include events like *First instance of world class Strategic Investor*, generates new behavioral options, which could be selected by, and widely adopted/diffused in the VC industry/High Tech Sector²⁰. Based on the 'Total Score' for each VC Company (which aggregates the various pioneering events with appropriate weights) Box 7 groups the sample of companies into the four categories of the selection/diffusion social impact indicator.

Box 7: VC/ Cluster 'Selection/Diffusion' Social Impacts: Indices & Groups

Categories	VC companies	Total score
VS(4 VCs)	VC-3, VC-7, VC-9, VC-1	13-20
MSP(5 VCs)	VC-4, VC-16, VC-2, VC-18, VC-11	8-12
MS(6 VCs)	VC-13, VC-19, VC-6, VC-12, VC-8, VC-5	5-7
LS(5 VCs)	VC-14, VC-20, VC-15, VC-17, VC-10	1-4

2.4.3 VC Contribution to Critical Mass

The last component of the social impact of VC Companies concerns their contribution to critical mass of the industry, which is the main factor triggering VC emergence. Four main sources/variables will be considered here- two from the "output side" and two from the "input side": *Number of Exits & Exits leading to Entry of important MNE*; and *Total Capital under Management & number of portfolio companies*. The second variable attempts to capture the contribution to critical mass from *entry of an important high tech MNE* into the cluster as a result of an acquisition of a VC's portfolio company (a main exit category). Thus VC companies with no M&A, which led to an important MNE, are considered LS with respect to this variable; those with exits leading to a sustainable entry of a MNE with subsequent dramatic increase in activity are considered VS, etc.

²⁰ The list of the relevant activities that represented 'novelty' and the weights used can be found in A&T2004d

A major factor in calculating the contribution to social impact of each source/variable is calendar time. Thus the weight we give to the early exits will be much greater than that given to the later ones. Similarly with the input side measures- *Total Capital under Management and number of investments.*

The final grouping of VC companies, which takes into account the scores for each individual variable, is shown in Box 8.

Box 8: ‘Contribution to Critical Mass’ Social Impact: Categories and Companies

Categories	VC companies
VS-4 companies	VC-3, VC-7, VC-9, VC-1
MSP-5 comp.	VC-4, VC-16, VC-2, VC-18, VC-11
MS-6 comp.	VC-13, VC-19, VC-6, VC-12, VC-8, VC-5
LS-5 comp.	VC-14, VC-20, VC-15, VC-17, VC-10

2.4.4 Overall VC Company Social Impact

The Box below summarizes the result of adding the *simple indices* of VC Company Social Impact each with a weight of one third for each company and then assigning them to one of the four categories of overall social impact

Box 9: Overall VC Social Impact Ps Groups and Individual Components

	VS	MSP	MS	LS
<i>Reputation and Networking</i>	VC-3, VC-4, VC-12, VC-9, VC-1	VC-19, VC-6, VC-7, VC-16, VC-5, VC-18	VC-13, VC-15, VC-17, VC-2, VC-11	VC-14, VC-20, VC-8, VC-10
<i>Pioneering Activities</i>	VC-3, VC-7, VC-9, VC-1	VC-16, VC-4, VC-2, VC-18, VC-11	VC-13, VC-19, VC-6, VC-5 VC-8, VC-12	VC-14, VC-17, VC-20, VC-15, VC-18; VC-10
<i>Contribution to Critical Mass</i>	VC-3, VC-9, VC-4, VC-1	VC-6, VC-7, VC-12, VC-5, VC-2	VC-13, VC-16, VC-10, VC-17, VC-15 VC-11, VC-18	VC-19, VC-14, VC-15, VC-20, VC-8
Aggregate Ps Index	VC-3; VC-7; VC-4; VC-9; VC-1;	VC-6; VC-16; VC-12; VC-5; VC-2; VC-18;	VC-13; VC-19; VC-15; VC-17; VC-11;	VC-14; VC-20; VC-8; VC-10;

3. Class A Market Forces and Implications for Israel’s VC emergence

3.1 High Pp, Ps level/correlation of ‘early’ VC entrants

Israel’s VC industry emerged during 1993-2000 under very favorable conditions both domestic conditions and external ones. The pre-emergence experimentation and learning processes by the business sector reported in previous research (A&T 2003, 2004a,c) suggests that market agents existing then acquired significant capabilities. This could now, at least indirectly, be confirmed or disconfirmed through the indexes

of private VC performance developed in the previous section. In what follows the term ‘early emergence’ will refer to the 1989-94 period (pre- and early VC emergence) and the companies getting established then or before will be called ‘early entrants’ (the others will be termed late entrants). From Box 10 we see that total early entrants are 12 and total late entrants 8 i.e. a *total early/late entrant’s ratio of 1,5*.

