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Evolutionary Interpretation of Venture Capital Policy in Israel, Germany, UK and Scotland

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Evolutionary Interpretation of VC Policy in Israel, Germany, UK and Scotland

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Abstract

Despite many attempts to develop high-impact VC policies, most VC markets in Europe are still underdeveloped. Many of these policies were based on 'traditional' (Rosiello et al 2009) VC policy involve a mix of monetary incentives and institutional changes. In this paper, we present an alternative evolutionary VC policy, which is based on a dynamic analysis of emergence processes and on the co-evolution between VC and entrepreneurship, as well as on a dynamic and adaptive view of policy.

The paper presents four case studies of VC development: Israel, UK, Scotland, and Germany. Evolutionary VC policies relies on few major factors: i) a strategic objective and a long-term commitment to enhancing VC market and high-tech cluster emergence and development, ii) a phased-policy portfolio including both direct and indirect VC-policy components, and iii) a dynamic policy process, which is adaptive to the specific context.

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1. INTRODUCTION

Despite many attempts to develop high impact Venture Capital (VC) policies in Europe, a consensus seems to exist that the results of most policies implemented up to the early 2000s were below expectations (Rosiello et al., 2009). We propose that such failure may be related to a rather static and narrow approach to VC policy, a pervasive emphasis on monetary incentives and a strong supply-side bias, with little regard for capability generation at both the firm level and the industry level. For example, Baygan and Freudenberg (2000) in their OECD report on VC policy suggest that the government's main objective was to cover 'funding gaps'. Three directions of VC policy are stressed: direct supply of public capital to firms; provision of (mostly tax) incentives to VC investments; and the broadening of investment rules of institutional investors. In addition, Baygan (2003a, 2004) lists 'supply side measures' in support of VC, which include promotion of private VC investment; development of second tier capital markets; direct equity investments in start-ups; and equity guarantee programs.

Underlying many VC policies stands the assumption that the *ex ante* specification of proper fiscal, monetary and institutional pre-conditions can be conducive to efficient VC markets. Existing entrepreneurs will automatically reveal themselves (Gilson 2003) or the removal of fiscal and institutional barriers to entrepreneurship will induce the birth and growth of a growing number of investable ventures (Da Rin et al 2006). Another implicit assumption is that a comprehensive policy process can identify *ex ante* all the systems failures in the process of VC market and entrepreneurial high-tech cluster emergence and development.

An 'evolutionary' criticism of the traditional approach would focus on four points. First, enhancing market or cluster emergence is a long process that may require phased-policy process in which each phase' policy should overcome new unpredicted system failures (subject to radical uncertainty) that previous phase' policy revealed (Avnimelech and Teubal 2008a). Second, as the objective of policy should be market emergence and sustainability rather than increasing the pool of capital, more attention ought to be paid to the demand-side and other elements of market emergence, primarily the prior creation of sufficiently large segment of "investor-ready" opportunities (Mason and Harrison, 2003) and a critical mass of high-tech start-ups. Third, the dynamics of emergence of VC markets and the system failures can differ from case to case (Florida and Kenney 1998; Sunley et al 2005) thus VC policy should be adaptive to the institutional context.

Our paper is organized as follows. Section 2 surveys post-2000 research on VC policy that explain how VC resolves pre-existing market failures in the financing of innovative star-ups. This research tends to assume that solving such failures automatically creates not only a VC market but also one adapted to policy objectives of financing early stage technology-based firms.

In Section 3, we review the process of VC policy implementation in Israel, UK, Scotland, and Germany. In section 4, we use our findings to introduce some general principles underlying an alternative VC policy approach. This discussion is an extension of Rosiello et al (2009). The outcome of our analysis is a dynamic view of VC policy, one which includes both VC-directed and VC-related components (Teubal et al 2007).

2. A REVIEW OF EXISTING PERSPECTIVES TO VC AND VC POLICY

The 'finance perspective' to the analysis of VC and VC policy originated in the 'finance literature' (Gompers & Lerner 1999). It focuses on VC as 'pool of money', as a nexus of complex contracts, on the operation of existing VC organizations and, to some extent, on the operation of existing VC industries or markets. Its policy recommendation often relate to incentives to fundraising and investment.

Lerner (2002) explains that VC constitutes a form of intermediation that solves a complex contractual problem, in that the relationship between private equity (PE) investors and entrepreneurial ventures is characterized by high risk, information asymmetries and moral hazard (and thus are subject to agency problems and high transaction costs). Lerner (2002) propose that a direct intervention by policy makers to increase the supply of VC available to start-ups may be justified by market failures and the positive externalities associated with the growth of technology-based companies.

Gilson (2003) emphasizes the effective contractual arrangement between entrepreneur and VC, in the U.S. VC model. Gilson asks whether this model could be replicated elsewhere via public intervention. The creation of a VC market is a difficult coordination problem, in that the supply of entrepreneurs is responsive to VC funding and to the existence of appropriate financial institutions and vice versa. However, Gilson proposes that the first successes with VC would reveal new entrepreneurs.

