FROM GENERATING STE CAPABILITIES TO EMERGENCE OF A START UP NATION

Analysis of the Israeli Experience and Some Implications*

Morris Teubal, **September 2011**

***For a shorter version see ppp "From Traditional Innovation Policy to Targeting Emergence of Entrepreneurial Systems: The case of Israel"**

MOTIVATION AND SPECIFIC OBJECTIVES

Israel successfully made a transition from an underdeveloped economy whose main exports during the 1960s were oranges and textiles to a high tech powerhouse based on an ICT-oriented Entrepreneurial High Tech Cluster (EHTC) which emerged during 1993-2000.

Israel's EHTC was one of the most successful ICT-oriented, entrepreneurial high tech clusters beyond the US, with over 3000 start up companies (SUs)-up from 300 during 1992- and over 100 VC (Venture Capital companies).

A strong Venture Capital industry emerged and co-evolved with the new wave of SUs during the 1990s, it being one of the major factors underlying Israel's success

-2

Another central factor underlying this phenomena was the strength of that country's Science, Technology and Higher Education (STE) infrastructure, which began in 1925-during the pre-State period- with the creation of two of the most important Universities: The Hebrew University of Jerusalem; and the Technion (Israel Institute of Technology in Haifa) of Haifa.

-3

The central objective of this presentation is to analyze how the above came to be.

I will be using an Evolutionary Perspective to analyze the Israeli case, both the 'positive' and the 'normative' (or policy) side.

A critical set of factors is the contextual framework, both external and internal

e.g the circumstances leading to creation of the State in 1948; the State's Defense Needs; and the mass immigration from the former Soviet Union during the 1970s*.*

A major factor was Innovation Policy broadly conceived (to include direct support of R&D/innovation in firms, STE support, VC support and a multitude of regulatory and institutional changes e.g trade liberalization and IPR).

Israel was quite innovative in this respect, mixing gradual liberalization in the areas of trade, capital markets, Government ownership of assets, etc with strong support of the STE infrastructure (till the year 2000) and Strong support for commercial innovation (I) in firms (starting in 1969, and including the by now well known Yozma Program-a targeted program- which supported Venture Capital during 1993-97/8*)*

-4:STRUCTURE AND OBJECTIVES

The focus will be on VC and on SUs. In A and B I introduce and characterize VC in general; in C and D I analyze emergence of a VC industry in Israel (and associated EHTC); the role of Policy, particularly the Yozma Program

I conclude by considering the new challenges of the Post 2000 period; and some thoughts about the emerging Systems-Evolutionary Perspective to Venture Capital Policy

A. Introduction:

- ***A*: Defining and Characterizing Venture Capital (VC)***
- ***A**: Solving the Market Failure in the Finance of SU***

B. The 'Added Value' Contribution of Venture Capital to high tech Start Ups (SU)

-5

C. Emergence of Venture Capital* [and EHTC] *in Israel

D. VC Policy: Pre-emergence conditions and the Yozma Problem

E. Conclusions and Post 2000 Challenges

F. Towards an integrated Systems-Evolutionary perspective to VC policy (in process)

A*1.Definition of Venture Capital -1

I.Classical Definition (Lerner)

Funds managed by *independent, specialized firms* (usually LP), staffed by full time investment professionals, for ***investing*** *in the illiquid securities of high growth companies* (whether or not high tech)

Features

- **A pool of money** *"funds"*
- **A financial intermediary managing the pool** *different from Business Angels* ('organization' versus individual; and own funds versus outside investors)
- **Investment Orientation** *equity finance of high growth, private, companies either high tech (SUs) or non-high tech (innovative SME's)*
- **Motivation** *capital gains*

A*1-2

II. Strict Definition of VC (VC*)

Funds dedicated to the early-stage finance of high tech Startups

The main difference from the Classical Definition lies in the investment orientation: high tech (rather than either high tech or non-high tech as long as 'high growth'; and 'early phase' that is at the early, R&D phase in the life of the SU)

III. Private Equity (PE)

Funds oriented to investments in 'privately held' companies I.e not quoted in stock markets and held by 'the public', *whether or not high tech and whether or not high growth/young companies (or early stage)*

PE organizations are thought as financial intermediaries where the dominant investment orientation is not according to VC*

A*1-3

Note that from a 'pool of money' perspective

"PE includes VC which includes VC*"

PE-> VC-> VC*

These distinctions are critical for countries with a strong skill and Science/Technology base wanting to promote EHTC. Frequently the policies aimed at VC* and ended up with PE

A1-4

VC/VC* is a New Intermediation Form

Supply Agent: **A new Financial Intermediary,** VC rather than banks

Demand Agent: A **new type of company to be financed**

In contrast to established/incumbent corporations which, prior to Venture Capitalism (*itself the product of the ICT revolution)* undertook most of the R&D and the subsequent commercialization, SUs specialize in "R&D/invention"

SU are also distinct from the 'contract R&D organizations' which preceded venture capitalism; they operate not only in product markets but also in knowledge and in capital markets

A new institutional framework: in the US this required adaptations of Pension Funds' regulatory framework ***these institutions are the major investors in US VC***

A1-5

The VC/SU-related new intermediation form also involved a change in the 'product/service' transacted in the new market

Rather than loans we have 'funds (provided against equity)' *bundled with* added value advice and services in the area of strategy, management, marketing, head hunting, certification and networking/opening of doors

A1-6

The Multidimensional Nature of VC (and VC)*

- **VC as a pool of money (‘*funds’)***
- **VC as organizations**
- **VC as a new industry and/or market**

In several Avnimelech/Teubal papers we develop the idea that VC is also a new industry and/or market which could or could not emerge. Emergence might be an important policy objective of Governments

This view was not the predominant view during the 1990s; and is not the predominant view in Academia nowadays

A2. VC organizations-1

Organizations undertaking VC investments, there are many types of such organizations e.g Limited Partnerships (LPs)

A VC organization may operate several funds simultaneously.