Fourteen (14) VC companies out of the sample of 20 VC (70%) are characterized by maximum **Pp-Ps** correlation (i.e. lie in the diagonal line in the box). Out of these 10 are early entrants and 4 late entrants. This is a high ratio (2.5) compared to the ratio of *total early/ late entrants ratio (1.5)*. Let us define ‘high’ **Pp, Ps** as levels of these variables being at least **MSP**. A total of 11 VC companies have high **Pp & Ps** (55% of the sample). Out of these 9 are early and 2 are late entrants that is an early/late ratio of 4.5, which is three times higher than the *total early/late ratio*. Finally, there are only eight (8) VC companies having both a high **Pp, Ps** correlation and high **Pp, Ps** levels. *All of these are early entrants*.

Box 10: VC Groups according to Private Performance (Rows) & Social Impact

	(a) Very Successful Social Impact	(b) Moderate Successful Plus Social Impact	(c) Moderate Successful Social Impact	(d) Less Successful Social Impact
Very Successful Private performance (1)	4 VCs	2 VCs (2 late entries)		
Moderate Successful Plus Private Performance (2)	1 VC	4 VCs		
Moderate Successful Private performance (3)			4 VCs (2 late entries)	2 VCs (1 late entry)
Less Successful Private performance (4)			1 VC (1 late entry)	2 VCs (2 late entries)

The high **Pp** levels and very strong **Pp-Ps** correlation of those VC companies founded and active during the early Emergence strongly suggests that **Class A** conditions and forces prevailed then in the VC industry. This might be surprising since many firms with positive social impacts could as easily have been making negative profits i.e. the typical ‘market failure’ situation of young markets described by early neoclassical analysis (Arrow 1962, in connection with R&D) seemed not to have been present in this case. We argue that despite **Class A** conditions, system and market failures blocked the autonomous creation of the VC industry during the early 1990s and that these **Class A** conditions both justified Yozma and *were a main factor*

explaining the high impact of this program²¹. With **Class A conditions** a trigger like Yozma, by assuring ‘critical mass’ and by strengthening collective learning and other mechanisms enhancing positive externalities- could have a high probability of generating cumulateness and thereby cluster emergence. The whole process took about 7 years.

We are now in a position to characterize *Israel’s profile of Emergence of a VC industry & SU-intensive model of high tech* in terms of three main characteristics:

- *Class A market conditions & forces prevailed*
- *A very rapid process of VC Emergence* took place fueled by a cumulative growth process with positive feedback
- *VC emergence was policy-led* - Yozma was a deliberate response to System Failures and with a high probability its implementation was critical for the success of the VC emergence process

3.2 Was Israel’s VC Emergence ‘Policy- Led’? Justifying the ‘Yozma Program’

Could we state that despite the presence of Class A market forces effective co-evolutionary and cumulative VC emergence processes *depended* on a targeted program like Yozma? There are a number of reasons for believing that this was so and that Yozma was critical for the successful emergence of Israel’s VC industry²². Our previous research and the microeconomic work reported here suggests that VC emergence required

- *Accessing sophisticated and reputable foreign partners and investors which was difficult due to the inherent lack of market tested reputation at the level of the VC & high tech industry as a whole*
- *A complex coordination process linking the above mentioned foreign agents with highly skilled domestic VC entrants and with financial resources.*
- *Assuring the minimum required level or critical mass for each one of the above resources.*
- *Assuring that the Yozma funds adopt a clear early phase, high tech (ICT) SU investment strategy²³; and accelerating selection of the LP form of VC organization*

²¹ Let us recall that during this critical VC pre-emergence phase the new activities (including IPOs and M&As) and new VC organizational forms, which later characterized the VC industry, were identified & tested by key players. The latter included Zvi Barel & Star, Zeev Holtzman & Giza, Tolkowsky & Veritas; and the activities of other individuals like Eddy Shalev who was not yet enshrined within formal VC organizations. Many of these become more profitable due to positive agglomeration benefits and cluster externalities accompanying the emergence process. There were also a large number of very good SU companies (e.g. Lannet, Lanoptics, Magic, etc), which represented rich pickings for the small number of investors and VCs operating at the time.