Bottazzi et al (2004) and Da Rin et al (2006) take a different perspective and argue that VC market will strongly respond to 'incentives' but my not respond to public attempts to increase the flow of VC via direct investments. A major implicit assumption seems to be that a VC market already exists rather than a situation when it has to be created. These incentives are mainly related to taxation on capital gains and barriers to entrepreneurship. Concerning the problems faced by Europe, the authors suggest that the idea of *closing a funding gap* through direct public intervention is fundamentally misleading. Policy-makers should restrain from direct investments and instead focus on defining the appropriate taxation and fiscal, institutional conditions to stimulate VC investments and entrepreneurship.

A key assumption of their analysis is that once these conditions are satisfied, the flow of VC is automatically matched by rising demand from high quality start-ups. Thus, while access to skills and R&D investment are included as independent variables, there is no mention of the dynamics of market emergence. These processes seem to be taken for granted. It remains rather unclear why some forms of direct support failed, whereas others, for example in Israel, obtained more encouraging results, or how can we ensure these VC-related incentives will be channeled to VC activity rather than PE activity (Cowling et al 2008).

Keuschnigg and Nielsen (2003) offer a comprehensive analysis of the market and welfare implications of various instruments of VC policy. In their model, the size and composition of the VC portfolio is determined by (i) incentives to search for opportunities, (ii) expected VC surpluses and (iii) the degree of market *tightness* (the imbalance between VC demand and supply). The VC market can incur two types of failures: double moral hazard (between VCs and entrepreneurs and visa-versa) and high transaction costs as regards the search for suitable opportunities. The objective of VC policy is to provide investors and investees with high-powered incentives. As far as VCs are concerned, this involves inducing VCs to provide also non financial support to the investee. The model is based on a number of assumptions and different degrees of *tightness* lead to different optimal solutions in equilibrium. Thus, if policy

fails to recognize that pre-conditions and/or overshoots its target, it is likely to cause serious distortions. However, Keuschnigg and Nielsen (2003) implicitly assume that capable investors can always identify viable opportunities and add value to them.

2.1 Summary and Critique

Most of the post-2000 research on VC policy implicitly assumes that a central problem in creating a VC market is overcoming pre-existing ' market failure in the finance and support of start-ups. It is generally agreed that *ex ante* capital provisions (fund-of-funds), financial incentives (capital gain tax reduction and guarantees) and institutional changes can push the system closer to VC market equilibrium. These sets of measures seem generally applicable, regardless of the structure and culture of the economy or its institutions. Moreover, any type of economic system, irrespective of its industrial or institutional configuration and stage of development, is expected to react positively to the setting up of new forms of intermediation and the removal of barriers to entrepreneurship. Another weakness of some of the traditional approaches is absence of an explicit analysis of entrepreneurial cluster emergence.

3. EMPIRICAL CASES

In this section, we consider four examples of intertwined VC and innovation policies that deviated from what we termed ‘traditional’approach. In all cases, the policy process and its outcomes have been shaped by a series of pre-conditions that can be investigated using the dynamic concepts of ‘emergence’ and ‘pre-emergence’ (Abernathy and Utterback 1978; Avnimelech and Teubal 2006).

3.1 The Emergence of a VC market and ICT Cluster in Israel during the 1990s

By the late 1960s a significant science, technology and higher education infrastructure had been established, a process which started in 1925. In addition, a new institutional setting for innovation policy was set up in 1969 based on creation of the Office of the Chief Scientist at the Ministry of Industry and Trade (OCS). Both stimulated a 25-30 year evolutionary process, which led to the emergence of a VC market and an entrepreneurial ICT cluster during the second half of the 1990s. From the outset, the policy of the OCS was to enhance economic welfare by inducing an innovation-based economic growth process through the diffusion of R&D to the business sector.

The evolutionary process involved three phases (Avnimelech and Teubal 2006): *background conditions* (1969-1984), *pre-emergence* (1985-1992) and *emergence* (1993-2000). During the *background conditions phase* three new universities and a set of public applied research institutes were established. This led also to increasingly large pool of qualified scientists and engineers. In addition, innovation policy was initiated with the OCS’s Grants to R&D in firms program followed by the ‘Bi-national Industrial R&D program’ (BIRD-F) which promoted collaborative commercial innovation between Israeli and U.S. firms. Financial incentives were extended to multinational corporations that contributed to a strong multinational presence in Israel. Finally, huge investments in defense R&D were undertaken. The outcome was strong growth of R&D performing companies.