A2: Limited Partnerships (LP's)-2

The VC is a 'management company' which manages one or more Funds with the objective of profit maximization;

Owners of the management company are 'General Partners'(GPs); external investors in specific funds are 'Limited Partners';

Funds are closed and of a pre-determined duration. GP compensation: 1%-3% of capital + 10%-30% of profits(capital gains). Investors get their money back + profits during operation of fund and profits remaining at end of fund life. Most common in US and Israel

A2: LP Characteristics-3

- Limited life (7-12 Years)
- 4-8 year **investment time horizon**
- All investment decisions made under the full **responsibility** and exclusive **control** of the fund managers
- Target compounded annual rate of returns (**ROR**) aimed at: in the range of 25% to 100%
- **Compensation:** primarily based upon the actual performance/capital gains of the investments made (share in earnings 10%-30%)

A2. General Partners: Background and Role-4

Who they are

- **Successful Entrepreneurs**
- **Investment Bankers**
- **Business Consultants and Strategists**
- **Senior Managers from a Variety of Industries**

Role in the VC Cycle (Gompers and Lerner 2004)

- **Organize Fund & *Raise Capital* for Potential Investments**
- ***Due Diligence*, selection of Investment Proposals & *Investement***
- ***Monitoring and Added Value Activities*: Mgt, Involvement in Business Development & Providing Networks for the Portfolio Companies**
- ***Harvest/Exit* (e.g. M&A or IPO) of Investments**

A2. Limited Partners (Investors)-5

Who they are

- **Institutional Investors: Pension Funds, Endowments & Insurance Companies**
- **Individuals: High Net Worth Individuals**
- **Strategic Investors: High Tech Corporations**
- **Foreign Entities/ Foreign Direct Investors**

Role in the VC Cycle

- **Suppliers of 90-99% of Capital for 70-90% of Capital Gains**
- **Passive: No direct involvement in Investment Decisions**
- **Limited Liability**
- **Networks**

A2: Advantages of LPs-6

Taxation-'pass through' *not available to 'firms' like public VCs*

Flexibility-not regulated as public VCs

High Powered Incentives-compared e.g to 'affiliated' [rather than independent'] VC organizations e.g Intel Capital

A2. Other VC (or VC-related) Types of Organization-7

- ***Public VC companies:***

Independent VC companies quoted in stock markets; first VC organization in the US (ARD founded in 1946) and one of the earlier types in Israel (Inbal Funds of 1992). *Major Issue: what are the disadvantages of Public Funds compared to LP form of VC organization?*

- ***'Affiliated'VCs***

-Corporate VC: organizations affiliated to corporations. Objectives: 1) investing in 'complementary technologies' to those of the corporation (or creating future 'options'***I.e 'strategic goals***); 2) profits ***(financial goal).***
Constraints on how much compensation to managers of funds.

-Affiliated to Financial Institutions: only financial goals; also constraints on compensation.

A2-8

- ***Angels***

wealthy individuals (either entrepreneurs with experience or individuals without) who invest their own funds directly in SU companies

- ***Private Equity Companies***

They invest both in high tech and in non high tech companies; and on SU and post SU phases. They include VC organizations.

A3.Venture Capital ‘Cycles’-1

There are two notions of VC Cycle

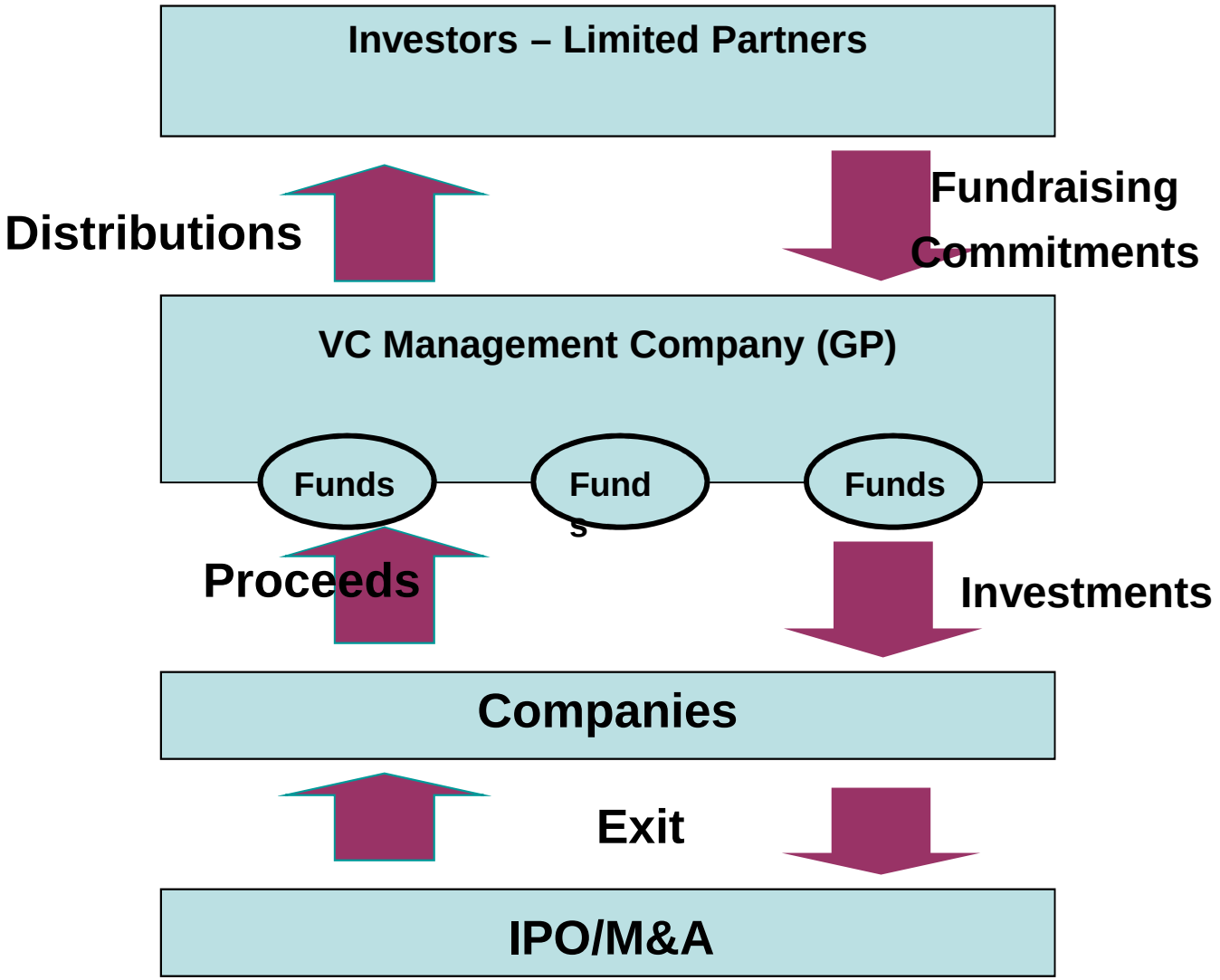
- **‘Operational’ VC Cycle**
- **VC Industry/Market ‘Evolutionary Life’ Cycle**