²² The failure of the Inbal Program, which began operating only one year before Yozma strengthens our argument below that Yozma was critical for the emergence of Israel's VC industry. The requirements below and the associated System Failures should be dated at 1993. For additional details of the Yozma Program see A&T 2004b.

²³ The experience in implementing VC policies in non US OECD countries showed that what was originally intended to be promotion of VC according to a strict definition of the industry could very easily ‘drift’ or metamorphose into Private Equity. See M. Brown 2002 for the US case. This seemed also to be the case of

- *Exploitation of increasing returns to scale (e.g. in the supply of inputs) & dynamic economies (including learning)*
- *Assuring that a cumulative process with positive feedback be initiated and completed within a short period of time*
- *Country/Government signalling concerning the excellent opportunities in the country and the resolve of Government to overcome all obstacles to VC emergence*
- *Substituting for lack of VC industry reputation which, absent sophisticated Government support, would be acquired only after completion or during VC emergence rather than at the beginning of such a process*

In our opinion most of the above were **System Failures (SF)** that is unaided market forces would not by themselves (even if they were Class A) overcome these failures²⁴. There is also sufficient evidence to support our view that the design and mode of implementation of Yozma succeeded in overcoming each one of the above specific SF causes (see below and Appendix). Therefore *Yozma assured the onset of a successful cumulative process and a strong economic impact despite the short window of opportunity resulting from the regular cycle of the global VC industry.*

Specific VC industry Characteristics

In our opinion ‘accessing intelligent & reputable foreign partners’, multicomponent ‘coordination’, ‘attaining critical mass’, ‘strengthening collective learning’ & ‘country/industry signaling’ (the substitute for lack of VC reputation) could not have been fulfilled by un-aided market forces. This is even more so once we recognize the relatively narrow window of opportunity for high tech transformation i.e. both VC emergence and a significant economic impact could not have taken place prior to the ‘next’ downturn in the global VC industry without the ‘trigger’ and ‘acceleration’ induced by Yozma. It meant that even if un-aided market forces could have led to VC emergence by themselves it would have been a much slower process (with the risk of not attaining sustainability during the available window of opportunity) and presumably one which a much lower economic impact. *Thus the possibility that market forces by themselves, even being Class A, would not have led to VC emergence was also real and highly likely.*

Germany and probably the experience of Sweden during the second half of the 1990s. The experience coincides with the view of Nelson 2002 on the relative difficulty of ‘diffusing’ social (relative to material) technologies.

There are additional *idiosyncratic aspects* of the VC industry that reinforce this view. One could say that once ‘basic’ capabilities & other factors were in place the critical input for VC industry emergence was availability of capital and accessing reputable & experienced financial institutions & strategic partners from abroad. Absent a strong reputation of the VC industry the probability of prompt and extensive partnering with such sophisticated foreign agents must have been low. Our interviews showed that *the fact that, through Yozma, the Government of Israel was willing to invest directly and indirectly in SU²⁵ was an important profitability confidence signal to such investors²⁶.*

No less important was the fact that *a seemingly necessary condition for the first VC funds created under the auspices of Yozma to trigger entry of subsequent funds is that the former be highly profitable²⁷.* Such a performance would generate what we termed *market-tested reputation*, which would considerably facilitate the raising of additional capital (& the participation of a wider set of foreign partners). Strong early profitability was due to very good exits (during 1996-7) from early investments; and this led immediately to Venture Capitalists worldwide and to business agents domestically to consider investing in Israeli VCs & to cooperate with them, hence the onset of cumulativeness²⁸. The Israeli experience shows that, once several Yozma funds had such high returns early, *the individual reputation effects spilled over to the VC industry/high tech cluster as a whole (or coalesced into a strong reputation for the industry as a whole)*; and that this led not only to expansion (i.e. follow up funds) of existing VCs but also to entry of new VCs.