The second *pre-emergence phase* includes a new comprehensive R&D law (that provides subsidies to business sector R&D), and a number of domestic macroeconomic and liberalization policies such as the successful price stabilization program of 1985 and the liberalization of capital, foreign trade and foreign exchange markets. This phase coincided with global changes, including enhanced opportunities for foreign start-ups to float in NASDAQ, liberalization of communications markets in the U.S.,

the UK and Japan, and the internationalization of U.S. investment banks. On the real side of the system, we observe a sharp restructuring of the military industry (which generated a pool of technological entrepreneurs). This phase was characterized by a strong learning and experimentation, with respect to entrepreneurship and VC. It led to identification of suitable configuration of the form of VC organization and of start-up firms, which were subsequently 'selected' by policy makers and embodied in the design of the 'Yozma Program' in 1993. The outcome was an expansion of informal VC activity; an increased rate of start-up formation leading to a critical mass of startups; the appearance of the first Israeli start-ups to successfully float in NASDAQ. Moreover, individuals (foreign and returning Israelis) and organizations came to Israel to search for new investment opportunities in high-tech. Underpinning the above was the new OCS priority: promoting entrepreneurship and the establishment of a domestic VC market. New government programs were implemented: 'Inbal Program' (1991) that targeted VC and failed, 'Magnet Program' (1992), and the 'Technology Incubators Program' (1992).

The *emergence phase* was triggered by the implementation of the successful 'Yozma Program' (Avnimelech and Teubal, 2004). Yozma was a policy response to both the weakened impact of the regular Grants to company R&D program during the second half of the 1980s and the new opportunities for start-ups opened up by the ongoing ICT revolution, the liberalization of global telecom sector, and the globalization of NASDAQ. It targeted a high impact domestic VC market with strong links with U.S. product and capital markets and indirectly, an entrepreneurial high-tech cluster. It triggered a cumulative process with positive feedback based on VC-SU co-evolution, reputation effects stemming from successful exits during 1995-1997, cluster scale effects, and enhanced activity of multinationals and foreign investment banks. As a result, the number of start-ups increased from 300 to approximately 3000; VC funds grow from 3 to more than 100 (total capital under management approximating 10B$ by 2000); more than 100 new IPOs in NASDAQ and 50 large M&A deals occur during 1995-2000, and ICT exports almost tripled between 1995-2000.

3.2 Four decades evolution of the German VC industry

Entrepreneurship in Germany goes back to the end of the 19th century, where we find the creation of some of the well-known industrial German corporations. Most entrepreneurial activity in Germany centered on the so-called "Mittelstand" - SMEs that are regional, family-owned businesses. After WWII, the "Mittelstand" formed an important engine for Germany's economic reconstruction (Adeberger, 1999). However, "by the late 1960s, Germany faced a very different set of incentives for entrepreneurship. Young Germans were anticipated to join large companies and banks, which typically provided lifetime employment at high wages and … high status" (Becker & Hellmann, 2003: 32). Moreover, employment stability and high status of university researchers provided little incentives for scientists to commercialize their discoveries. In addition, Germany's traditionally credit-based financial system excels at providing long-term low-risk capital. A typical "Mittelstand" company was founded and managed by a family. Initially bootstrapped from family resources, with time it would secure loans from banks – the concept sharing equity with outsiders was not accepted (Adeberger, 1999).

In 1965, the Government created the first KBGs (semi-public equity investment companies), many of them as subsidiaries of banks. Often, their investments were in the form of a "silent partnership" (type of debt), and ideally the entrepreneur would buy back the KBGs' share after five to ten years. KBGs invested primarily in

established, medium-sized companies and the total number of investments was very low (Franzke et al., 2003). In addition, in the early 1970s states in Germany started to create the MBGs - a specific form of public PE in which investments are restricted to the specific state - in cooperation with local banks and local industry representatives. However, up to 1975 there was very limited PE activity in Germany (Fiedler & Hellmann, 2001).

First attempt of triggering the PE/VC industry (1975-1985)

In late 1970s, the shortage of equity capital available for investment in innovative SMEs has been identified as a serious barrier to the development of high-tech companies and sectors (Pfirrmann, Wupperfeld, & Lerner 1997). WFG, which was established in 1975, was the federal Government first direct attempt to promote the development of a VC market. This 50 million DM fund, involved the participation of both the government and the main financial institutions in Germany. WFG was a total failure: it recorded significant - a total ROR of -25%, and it never succeed in inducing VC market development in Germany (Becker & Hellmann, 2003). The failure of WFG can be traced back to inappropriate contracting, conflict of interest, low value added, incompatible entrepreneurial system and no exit markets (Becker & Hellmann, 2003). However, it should be also associated with the unsuitable entrepreneurial and VC environment in Germany at the time.

Second attempt of triggering the PE/VC industry (1986-1995)

In the mid 1980s, a number of German private PE firms followed the U.S. LP model and emerged with moderate success. In addition, a few foreign VCs started to establish subsidiaries in Germany and the MBGs, which had gained little experience during the 1970s, became more active (Martin et al., 2003, 2005). Moreover, the first business incubators in Germany were founded in the late 1980s.

The German VC market developed considerably from 1985 to 1990, both with regard to professionalism as well as to size. The total invested VC volume tripled from approximately $0.4 billion in 1985 to $1.2 billion in 1990. However, still a significant majority of the PE activity in Germany was by Public or Semi-Public funds. Moreover, during this period LBOs, MBIs, and turnarounds financing dominated the PE industry, with approximately only 10% devoted to VC financing. In 1984, the number of IPOs started to increase gradually, reaching an annual average of 19 IPOs between 1984 and 1996 (Franzke et al., 2003).