Operational VC Cycle

Put forward by Gompers and Lerner (1999,2001,2004), it refers to the typical cycle of a specific fund of an LP VC organization. The cycle begins with ***Fundraising*** where commitments from investors are obtained; ***Due Diligence and Venture Investing*** in SU companies***; Monitoring and Added Value Services*** to such companies***;*** and ***Exiting of Investments***(typically IPO or M&A)

This is represented in the graph of the next page

A3: Operational VC Cycle- LP case (Gompers &Lerber 2001)-2



A*3-3

VC Industry/Market 'Evolutionary Life' Cycle

In Avnimelech & Teubal 2004,6 we analyze the Emergence of a VC/VC* market & industry (& Entrepreneurial High Tech Cluster) in Israel and the role of policy in the process

In contrast to how an existent industry or VC organization operates, *the question we ask is:* 'when will a VC* industry and/or market emerge and what could be the role of policy in the process'

4 Phases were identified in the Israeli case

- Background conditions phase, 1969-84
- Pre-Emergence phase, 1985-92(related to the Fluid Phase of Abernathy and Utterback 1978)
- Emergence, 1993-2000(related to A & U's Growth Phase)
- Crisis and Restructuring, 2001-2004 (related to A&U's Mature Phase)

A**:Market Failure in the Finance of SUs,VC as a new Intermediation Form-1

***The traditional mechanisms for financing R&D in firms which emerged in the IV Technological Revolution (*Bank Loans for younger firms; and floating in the regular Stock Market for firms with a 'track record') *could not effectively be used to finance SU companies* (which are young, inventor companies focusing on R&D)**

They were oriented to Incumbent companies who were large and performed all functions (production, marketing and R&D), rather than to SUs.

-2

Reasons

- **Asymetric Information** ***(focus of discussion)***

Banks understood loan finance in traditional areas, but not the potential benefit from invention/R&D

- **Strong Market and Technological Uncertainty (but also high expected return)**
- **Lack of Tangible Assets**
- **Unknown Entrepreneurs**
- **Different Capabilities required**

-3

This was a 'market failure' (MF) because it soon became clear that having large numbers of SUs was an important US national objective (alternatively, 'having a well functioning 'market' for the finance of SUs" was a national strategic priority).

The Venture Capital (VC) literature states that VC 'solved' the MF problem, by eliminating (or substantially reducing) Asymmetric Information

This because this new financial intermediary could, as well as SU owners, understand 'technology' and assess the market potential of the company

-4: Clarifications

***(1)We should distinguish between MF in R&D and MF in 'financing of R&D'. The former results from an 'externality', the other from another cause (*asymmetrical information)**

***(2)Not any VC organization would solve the MF problem, or would solve it in the 'optimum' way. There are several VC types, and it may be that in some countries one type is better than another (*in the US and Israel, the dominant type was Limited Partnership, LP.**

-5

(3) Moreover, the problem is more complex since the issue is not only identifying 'a new financial Intermediary'

Rather, the US experience suggests that the issue is identifying a 'new intermediation form'. This relates to the **'optimal mutual adaptation'** ***of:***

- **VC Organization and Strategy**
- **SU Organization and Strategy**
- **Institutional context**

A**-6

(4) Idenfyting 'an adequate' intermediation form is a 'qualitative' aspect of the late* Fluid/Pre-emergence Phase (or early Growth/Emergence Phase) *of a VC market/industry.

It is 'qualitative' in the same way as a 'dominant product design' is so in the regular ILC model

Arriving at it ('selection') requires a process of interaction and strong, collective/interactive learning

B. The 'Added Value' Contribution of Venture Capital to high tech Start Ups (SU)

VCs with strong capabilities provide 'added value' in additional to finance to their portfolio SUs.