²⁴ Ascertaining that these were *system* rather than *market* failures also meant that simply providing incentives would not assure the overcoming of such failures (see A&T 2004c).

²⁵ Directly since a portion of the Yozma Program budget (20M\$) was earmarked for direct investment in SU - Yozma Fund; and also since the Regular BS R&D subsidies by the OCS were increased between 1993-2000.

²⁶ Lerner 1999 in his study of the US SBIR program (which supported ‘early’ R&D of SMEs operating in areas of interest to the Federal Government) found a similar phenomenon that operated at the level of individual companies—the ‘certification effect’. SU backed by this program had superior performance mostly due to a signaling effect. Beyond signalling, Yozma’s Fund of Fund activity had another very important effect since investors/limited partners were granted the option of buying Government’s share at (approximately) cost. This represented a strong incentive to the ‘upside’ especially given the fact that Government’s share in the typical Yozma fund was 40% of total capital.

²⁷ Yozma’s upside incentives created strong incentives to VCs to select and groom very good SU over and beyond what the market or an outright subsidy (or Government Guarantee) would provide.

²⁸ This effect has been analyzed by Gompers 1995 who focuses on how early ‘exit’ successes of young, unknown VCs enhanced the flow of capital to follow up funds of these organizations. In Israel the contribution of this effect to cumulativeness and VC emergence in Israel was *also* due to the effect of such reputation in bringing a wider set of world-class foreign investors as Limited Partners in existing VC.

By the same token, early funds and early investments, which are not *highly profitable*, risk truncating the subsequent process of VC industry emergence²⁹. Avnimelech 2004 takes the "Reputation leads to Capital leads to Added Value" argument further and argues that, through a path dependent process, initial success/reputation may attract high quality investors and deal flow and therefore increase success & strengthen reputation. This in turn will trigger a new reputation-capabilities cycle and through this generate a national, sustainable competitive advantage in the VC industry.

3.3 Yozma's Success: Accelerating or Causing VC Emergence?

We now summarize and complete our argument concerning the role of Yozma. *First*, Class A Market Forces in the VC area were *necessary but probably not sufficient* for VC industry emergence and for propelling high tech to its new 'Silicon Valley' configuration-additional capabilities and other elements and components were also required; *Second*, these would not automatically be generated to the extent and the speed required; *Third*, either Yozma caused emergence or it accelerated what market forces would have accomplished anyway. Our assessment is that in either case Yozma was a successful policy with a significant impact. Due to the narrow window of opportunity even if Yozma only accelerated 'emergence' the economic value of the resulting high tech transformation would have increased considerably i.e. unaided market forces might have under performed compared to a Yozma-driven process³⁰. In all likelihood they would have created a smaller VC sector, and an associated shorter period of expansion and growth of high tech & the economy as a whole.

SUMMARY AND CONCLUSIONS

This essay introduces a *microeconomic dimension* to a wider study of Israel's Venture Capital Industry during the 1990s. It complements prior research conducted at the *industry level* of analysis which, focused on the background conditions and pre-emergence events associated with the transformation of Israel's high tech industry during the 1990s from a Defense-dominated Electronics industry to a 'Silicon Valley' model.

²⁹ A weak Reputation effect could lock –in VC into a low-level 'equilibrium' trap.

³⁰ Paul David has emphasized that effective policies implemented under conditions of strong 'path dependence' enjoy only *a narrow window of opportunity* a statement which fits our view of the impact of Yozma. We also believe that if the timing is correct as in Yozma's case, a strong policy impact could be linked with it having generated a *functionally desirable* path dependent process—emergence of the VC industry.

The emergence of Venture Capital in Israel during 1993-2000 is an example of *policy-led structural change*, which conforms with the main tenets of the so-called structural/evolutionary perspective to economic change including that, which asserts that structural change is frequently a *cause* rather than an outcome of economic growth. Another important point is that the targeted policy adapted to trigger VC emergence is an example of *successful infant industry development strategy* implemented at the heyday of the process of Globalization of capital markets for entrepreneurial high tech companies. The timing of this policy (The Yozma Program), its design and the broad lines of its implementation also reflect what has been termed a Systems of Innovation or Systems/Evolutionary perspective to Innovation & Technology Policy (Teubal 2002, A&T 2004c).