Parallel, to the slow accumulation of PE-related experience in Germany, the global ICT-revolution influenced the German entrepreneurial culture – the emergence of fast growing opportunities for start-ups in the ICT sectors; and the large capital requirement of such companies gradually channeled the local entrepreneurial culture toward more acceptance of the VC model (Fiedler & Hellmann, 2001).

In the early-mid 1980s, the Research Ministry emphasized its long term commitment to supporting innovative SMEs and solving the seed-financing gap. In 1983, the Research Ministry introduced the first national VC scheme - a program called "Promotion of technology oriented start-ups" to better understand the development trajectories of start-ups and to evaluate promotion possibilities. The scheme included extended subsidies to start-ups, and guaranteed a large portion of the risk of the private investors in start-ups. While startups that participated in the program failed less frequently than the average startup, the investors still experienced losses (Adeberger, 1999). In 1987, the German parliament also passed the UBGs law, which provided

considerable tax advantages for non-institutional investments in start-ups through traded equity companies (Franzke et al., 2003).

In 1989, the Research Ministry introduced the second VC scheme called "Equity capital for newly-founded technology companies" (BJTU), with the goal to initiate and develop a private early stage VC market in Germany. Two main changes were made in the new scheme: a switch from providing subsidies to equity finance and leaving the investment decisions to the business sector investors. The policy was implemented by two semi-public banks that provided up to DM 1 million if a private sector investor was willing to invest the same amount in a start-up company; and guaranteed 90% of the investors' risk (Adeberger, 1999). These programs were successful, and in 1995 the third VC scheme - 'Equity for young technology-based firms' (BTU) - was implemented. This scheme included small changes from the second scheme – decrease in the share of guarantees and increase in the maximum amount invested. This program have become increasingly popular with private VCs and he number of firms in which the Research Ministry has invested grew rapidly (Adeberger, 1999).

PE/VC industry emergence (1997-2000) and post-emergence

Since 1997, there has been a significant change in German VC market both increase in the amount invested and significant change in the attitude toward entrepreneurship and external equity finance (Fiedler & Hellmann, 2001). During 1997-2000, approximately 40 PE funds were created each year. The PE investment almost doubled from approximately 0.8 billion dollars in 1996 to 1.3 billion dollars in 1997. By 2000 the PE investment volume had expanded to more than 6 billion dollars. At the same time, the share of public investment in the PE market decreased from 40% in 1996 to 20% in 2000 (Martin et al., 2003). Moreover, seed and start-up investing was growing rapidly—more than three times faster than the overall PE market. In 2000, classic VC investments had reached a level of approximately 3 billion dollars, and Germany represents the largest VC market in Europe. The German VC market was characterized by a special feature of public-private partnerships (43% of the market in 2000), which require significantly lower returns from their investments (Bascha and Walz, 2002).

In 1997, the Neuer Markt was founded and initially it appeared to be a great success. However, following a sharp decline in stock prices after March 2000, the level of IPO activity declined rapidly, and the Neuer Markt was closed in 2003 (Vitols, 2005).

In 1998, the Federal Government together with business sponsors set up the Business Angels Netzwerk Deutschland (BAND). Since 2001, the informal VC market grew rapidly. Parallel, the technological incubator market developed significantly.

The PE investments in Germany show a significant decline during 2001-2003. However, since 2004 it started to grow again. Eventually, the volume of PE investments in 2007-2008 was larger than the volume of 2000. However, the focus on LBOs, MBOs, and turnarounds financing increased considerably, with the share devoted to VC financing dropped from approximately 50% in 2000 to 20% in 2008. Moreover, in 2008, after more than 4 decades of PE market trail and errors, still 25% of the German PE market is public and semi-public funds.

Germany's VC strategy included direct investment, extensive use of guarantees, the involvement of banks, and an emphasis on supporting young innovative firms (Sunley et al 2005), rather than generating commercial returns.

From a static point of view there are three main parameters for potential VC market emergence: a pool of entrepreneurs, venture capitalists, and suitable capital markets (Gilson, 2003). All of these were illustrated in the German case. The availability of

high quality entrepreneurs and incentives for entrepreneurship, a suitable environment for PE activity and accumulated PE experience, and an active stock market were critical determinant for VC industry development in the late 1990s in Germany (Becker & Hellmann, 2003).

3.3 VC development and policy in the UK

Up to the early 1980s, the UK PE market was still small, fragmented, underdeveloped and biased to late stages (Sweeting, 1991). After the 1979 election, the Thatcher government increased the emphasis on SMEs as underexploited sources of job creation and economic growth (Kestenbaum and Walker, 2009).