I. There are various aspects of this 'added value', I will refer to those aspects for which I have (mostly Israeli) examples

- ***Strategy*-helping the SU define their product/market**
- ***Management*-up to the point of a VC general partner taking over the mgt of a SU till a new manager is appointed**

B-2

Continued-

- ***Head Hunting*-helping to identify a (e.g. foreign) manager for the US operation of the SU, especially after the R&D phase**
- ***Global Partnering*-critical for the post R&D phase, for penetrating foreign markets**
- ***Opening of Doors*-e.g of important User organizations in order to test the product; of Investment banks for underwriting an IPO**
- ***Accessing Complex Complementary Assets*-reduce Transactions Costs in commissioning co-specialized complementary assets (Teece 1986, and recent literature). See also global partnering**

B-3

- ***Reputation*-getting a top tier VC to invest in one's SU also signals 'quality' to other agents (users, partners, suppliers, competitors)**
- ***Identification of Exit Opportunities***

II. There are several points that have to be mentioned with regards to the possibility of providing timely and adequate 'added value' to portfolio SUs

1. **<u>VC capabilities are important</u>**
2. **They depend on <u>VC manager background</u>: science/technology/engineering (and even better a this with a background of management) or finance/economics**

B-4

3. Added Value also depends on <u>VC organization and Strategy</u> (some believe because of possibilities of providing 'high powered incentives').

Thus the flexibility of LP form of organization (which is not regulated, in contrast to 'public' VCs) may enhance the timeliness of 'added value'

4. <u>Which VC capabilities depend on area</u> e.g it is generally believed that the capabilities required for ethical drug development are much greater than for many ICT areas

In Israel an ICT oriented VC industry emerged during the 1990s, with relatively few capabilties in the life sciences area.

B-5

5. There could but need not be one 'optimal' form of VC or VC-related organization (despite the fact that in the US and Israel LPs emerged as the dominant form)

In some contexts angels may play a very important role e.g in Scotland in the Life Sciences;

it also may depend on the phase of evolution of the VC industry: at the pre-emergence phase a variety may be desired in order to experiment with and in order to identify or select a 'most desirable form'*; whereas for emergence it may be desirable to focus on a dominant VC organizational form

similarly at the mature phase and because of the need to accommodate different types of SU- variety in order to re-invent the underlying entrepreneurial high tech cluster (EHTC), it may be desirable to have a variety of forms

C.EMERGENCE OF VC IN ISRAEL

- ***Israel succeeded during the 1990s in creating a high impact domestic Venture Capital (VC) industry/market; and a 'related' Silicon Valley model of high tech cluster*** **(EHTC= Entrepreneurial High Tech Cluster)**
- **These achievements enabled that country to *latch into the ICT Revolution and to favorably exploit the opportunities opened by the Globalization process***

C1-2

- ***The EHTC developed during the 1990's was (maybe together with the one in Cambridge, UK) one of the most successful EHTC's developed up to then outside of North America***

At least 2500/2000 Start Up SU foundations during the 1990s ; the number of organizations involved in VC rose from two or three to about 100/130; total capital under management reached 8.5 B$/10B$ level.

C1-3

- ***Up to the 1990s several attempts by other countries in Europe (either through the promotion of VC or through other policides e.g Germany and even Ireland and Finland) to promote SUs and/or EHTCs were not so successful or failed outright***

C1-4.*Why an intersting case?*

Our detailed, rather comparative, analysis of the emergence of Israel's VC/EHTC suggests two implications of the case and of its methdology of analysis

***First*, while the Israeli example cannot be copied, *specific aspects of the underlying process could be of interest to other countries/regions* interested in developing VC/EHTC or other innovative SMEs-based Entrepreneurial Clusters**

e.g *Yozma Program* (the targeted policy now being emulated elsewhere); and other VC-directed and VC-related policies

C1-5

<u>Second</u>, the methodology & theor. framework used in the analysis* (the emerging *Sistems-Evolutionary, S/E perspective) may help frame policies in other complex & dynamic environments

They may be of interest to other regions/countries including industrializing economies (and not only those interested in entrepreneurial high tech clusters)

*This is so since Innovation and VC policy **<u>cannot</u** be designed/implemented from a static perspective*

C2. DATA ON ISRAEL's EHTC OF THE 1990s

Venture Capital

- ***VC <u>raised</u> increased from 58M$ in 1991 to 4.557 M$ in 2000 (back to 558M$ in 2003)***
- ***VC <u>invested</u> as a share of GDP rose from 0.4% in 1997 to 2.6% in 2000 (and back to 1.2% in 2004)- highest share among OECD countries***
- ***High (est) <u>share of VC investments in 'early phase'</u>*** (e.g SU up to 5 or 6 years of age)

C2-2

High share of VC entrepreneurs with S&T backgrounds and with high tech experience