The microeconomic analysis focuses on building indices of Private Performance and Social Impact for 20 leading VC companies. These are used to characterize further the process of VC emergence, one outcome of such analysis being that market forces operating in the area during *pre-* and *early* emergence possessed strong capabilities, were eventually highly profitable (*high VC private performance*) and had a significant indirect impact on the subsequent growth and development both of VC and of the high tech cluster as a whole (*high VC social impact*). This condition has been termed *Class A market conditions/ forces* (or simply Class A). Prevalence of such conditions explains both the extremely rapid process of growth during VC emergence and the high impact of the targeted policy implemented for this purpose. Moreover, integrating the microeconomic analysis of this paper with the industry-level analysis of previous research provides additional insights, which may be useful for the design and timing of targeted VC emergence policies in other countries.

Structural Change--Economic Growth Co-Evolution

The structuralist (Kuznets 1971, Justman & Teubal 1991, Lipsey & Carlaw 1996) and no less the various authors in the related S/E tradition assign a casual role to Structural Change in determining aggregate economic growth. This view is again confirmed by our analysis of Venture Capital emergence in Israel and the associated re-configuration of that country's High Tech cluster during the 1990s. Venture Capital emergence-an instance of structural change-- was a central vector in the re-configuration of Israel's high tech cluster (of which the Venture Capital industry became a central component) and of the associated acceleration of high tech's rate of growth during that period. Moreover, although with a weaker effect, the growth of high tech in the 1990s

was a driver of the country's overall economic growth. What to some extent is missing is a non-Neoclassical analysis of the reverse link—that between Economic Growth and Structural Change. An early exponent of this was Schmookler's analysis of the sector determinants of invention. Through the effect of changing 'demand' patterns on the sector pattern of investment-Economic Growth would also affect the pattern of 'demand' for capital goods' innovation (Schmookler 1966)- an important mechanism of structural change. Other mechanisms linking economic growth to structural change come out from our analysis of the Background and Pre-conditions for Venture Capital, which economic growth generated in the 1970s and 1980s and which led to the emergence of the new industry in the 1990s. These conditions could be grouped into supply, demand and institutional/cultural factors e.g. emergence of a demand for VC services during the early 1990s-the result of prior growth of high tech SU; generation of 'market agents' who later became the 'Class A market forces' which later created and developed the new venture capital industry; etc. Note that these 'structural' features are much more specific than those suggested by Neoclassical analysis (e.g changing patterns of demand for various categories of commodities, changes in Comparative Advantage due to capital accumulation).

Specific Conclusions

(1) *Israel's infant VC industry was characterized by “Class A conditions” and these played an important part in Yozma's success and in the specifics of the emergence process.*

A major theme covered here is the correlation between VC Company Private Performance and Social Impact, and 'positive' & 'normative' implications flowing from it this. Companies in our sample founded in the pre-emergence and early-emergence of the new high tech cluster-*early entrants*- not only generated, on average, strong 'social impacts' (in the sense of strong indirect contributions to SU and other VCs); they were also highly profitable (Class A). Thus early VC entrants expanded and also paved the way for 'later' VC entrants and for more and better SU. The latter in turn further stimulated both VC incumbents and new entrants to the industry. The outcome was an increasingly synchronized and mutually reinforcing VC-SU co-evolutionary process (A&T 2003, 2004a; Avnimelech 2004), which was accompanied by a very high rate of growth both of the VC industry and of the SU segment of High Tech.

Class A conditions also explains why the Yozma program's incentives and the signaling process it entailed succeeded in bringing an important set of foreign partners to participate in the new industry. Not only were the individuals and organizations active

early in the game experienced & knowledgeable of high tech and of the new opportunities offered; but some had reputations in the new activities as well or were quick to acquire them (a result of some very successful exits). Thus the few foreign partners of early entrants were followed by a new wave of foreign partners.

(2) The Relative Complexity of the Targeted VC Policy (“Yozma”)

Our extensive analysis of the Israeli case strongly suggests that the design and implementation of a targeted policy to promote VC emergence in other countries could be extremely complex. This because the central emergence process requires foreign inputs which are difficult to access due to lack of market-tested reputation; the requirement of enlisting a critical mass of highly capable domestic resources; and the need for a complex coordination process involving existing and potential agents (to be effected within a short period of time). Having said this, it might be that enhanced internationalization of the world VC industry may make these requirements less stringent in the future.