A range of Government schemes were implemented in the early 1980s to resolve market failures in funding SMEs (BVCA 2009). These included the 'Small Firm Loan Guarantee Scheme' (SFLGS) that provided almost £4 billion to over 90,000 eligible SMEs. In 1981, the 'Business Start-up Scheme' was introduced, to support SMEs that are suitable for external equity funding. This scheme was often abuses for tax avoidance. In 1983, it was replaced by the 'Business Expansion Scheme', which provided tax relief on investments in unquoted SMEs. However, much of the investment went into low-risk SMEs. To sum up, none of these Government programs had significant effect on the financing of technology-based start-ups.

Between 1981 and 1986 PE investments had increased from £195 million to £671 million (Bannock, 1987). This upward trend in the UK PE market in the mid-late 1980s has been driven by the growth in the MBO/MBI market. This growth was stopped by the economic recession of the early 1990s (Burgul, 2000).

Emergence of the PE/VC industry (1994-2000)

In the second half of the 1990s, PE investments in the UK tripled in value, reaching over £8 billion in 2000. However, funds have gone primarily to traditional industries and later stages of investment. During 1995-2000, only 15% of UK PE went to ICT sectors and only 35% went to classic VC investments (Baygan, 2003).

UK was a pioneer in the development of the informal VC market (Mason and Harrison, 1995, 1997). The significant growth in the industry started in the mid 1990s. In 1997, the UK government cooperated with the business sector to create the first national business angles network in Europe.

VC Policy mid-1990s

By the mid-1990s, the UK government has introduced generous tax incentives targeted to different types of investors to increase the supply of PE. These included the 'Enterprise Investment Scheme' (EIS), the 'Venture Capital Trust' (VCT) scheme and the 'Corporate Venturing Scheme' EIS (1994) provides tax relief for private investors who invest in shares of qualifying companies. The VCT scheme (1995) allows individuals to invest indirectly in a portfolio of companies through a professionally managed fund. These funds were qualified for a range of tax breaks. The 'Corporate Venturing Scheme' (2000) provides tax reliefs for CVC investments in unquoted SMEs. In addition, the 'Alternative Investment Market' (AIM) was introduced in 1995 as a second-tier stock market with less stringent admission requirements and lower costs, better suited to the IPOs of young, high growth companies. However, the rise of secondary markets in the UK has not been matched with a parallel increase in market capitalization and liquidity (Baygan, 2003).

Post-Emergence of the PE/VC industry (2001--)

In 2001, UK PE investments declined by 25%. The average annual PE investment during 2001-2003 was about £6 billion. Since 2004, the UK PE market has gone through tremendous growth reaching the highest levels ever. The average annual PE investment during 2006-2008 was about £24 billion. However, despite very high levels of PE financing in the UK, relatively little funding is reaching technology-based start-ups (Baygan, 2003). During 2005-2008, the share of seed, start-up and expansion stages investments (classic VC investment) was less than 25% and the share of investment in ICT sectors was less than 30%.
In the late 1990s, there were 20,000-40,000 business angels in the UK investing £0.5-£1 billion per year in 3,000-6,000 companies. Since 2001, there was a significant growth in the informal VC market in the UK (Mason and Harrison, 2000, 2003).

Post-2000 VC Policy

In the late 1990s, the UK government shifted its focus from regulatory and tax incentive policies to targeted initiatives to increase access to PE for small technology-based firms. In 1999, the 'Enterprise Fund' - a fund-of-funds of a £270 million, where government seed financing leverages private investment, was established. This fund used for the finance of the following programs: In 2000, the 'High Technology Fund' - a fund-of-funds to provide equity to existing VC funds, was established. The initial investment of £20 million from the government was used to raise £106 million from institutional investors. In 2001, the first 'Regional Venture Capital Fund' (RVCF) – a regional private-public fund-of-fund partnership - was established. By 2004, the RVCF funds had committed £75 million of public finance which has leveraged £175 from the private sector and the European Investment Fund. In 2002, the 'Community Development Venture Capital Fund' (CDVF), which focuses on PE investment in peripheral areas, was established. In 2002, the 'Early-Growth Fund' was established, it provide small amounts of equity finance based on angel co-investment. In 2002, the 'University Challenge Fund' (UCF) scheme was created; the fund provides early-stage financing for university spin-offs (19 UCFs were set up with £75 capital under management).

3.4 The Policy-led Emergence of an high-tech cluster in Scotland in the 2000s

During the two decades that preceded political devolution the performances of the Scottish economy was influenced by multinationals operating in the financial services, energy, transport and utility sectors. By the early 00s, however, the downturn of the global economy and the difficulties faced by some multinationals led to the shutting-down of some plants and the considerable downsizing of others, with negative implications for the whole economy. Although oil, gas, transport and financial services continued to grow, increasing emphasis began to be laid on the need to develop a more innovative and entrepreneurial economy, in order to correct problems originating from an excessive reliance on foreign direct investment (FDI).

The Scottish Executive committed to create a *Smart, Successful Scotland*, a long-term strategy aimed at raising the sustainable growth prospects of the national economy by achieving success in the knowledge-based economy. Then, A 'Science Strategy for Scotland' was published in 2001, which set out a vision of harnessing the potential of science to increase prosperity. It focused on research excellence, commercialization of science, science education, public understanding and science in Government.