90% of funds coming from foreign sources

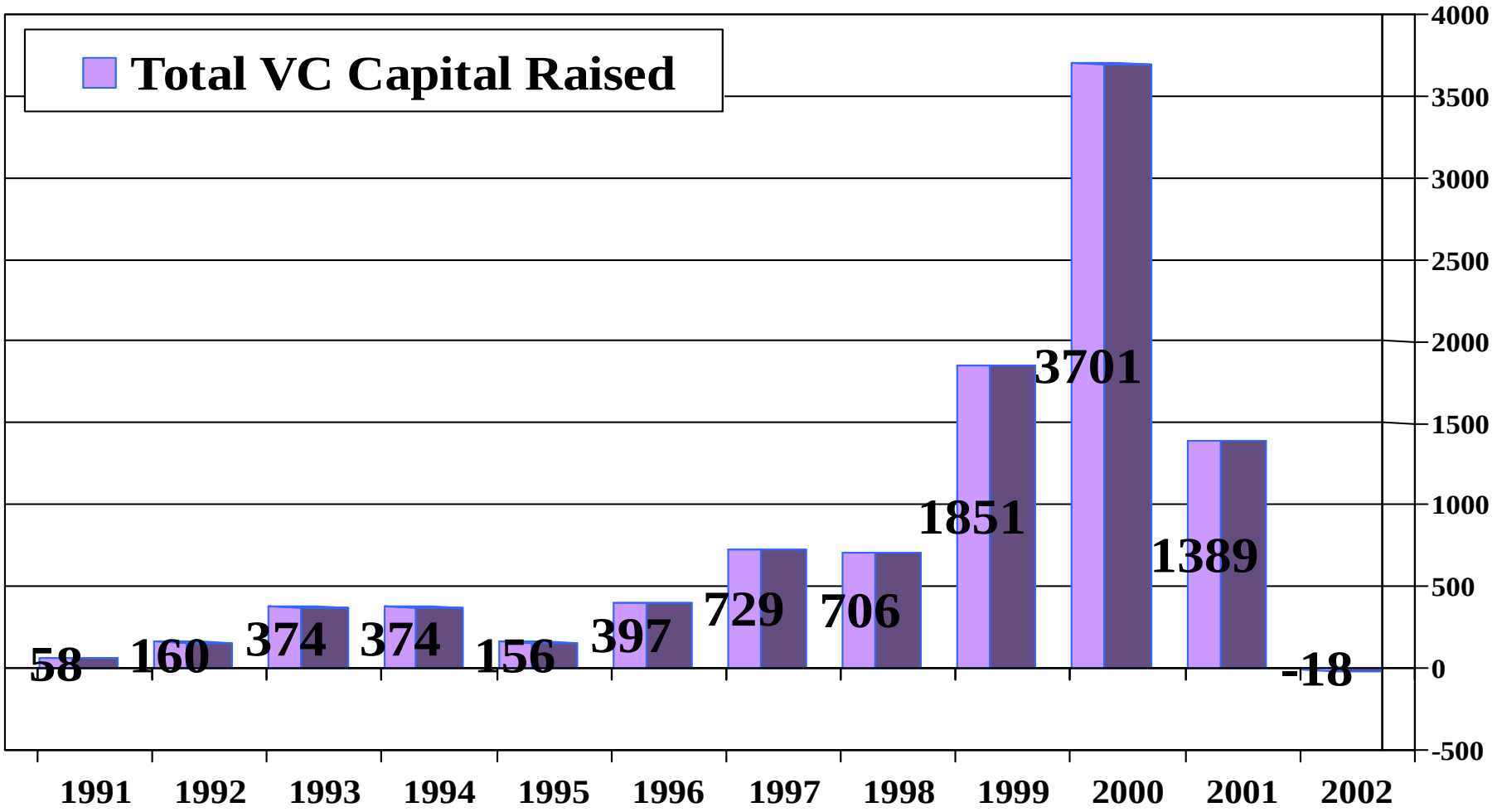
Negligible investments by Domestic Pension Funds

Dominance of Limited Partnership form or organization

VC co-evolved with High Tech (particularly SU segment)

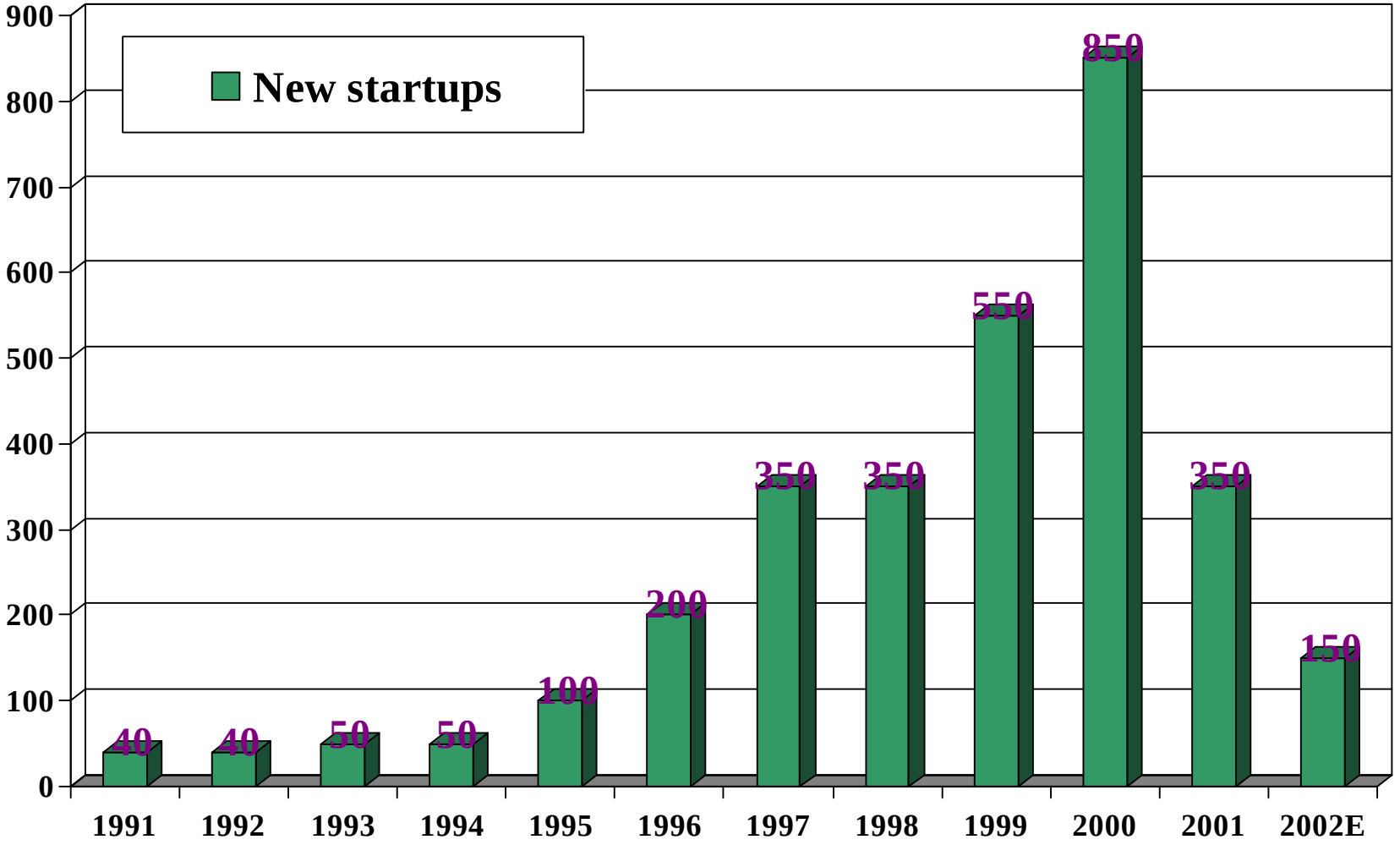
Acceleration of Rate of Growth of VC Activity Figure 1:

Capital Raised by the Israeli VC industry:
1991-2002



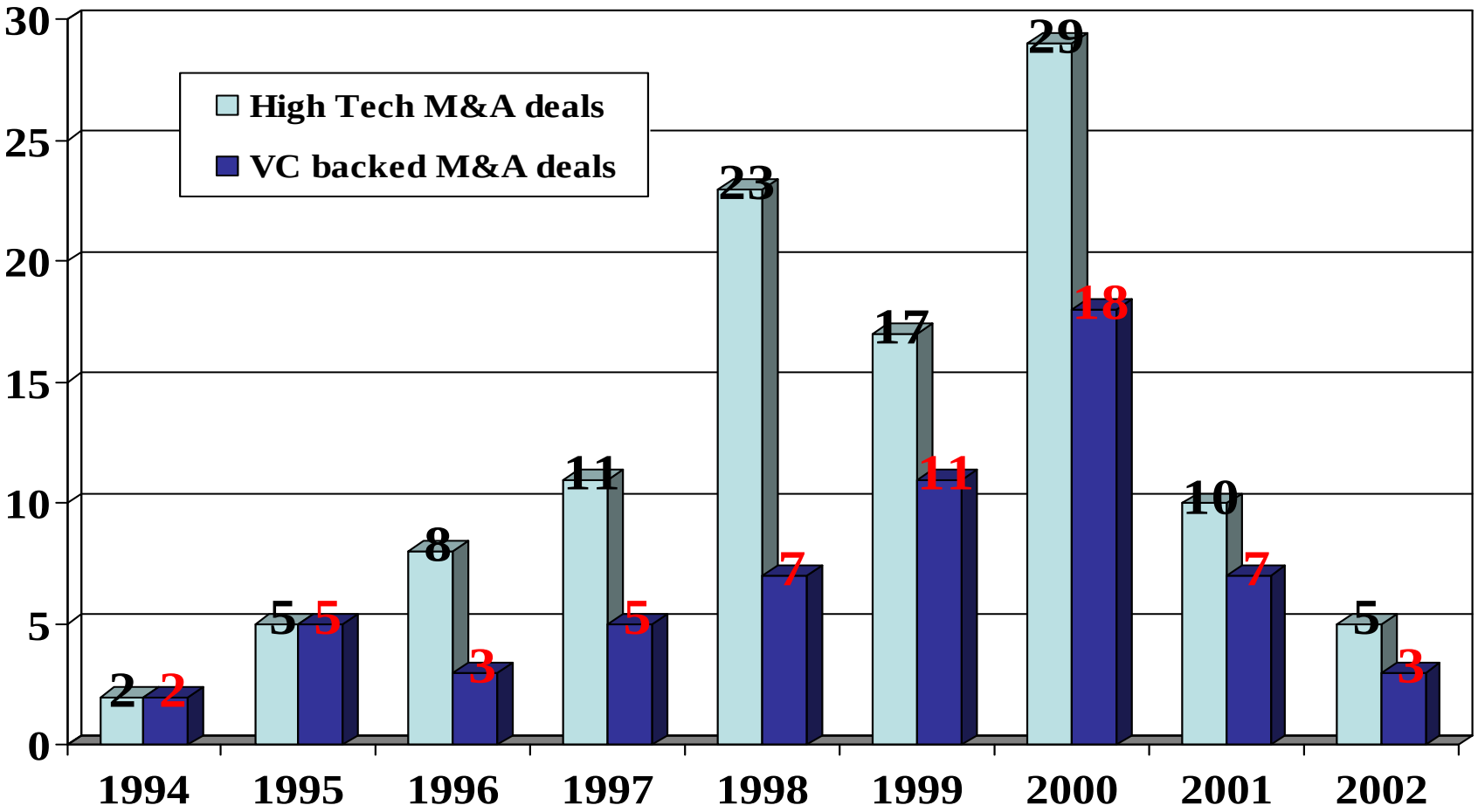
Source: IVC

Figure 2: Foundation of SU companies: 1991-2002



Source: IVC, D&A, D&B, S&P, OCS, CBS and other sources

Figure 3: Israeli high Tech companies which were Targets in M&A deals 1994-2002



Source: Avnimelech 2002

Table 1: The 1990s compared with previous decades

Decade	90s	80s	70s
Accumulative Number of Startups established:	~2,500	~300	~150
Accumulative Number of VC Companies:	~100	3	0
Capital Raised by VCs: M$	10,000	~50	0
Capital Invested in Israeli Startups: M$	~6,500	~100	0
Accumulated No. of High tech IPOs (in NASDAQ):	~150	~10	1
Accumulated capital raised by SU in IPOs (in NASDAQ and EU capital markets) and in M&As: B$	~35	<0.5	<0.25
Share of hi-tech Exports in Total Manufacturing Exports	58%	40%	~25%
Share of high tech industries in Total Manufacturing Sales	34%	24%	~18%

Source: Avnimelech and Teubal 2002 (OCS, CBS, IVA and other sources)

Table 2: Israeli Software & Electronics Sale (M$)

	1991	1995	1999	2000	2001	2002
Software Sale	540	950	2,950	3,700	4,100	2,800
Software Export	110	300	2,000	2,600	3,000	1,900
Electronics IT sales	3,600	5,900	8,600	12,500	11,500	9,700
Electronics IT Export	2,300	4,300	7,100	11,000	9,800	8,200

Source: IASH and IAEII

C2-7: Summary of EHTC towards 2000

Numbers of SU created: 2,500
Accumulated VC funds raised: 8,500 M$
VC Investments in Israeli SU: 6,650 M$
Accumulated Nos. of IPOs: 126
Accumulated VC-backed IPOs: 72
Accumulated Nos. of significant M&A by MNE: 75
Number of VC companies: 100
Share of ICT exports in manufactured exports (end of decade): 54%
Civilian R&D as a share of GDP: 4.3% (2004)
Three/Four fold increase in ICT output/exports->13 B$

C3. AN EXTENDED INDUSTRY LIFE CYCLE (ILC) PERSPECTIVE TO VC/EHTC EVOLUTION

(1)Background Conditions (1970-1984)*

(2)Pre-Emergence Phase(1985-92)*

(3)Emergence Phase (1993-2000)*

(4)Crisis and Restructuring (2001-2003)

(5)Consolidation Phase (starting in 2004)

C3-2: (Some) Background Conditions Phase(69-84)

Strong STE infrastructure for historical reasons ***and continued support till after 2000***

- ***Clear 'market/system' failure regarding BS R&D/Innovation*** export of textiles & oranges, not high tech
- ***Creation of the OCS as a specialized agency (part of Ministry of Industry/Trade) in charge of promoting BS R&D***
- ***Backbone Policy: A Successful Grants to BS R&D progam which Directly supported projects at firms. Horizontal Support with neutral incentives at firm level***

C3-3: Pre-Emergence Phase(85-92)

New opportunities in the global environment (globalization and technological revolution)

Begginings of Software industry, de-regulation of communications markets, liberalization of trade and investment, globalization of NASDAQ (→ first IPO of a non-profitable Israeli SU in 1991)