(3) At least within a certain range of domestic capabilities- Class A conditions could enhance both the justification for a targeted VC emergence policy and the probability that such a policy will be successful.

While **Class A** conditions imply existence of *some* reputable/capable VC companies they do not assure VC/high tech reputation at the *industry and country levels*. Thus while some appropriate foreign partners did link to high quality new domestic entrants-the momentum engendered would probably not be enough to trigger an autocatalytic process of cumulative, self-sustained growth. Under these conditions the *System Failures* precluding initiation of a cumulative VC emergence process comprise:

- Low rate of entry of highly skilled and experienced domestic VC entrepreneurs;
- ‘Failure’ (due to country reputation problems) of existing market forces to partner with a sufficiently large number of world class foreign agents;
- ‘Failures’ in exploiting static & dynamic economies of scale

The upshot is that **Class A** conditions may still justify a targeted policy directed to VC emergence. Moreover, within a certain range, an increase in the sophistication of local VC capabilities could, by reducing the ‘gaps’ in foreign resources required for triggering VC emergence, enhance the justification for implementing a targeted policy (it would also increase the probability of success). However, beyond a certain level of

domestic capabilities policy would not be justified since VC emergence would occur without Government intervention. Similarly when conditions are *not Class A* policy may not be justified since even the best policy design might not trigger VC emergence.³¹

(4) Class A Market Conditions and the Policy Paradox

Class A industries are those were leading ‘early entrants’ (or an important segment of such firms) were either already privately profitable during pre- or early emergence or -due to their capabilities- would be soon in the future. They also were strong contributors to the future growth of the industry through externalities, reputation effect, networking effects and other factors (*high VC social impact*). Alternatively industries who are not Class A (say Class B industries) are those whose leading early entrants were not privately profitable nor –given their capabilities broadly defined to include reputation and networking effects- where expected to be so (for VC industries this was the situation in India in the late 1980s, early 1990s see Dossani & Kenney 2002). Moreover, due to absence of reputation & networking effects or to negative profitability, the potential social benefits of these companies might easily not have materialized. This means that early entrants would not trigger a cumulative, self-sustaining process of emergence i.e. the industries concerned should not be candidates for targeting.

Class B industries are those predicted by a simple ‘neoclassical’ market failure perspective (Arrow, 1962) as applied to new industries. Arrow referred to R&D performing agents who, due to the inevitable externalities generated from such activity (*‘high social impact’*), would suffer negative profits (*low private performance*). Due to the high levels of uncertainty and risk in the early phase of an industry a similar situation would frequently characterize "new" industries³². The traditional role of Government in that context would be to provide compensatory incentives to agents for their loss making, ‘externalities-generating’ activities. Our analysis suggests however that even after such support, the probability of succeeding in triggering an emergence process would be low. In these circumstances, rather than targeting the industry the role of Government could be directed to stimulate the

³¹ Formal modeling is required to make these points more precise.

³² In "new" industries we expect a high rate of firm entry and a high rate of firm failure/exit, as the new opportunities are being tested and experimented with. See Abernathy & Utterback 1978; and Klepper 1996. This is

creation of Class A market conditions and background conditions (for the latter see A&T 2004c). Targeting should be withheld, at least for the time being, or should focus on other industries where Class A conditions prevail.

Class A conditions suggest a possible 'Policy Paradox' or a 'Policy-Market Forces' Paradox: the high underlying capabilities would facilitate successful implementation of a *targeted program* directed to the infant industry in question; but, the probability that such a program is justified might, for the same reason, be low. Our analysis suggests that under certain conditions e.g. within a range of Class A capabilities the above 'Policy-Market Forces' paradox could be more apparent than real. This is because up to a point, rather than substituting for policy, stronger & more capable market forces may require policies to help materialize their industry-generating potential.