As explained by works such as Rosiello (2008), Mason (2009) and Roper et al (2006), the emergence of a local VC market was a key component of overall strategy. In fact, the role played by Scottish public bodies in promoting economic development via VC

dates back the setting up of Scottish Enterprise (SCEn), the local economic development agency. Prior to that, Scottish Development Finance (SDF), the investment arm of the Scottish Development Agency (Scottish Enterprise's predecessor) was already and 'by far the most substantial public venture capital investor in Scotland' (Hood 2000, p.1).

In the post-2000 period, VC policy in Scotland became extensively reliant on co-investment schemes, a policy approach that has been complemented by a number of measures aimed at improving capabilities and interactivity at both a firm level and a systemic level (Love and Cooke 2006; Rosiello 2008)

Nevertheless, in contrast with the other cases presented in this section, the emergence of a VC market and high-tech cluster in Scotland has not been completed (Rosiello 2008; Roper et al 2006; Scottish Executive 2006). Therefore, most policies could be interpreted as focusing on creating favorable pre-emergence conditions.

Thus, in the present of the global VC industry, a major issue is whether a country would wish to develop a local VC industry or only a VC market with connections to the global VC industry. During the mid 1990s the only viable option was to develop a local VC industry since without local VCs to collaborate with, foreign VCs would not open offices in a country. However, this constraint might become less relevant with Scotland being a case where future development of a local VC market would significantly rely on 'out of Scotland' VCs, especially from the London area. Presently, as shown by Mason and Harrison (2003) and Rosiello and Parris (2009), a VC-market structured around local LPs does not exist in Scotland.

However, local angel-groups have high visibility. Don and Harrison (2006) estimate that in 2004, 539 investments involved angels who were responsible for investment over £600M - while in the same period, SCEn co-investment funds were involved in 44% of the total number of VC transactions. Angels and their networks could be considered a component of what could be termed the pre-emergence stage, a fact that suggests a different model of evolution.

The above is consistent with our view that SCEn focuses on improving pre-emergence conditions for the development of a biocluster and associated VC market. Alternatively, for VC or biocluster emergence to be an objective of policy it must be that proper pre-emergence conditions prevail. Otherwise, emergence policies could be delayed with the policy focus shifting to improving pre-emergence conditions. These mainly relate to (a) the definition of new intermediation forms adapted to domestic conditions, which could be oriented to overcoming traditional market failure; (b) the promotion of investor-ready entrepreneurship to develop a critical mass of start-ups; (c) the effective coordination and partnership among various components of the innovation system; and (d) the creation of links with external players.

Policies

As noted earlier, Scottish VC policy is largely reliant on co-investment schemes. As suggested by Mason (2009), this decision is probably motivated by the configuration of the local investment community, to a significant extent composed by private investors and angel groups. Thus, what still would seem to be critical for the emergence of a high-tech cluster is a VC market broadly defined to include not only formal VC organizations but also other related intermediaries, such as business angels.

SCEn's strategy includes VC-directed policies such as the "Scottish Co-investment Fund" (SCF) - a £45M public/private equity fund that helps small companies to obtain money from banks and private investors by investing up to £500K - and the 'Seed

Fund' that invests up to £100K. More recently, additional support is available via the 'Scottish Venture Fund' that participates in investments up to £10M. These schemes operate horizontally across sectors, however, the life sciences tends to draw the largest proportion of these resources (Rosiello and Parris 2009).

Aside from VC-directed policies, we find VC-related policies that target the demand-side of VC. Proof of Concept' is a grant that finances the commercialization of projects across Scottish research institutes; the 'Smart and Spur Awards' support new ventures to carry out innovative projects and commercialize new products and services; and the 'Investor Ready Fund' is a scheme that pays 50% of legal and accountancy fees to start-ups seeking a private investment.

Other policy schemes do not provide financial support in the form of grants of co-investment funds but are directed to improve connectivity and co-operation within as well as outwith the local system of innovation. For example, 'Score' and 'Seekit' support R&D projects jointly undertaken between public research bodies and private companies with specific technical needs; equally, 'Scottish Development International' helps Scottish companies gain access to people, technologies and business partners worldwide

SCEn currently supports business development and innovation in 13 broadly defined sectors. As a result, some policies are sector-specific and they are frequently aimed at creating the infrastructure of innovation that is necessary for cluster emergence. For instance, three Intermediary Technology Institutes (ITIs) have been set up to remedy the systemic lack of exploitation capacity. Launched in September 2003, ITIs have £450 million each to invest over a ten-year period in pre-competitive research project involving both industry and public research centers. The ITIs focus on life sciences, energy and multimedia. As discussed in Rosiello (2008), the life sciences (32,000 employees/£1.5billion contribution to the Scottish GDP) is a sector that receives substantial support not only from grants and co-investment funds that operate horizontally, but also from targeted policies that provide extra financial support, facilitate knowledge generation and exploitation, and promote access to global markets. For example, 'Scottish Health Innovations Limited' was established in 2002 to support the development and commercialization of innovations arising within the National Health System (NHS). The 'Translational Medicine Research Collaboration' was launched in 2005 and it involves Scottish Universities, the private sector and the NHS, with the goal of setting up a centre for the development of biomarkers and leading the sector's eco-systems development.