Increase in R&D in Israel's BS and begginings of a Civilian-oriented high tech industry

Creation of new SUs, new entrepreneurs and Business Groups, foundation of some of what would become the largest ICT companies of the 1990s **e.g the RAD group, Formula, Comverse, Amdox**

C3-4

Significant Business Experiments involving both SU and VC

In order to exploit the new opportunities also in capital markets. The strategy of SU became 'born global' towards the end of the Phase; and oriented no less to global capital/knowledge markets than to global product markets

There was not yet a VC industry, only about 2-3 formal organizations (Atena, Star). Still many individuals (also from abroad) searched for investment opportunities, and to perform part of the functions a VC industry would perform

'Selection' (both by the market and also through Yozma—see below) of the Limited Partnership form of VC organization

A critical mass (about 300) of SU by 1993

→ Demand for the services of a future VC industry

C3-5

A number of IPOs in NASDAQ by incumbent companies Scitex, Tadiran, Teva →new links with global capital markets

Consolidation of External Networks and Links

With Nasdaq, business links from the BIRD program, Defense links, Israeli Diaspora and returning Israelis, Academic Links

C3-6

Significant Restructuring of Defense Industries and reallocation of highly skilled manpower to Civilian industry

Partly a result of Macroeconomic constraints and of cancellation of large military projects. The restructuring affected also the allocation of future *flows* of skills (new graduates from Universities, inmigrants)

Liberalization of Capital and Foreign Exchange Markets

Critical for future flows of foreign capital to VCs and SUs

C4-1: VC/ETHC Emergence(93-2000)-1

During 1993-2000, VC activity & SU foundations accelerate and a new EHTC emerged involving a quadriplication of high tech exports **see C. above**

This was the outcome of a 'cumulative process with positive feedback' **[autocatalytic, or dynamic increasing returns** see below**]** ***process, triggered by a targeted VC-directed program Yozma*** see below***)***

C4-2

That process built upon very favorable Phase 2 pre-emergence conditions **part of them the result of policy, see D(2)**

Moreover the domestic and global contexts was very favorable

- ***growth in the NASDAQ index and globalization of these and of knowledge markets,***
- ***growth in global technology markets***
- ***highly skilled inmigration from the former Soviet Union***
- ***The Oslo Peace Process***
- ***Continued ICT revolution (e.g the Internet); etc***

C4-3

Still, the cumulative process of emergence would not have happened without a new targeted ITP program-Yozma; and without luck!