(5) Elements of the Israel's Targeted VC emergence policy are relevant to Infant Industry promotion under conditions of Globalization

The system failures to which Israel's targeted VC emergence policy responded *and* the targeted program's specific design features differed considerably from what has been reported in the literature on infant industry promotion in industrializing economies. This experience might be relevant for infant industry promotion, particularly of sophisticated industries without well-organized markets for their underlying technology and knowledge. More specifically, with the increasingly high return/high risk globalization and 'winner take all' situations such as those characterizing the global VC market, policy incentives targeted to areas with pre-existing strong market conditions may be more crucial than in the past for successful infant industry development.

Thus countries wanting to develop sophisticated infant industries may want to assure themselves *first* that Class A conditions exist or could be created (if they do not, the targeted infant industry policy might have to be delayed, substituted for other temporary policies, or suspended). They also should note that within a certain range at least a *higher level* of domestic capabilities could enhance both the justification of undertaking a targeted infant industry development policy and the probability that this policy will be successful. One category of infant industries where these conclusions are relevant are those where 'market tested reputation' is critical for successful industry emergence i.e. whenever having or attaining such reputation is important for the

consistent with a subgroup of companies having among themselves a negative Pp & a negative Pp-Ps correlation in the early phase i.e. loss making firms generating a strong process of collective learning.

cumulative process underlying emergence, mainly because of the possibility it opens for the participation of world class foreign partners/resources³³.

Links with the Literature

A. Gilson's Template for Engineering a VC industry

We already mentioned that contrary to Gilson's thesis our analysis of the Israeli case very strongly suggests that a critical mass of SU and entrepreneurship is (for 'demand' reasons) required *prior to* the successful implementation of a policy- led, high impact VC emergence policy. Moreover the pre-existing context should have created *potential* Class A entrepreneurs in sufficient numbers to propel a strong VC emergence process. Finally, policy makers and the policies they design and implement should be aware of the need and should be capable, in a proactive way- to identify, coordinate and direct such agents to the new Venture Capital industry. This already poses significant constraints both on the required 'background and pre-emergence' conditions; and on the design and implementation requirements of the targeted VC policy. It follows that it would be doubly difficult to implement such a policy in a context where the critical mass of entrepreneurial/SU requirement would not be there. We conclude that Gilson's *simultaneity* would not be feasible in a wide variety of contexts i.e. the evolutionary *phasing* of the 'entrepreneurship' requirement would be critical.

B. The Gompers-Lerner-Scharfstein process of 'Entrepreneurial Spawning'

In an interesting article Gompers et al 2002 discuss the phenomenon of 'entrepreneurial spawning' defined as VC-backed SU, which originated as spin-offs of incumbent companies. The paradigmatic example is Fairchild whose semiconductor industry spin-offs/SU became the backbone of Silicon Valley's high tech cluster. The authors conclude that to promote entrepreneurship/SU (and indirectly, VC) the provision of capital and investment incentives are not enough. What is important is to attract firms with a capacity to incubate entrepreneurs i.e. 'firms with an existing pool of workers who have the training and conditioning to be entrepreneurs'. This because in one view which was shown to be that with the best

³³ This would seem to be increasingly important under the new global conditions. Beyond the reputation acquired through the participation of foreign partners we have the additional reputation from high actual (and expected) private performance of early entrants. Moreover, spillovers to other agents could eventually engulf the whole industry.

explanatory power, ‘employees of established firms are trained and conditioned to be entrepreneurs by being exposed to the entrepreneurial process and by working in a network of entrepreneurs and venture capitalists’ (Gompers et al 2002. p.2).

We cannot agree more with such conclusions although in many non-US contexts, there are several reasons why the policy requirements for ‘entrepreneurial spawning’ are more complex than those mentioned above. First-the authors implicitly assume that a VC industry already exists. When this is not the case, *and most countries do not have well-developed VC industries*, ‘entrepreneurial spawning’ may require a prior process of emergence of the Venture Capital industry. Moreover, our analysis suggests that such an event may require both a critical mass of SU/entrepreneurs (for VC ‘demand’ reasons); and a sufficient number of Class A entrepreneurs (for VC ‘supply’ reasons). Only then could ‘entrepreneurial spawning’ and VC - SU co-evolution take place. Thus when engaging in a more systematic analysis of the factors explaining entrepreneurship and the links between entrepreneurship at time t and that at time t+1we should consider both direct (‘entrepreneurial spawning’ and other links not mediated by VC) an indirect components. The indirect component would result from answering the following questions: how is a critical, pre-existing mass of SU been created in the System; how are potential Class A market forces generated in the system; and how are they funneled into the fledging VC industry?