More recently, investments have been made in strengthening the physical infrastructure - the investment in the 'Edinburgh Bioquarter' is worth £600M, the one made in the 'Scottish Centre for Regenerative Medicine' £59M - and promote collaboration among Scottish research institutions - in 2009 the Executive has committed £35M to the creation of research intensive 'health boards' in Aberdeen, Dundee, Edinburgh, and Glasgow, with the objective to stimulate partnerships between research-led universities and medical schools for patient benefit.

4. FROM A 'NEW' FINANCIAL INTERMEDIARY TO A 'NEW' MARKET

These short VC development and policy cases allow us to introduce our evolutionary approach to VC policy. Our main objective here is to contribute to the development of an alternative VC policy framework and to suggest the major elements in this policy framework. This work is complementary and an extension of Rosiello et al (2009).

4.1 Strategic objective - market emergence

The cases discussed above suggest the need to distinguish between VC as a new institution that deals with pre-existing market failures in the finance and support of innovative start-ups, and VC as a new market which, if emerges, does it by co-evolving with the entrepreneurial high-tech cluster and with the innovation system.

VC funds are not only expected to draft contracts and find institutional arrangements that reduce transaction costs and agency problems. They are also anticipated to identify and invest in ventures with a high growth potential and to add value to their portfolio companies, in a way that enable them to maximize expected returns. Thus, a VC form that can perform such an intermediation function must be mutually adapted to its investees and to the overall institutional framework.

In the Israeli case, this took the form of 'selection' towards the end of the 1980s and beyond of the LP form of VC organization with a focus on investing in early stage born global ICT start-ups. In the U.S., this mutual adaptation involved a non-linear process of lessening the rules of investment of pension funds and development of the VC routines and contracts (Gompers and Lerner, 1999, 2001). In the German case, this process led to a unique VC instruments (such as silent partnership) and distinct market structure (-such as dominate role for public-private partnerships). To this mutual adaptation of supply and demand agents and of the institutional framework, one must add the emergence of a dominant design of the product being traded in the VC market - equity finance with added-value services offered to start-ups.

Therefore, overcoming traditional market failures in the finance of start-ups is not identical with creation of a new VC market. Emergence is a cumulative process with positive feedback, which creates and utilizes externalities. The dynamic economies of scale which characterize this process mean that this may not occur as a spontaneous process and that it may be difficult to initiate and easy to truncate (*dis*economies of *small* scale) such process.

The upshot is that overcoming market failure through the identification and materialization of a VC-based financial intermediation form is a major preliminary step in the process leading eventually to a VC market emergence. This can be a critical pre-emergence condition. However, one cannot state that it is equivalent to the new market itself. Moreover, serious obstacles could stand in the way of full emergence, particularly in blocking cumulative processes with positive feedback.

The Notion of 'Market'

Central in this discussion is the definition of market. We see markets as social institutions that perform a variety of functions and exhibit different forms of organization (Antonelli and Teubal 2009). Our notion of market hinges on Smith's (1776) view of the market as *a device that promotes division of labor, collective learning, innovation, and economic growth.* A decrease in transaction costs is one of the outcomes of a market after it emerges. However, if markets have to be built, other factors play a key role, such as asymmetric information, a critical mass of producers and consumers, and a critical volume of transactions to overcome the fixed costs of a *market place* (see Rosiello et al., 2009).

A market does not materialize in coincidence with a limited number of transactions; rather, it builds upon a substratum of prior transactions once a stable threshold volume is achieved (Antonelli and Teubal, 2009). Following this line of thinking, a VC market may emerge, after the creation of a set of pre-conditions, when a set of previously isolated transactions sparks an emergence process.

4.1.1 VC Emergence and Policy

We propose that triggering and sustaining emergence *of a VC market* could constitute a central target for VC policy. Israel's Yozma program explicitly targeted a domestic VC market and indirectly, an entrepreneurial high-tech cluster. While an appropriate intermediation form leading to market emergence can result from a dynamic process, there is no assurance that this will occur. Indeed, the comparison between the Israeli experience and those of Germany and the UK show that emergence of a PE market instead of a VC market can be an outcome.

As far as VC policy is concerned, the limited impact of both fiscal provisions and direct Government investments stand out against the success of the Yozma Program (Avnimelech and Teubal, 2008a), which we consider as an extreme case of non-crowding out. Both the emphasis on a fund-of-funds approach and the existence of favorable pre-emergence conditions explain why in Israel strong complementarities were found between the Government's investment contribution and private sector contributions. The normative implication seems that, in contrast with Da Rin et al (2006), public/private VC funding complementarities can emerge (Lerner 2002), especially when the Government's investment contribution is made in the early emergence phase of the VC market and after development of pre-conditions associated with the VC-demand.