***The timing of Yozma and its design were crucial*-see below.**

So (and partly related to this) was the preparatory 'policy learning' process which took place during the late 80s and early 90s **e.g 'selection' of the LP form of organization; and the requirement for the supported 'Yozma Funds' to partner with reputable foreigng financial institutions**

D. Yozma program (1994-7/8)-1

Background & Objectives

•**Identification of the System Failures** constraining the growth of high tech: (early 90s): ***Absence of a VC industry***

• **Creation of stable, competitive, domestic VC industry with strong capabilities**

•Ensuring **minimum government intervention** in management

•Generating **a critical mass of VC activity** (for triggering a cumulative process of emergence)

• **Linking with & Learning from foreign partners**

D-2. Yozma Design

- ***Government VC component***

A *$100M Government venture component* which leveraged an additional $150M of private capital

- ***Fund of Fund***

In each of the (10) Yozma funds supported, the government invested 40% of the capital raised - 8 M$ (size of funds $20M)

- ***Incentives to the upside***

The privately held 60% had *a 5 years option to buy the government share at initial value plus interest*

D-3

- **Focus on *Early Stage investments in purely high tech SU***
- ***Adoption of LP form of VC organization***
- ***Requirement to partner with a reputable foreign financial institution*** **e.g Advent,** not a requirement iin e.g the Irish case
- ***All management companies were Israeli entities which included partners from both Israeli financial institutions and foreign (US) PE (VC) entities.***
- ***Some selection of Teams***

D-4: The Cumulative Process Triggered by Yozma

A number of sub-processes were involved

including those listed below. Overall, the first ones began operating earlier than subsequent ones (except VC-SU co-evolution which operated throughout VC emergence)*. A major motivation is 'high and increasing profitability, but there are also 'strategic reasons'

Ascertaining the 'nature', 'strength' , 'phasing' and 'impact' of each one of them; and their mutual re-enforcement requires additional empirical analysis and additional tools

D-5

1. ***Yozma (and 2-3 other 'early') VCs created follow-up funds***
2. ***Entry of new, non-Yozma linked VCs***

3. Successful Exits → enhanced Reputation

Of individual VCs, SUs and of the emerging EHTC

4. ***Entry of a variety of world class/high profile foreign agents***

D-6

Financial Institutions, strategic partners (IBM, Nokia, Intel), direct (& indirect through 'corporate' VC arms) investments and M&A, etc

5. Entry of Investment Banks→…→

6. VC- SU co-evolution-not a separate process

7. 'Cluster Effects'

D-7

Foreign agents, foreign capabilities and foreign capital played crucial roles- a crucial contextual factor, the result of Globalization.

Their contribution was both quantitative and qualitative e.g. entry of a high profile agent signalled to others their belief that Israel was a good place for high tech investments. Their participation in the process opened up new possibilities for creating new companies and for accessing global product and global capital markets

E: Conclusions and Present Challenges

VC emergence is one possible objective of ITP/VC/EHTC policy

This was not considered as such by policy makers in EU up to the 1990s. There are also other objectives of such policy as well.

Whenever this is the case, a <u>targeted VC/EHTC-directed program or policy</u> may be justified

Its objective would be to 'trigger' and 'sustain' a cumulative process of emergence with positive feedback

-2

Israel's VC emergence process involve a number of sub-processes including significant VC-SU co-evolution. Many of these like Collective Learning, Reputation effects and Networking effects would seem not be part of biological selection/reproduction processes

Also, in the Israeli case VC emergence was (I) intertwined with and (ii) the central driver of emergence of EHTC

In other countries and for Life Sciences oriented VC/EHTC, the profile of emergence might differ from that in the Israeli case

-3

VC emergence may require an already extant High Tech industry with sufficiently strong Capabilities. It seems unlikely that a VC industry could be the main driver creating a high tech sector or cluster. The critical mass of SU achieved in 1992 (300) were a critical factor in the success of Yozma during 1993-, 24 years after the OCS starting supporting commercial innovation in firms.

A dynamic, Systems/Evolutionary perspective to VC/EHTC and to the associated policies is necessary for successful targeting of VC/EHTC

But triggering/sustaining emergence of a VC market/industry (and associated EHTC) is not the only objective of VC & Innovation Policy.

A very common situation is that pre-emergence conditions are not sufficiently favorable, frequently due to absence of 'investment ready opportunities' i.e. of a critical mass of SU. In this case, other policies e.g support of SUs via incubators, direct support schemes, etc may be critical **these should be considered VC-relevant policies**

Over and beyond favorable pre-emergence conditions, 'timing' and 'design' may be of the essence

-4

Many Policy Failures (PFs) were due to inappropriate timing and inappropriate context

Some elements of the required context would necessitate other policies implemented prior to VC policies

This means that the <u>phasing of policies</u> is an essential aspect of Evolutionary ITP

Successful VC Emergence ***does not assure VC/EHTC Sustainability*** other industry specific policies may be required

-5:Policy Failures

F1: Unfavorable Background Conditions Prevailed when VC Policies were Implemented e.g. Insufficient R&D/Innovation Capabilities in the business sector due to weak public support of innovation.

***F2: Unfavorable Pre-Emergence Conditions e.g. Insufficient Business Experiments and/or Policy Experiments and Learning prior to Targeting VC-→ I*nappropriate VC Policy Objective and Design**

F3: Weak pre-existing demand for VC services→ wrong timing and context for targeted VC policy to trigger VC emergence

F4: Wrong timing or unexpected changes in external environment→Short emergence period prior to down turn in global technology and capital markets → Insufficient cumulative effects

F5: Inadequate and I*nappropriate *post emergence restructuring process → the VC industry doesn't advance to the consolidation phase