C. Porter’s ‘Clusters and the New Economics of Competition’

Porter’s 1999 paper suggests that the process of Globalization, by generating global markets, which in principle can be accessed by all agents, narrows the sources of **Sustainable Competitive Advantages (SCA)** of individual companies. This in turn enhances the importance of clusters, which (or particularly those which) contain idiosyncratic sets of resources. This paper suggests that a second driver of globalization, namely the emergence of an increasingly harsh selection environment involving both high (expected) returns and high risk to invention/innovation/SU requires that existing clusters (or company agglomerations) should undergo significant processes of re-configuration. More specifically, we suggest that the development of VC, PE or other equity-based ‘finance and support’ mechanisms to

SU/innovative SMEs may be critical; and that this may require policies and assurance that an adequate number of ‘entrepreneurs’ including Class A entrepreneurs be made available.

While both studies complement each other it seems that we are taking Porter’s argument one-step further. While Porter states that under the new conditions SCA depends more than before on clusters without considering cluster dynamics-our paper emphasizes both the potential relevance of a certain (generic) type of cluster re-configurations and the requirements that ‘old’ clusters must fulfill in order to undergo (or before undergoing) such a transformation. This paper and previous work emphasize both existence of a prior pool or critical mass of ‘good’ or ‘high quality’ SU; and sufficient Class A market forces to man the future VC/PE or other ‘equity-based’ SU finance and support systems.

Appendix: How Yozma overcome the specific causes of System failure

Difficulties in accessing intelligent & reputable foreign partners

Active search and interaction with highly qualified and reputable foreign VCs

Sharing risk with private investors (government share in Yozma funds was 40%)

Upside incentive to private investors in Yozma funds—mostly attractive for highly skilled professional managers/owners and investors/partners

Assembling a Critical Mass of Capabilities

Required participation of world class foreign VC companies and investors in each Yozma funds (as limited partners).

Required participation of capable local agents (individual and institutions) as general and limited partners. Having a S&T background and experience in High Tech were important although not the only criteria used

Selection of Yozma VC management company candidates according to their background and potential

Critical Mass of Financial Resources

Direct government VC investment through Yozma Venture Fund (\$20M).

Government Fund of Fund investment (80M\$) in 10 hybrid, privately owned VC management companies (Yozma funds).

It leveraged an additional 150 M\$ of private funds (foreign and local).

The total of \$250M was sufficient to trigger a cumulative emergence process

Coordination

Involving Agents (domestic and foreign) and financial Capital

Intensive interactive prior to policy implementation. This involved Government officials, agents from Israel's high tech & financial sectors; and individuals & organizations from abroad.

With other Policies

Parallel implementation of complementary *ITPs* (expansion of R&D grants program, MAGNET program & Technological Incubator program)

Investment Coordination in early operation of Yozma Funds

Participation of OCS representative in the board of Yozma funds.

Conventional market failures (see learning below)

Selection of VC strategies consistent with strict definition of VC

This was a requirement for Yozma Fund status (also the adoption of a LP form of organization was required)

Yozma/Government representation on Yozma Fund boards monitored implementation of this requirement

Assuring Fast Learning

Required participation of professional foreign VC companies and investors in Yozma Funds (as limited partners).

Required participation of capable local agents (individual and institutions) as general and limited partners

New or indirect learning mechanisms: the requirement that Yozma funds involve a formal VC company relatively focused according to stages and areas of investment; and through OCS participation in the boards of Yozma funds.

Country/Government Signalling

The 100 M\$ venture investment contribution of the Israeli Government, the extensive interaction process; and the implementation of complementary *ITPs*-- sent a strong signal to foreign partners and investors both about the distinctiveness or even uniqueness of Israel's VC/high tech potential and about the government commitment to these areas.

Selection of VC Characteristics

Selection was enhanced by the above mentioned interaction process and by OCS-led coordination among agents both prior and during Yozma program implementation. Frequently once OCS identified a desirable sub-group of activities, structure, etc, they became a requirement for Yozma candidates to follow.

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