In the UK during the 1980s, a range of VC schemes, focusing on tax incentives and on direct Government supply of capital to SMEs, were implemented. From the late 1980s, the Government introduced changes in the regulation of pension fund investment in PE. Since the late 1990s, the UK implemented several policy initiatives, based on OECD recommendations, to improve the access of SMEs to equity financing (Baygan, 2003). However, PE investment remains biased towards late stage and traditional industries (Cowling et al 2008). Thus, the UK case suggests that early success in PE investment may block the smooth development of an early stage VC market. Moreover, this case shows that the available of VC supply (PE can easily be transferred into VC) will not automatically reveal high quality entrepreneurs. On the contrary, too early excess VC supply can lead to great losses and bad reputation and thus is not a suitable environment for gradual accumulation of skills by both VCs and entrepreneurs.

VC-SU co-evolution

Central in the emergence of a new VC market is the co-evolution between VCs and start-ups. In the case of Israel, this was the main driver of the whole process (see Avnimelech and Teubal 2008a). Although various studies recognize that demand and supply of VC may not only interact but also co-evolve, most studies assume that VC demand will undoubtedly respond to public stimuli and institutional change. The experience of various European countries suggests otherwise, that is, even in the presence of favorable fiscal rules, tax incentives, institutional settings and access to stock markets, a sufficiently responsive process will not automatically unfold. This may suggest that VC policy should be a comprehensive portfolio of programs bundle with cluster development policies.

4.2 Radical uncertainty – adaptive policy process

While enhancing VC emergence, different policies are needed at different development phases (Avnimelech and Teubal, 2008b). Some of these different policies can be predicted in advanced based on the pattern of industry and cluster life cycles (Avnimelech and Teubal, 2006). However, under uncertain conditions, a successful

phased-policy portfolio cannot be design *ex ante*; rather it is a trial and error process, in which successful policy implementation may reveal unexpected new system failure and failed policy may identify hidden system failures. Moreover, changes in the external conditions may create completely new requirement, or may create new solution to existing system failures.

The Israeli experience provides several examples. To start with, the failure of regular R&D program to create successful start-ups in the late 1980s triggered the search for new innovation-policy measures. Later on, the failure of the first VC policy -Inbal program- made policy makers realized the need for a domestic private LP based VC sector to support start-ups. This process was later reflected in the design of Yozma, a VC policy that was not conventional in 1993.

Similarly, Kestenbaum and Walker (2009) argue, based on their analysis of six UK VC schemes over the period 1995-2008, that the more recent VC schemes have been structured in response to lessons learnt from the earlier VC schemes and thus have improved impact.

Strategic priorities

A major difference between a traditional approach and an evolutionary approach to policy, relates to uncertainty (Metcalfe 1995, Metcalfe and Georghiou 1998). While the former deals with the existence of risk, evolutionary economics assumes radical uncertainty, that is, either not all the possible future 'states of nature' are known or if known, the probability of their occurrences is not known.

However, when radical uncertainty does not encompass all possible phenomena and there are *some* possibilities for learning about how to adapt to the future, policy-makers must be capable of defining policy objectives and strategic priorities, in a coordinated way across the relevant set of policy areas, industrial sectors and technological fields (Avnimelech and Teubal 2008b).

For example, the German case suggests that long-term commitment, extensive trial and error process, and the use of both direct and indirect tools is an important element in VC targeted policy. Since 1965, the German government used four different direct tools and additional indirect tools in targeting VC emergence. After several failures, the Research Ministry implemented an effective strategy to enhance the VC market in Germany during the late 1990s.

4.3 Context-specific policy process

A major conclusion from the VC policy cases studies is that the profile of such a policy may differ from case to case. In certain contexts, such as the Scottish life sciences cluster, VC policy could be aimed at strengthening pre-emergence conditions rather than immediately aiming at creating a full-fledged VC market. In other cases, including Israel in the 1990s, VC Policy should also be directed to trigger and sustain emergence both of a VC market and of an entrepreneurial cluster. On the other hand, in the UK context it seems that the focus should be mainly on creating capabilities in the entrepreneurial sector and by venture capitalists, given that the pool of PE can easily respond to increase in the returns in early stage investments. Finally, the German case suggests that in some cases cultural changes may be the essence of VC-related policies.

The Scottish case shows that a VC-led profile is not the only possible profile of emergence. It shows that less formal organizational precursors, such as business

angels, may constitute a pre-emergence condition leading to subsequent entry of institutional VCs (Rosiello and Parris, 2009).

Moreover, the evolutionary perspective to VC policy suggests that a policy may also change from phase to phase within a particular country. The effect of the introduction of the first VC scheme in a country can be remarkably different depending on the pre-conditions of the innovation system and risk capital market in the country. For example, while during the implementation of the WFG program, the German environment was not suit for VC activity (Becker & Hellmann, 2003), during the implementation of the third VC scheme the German environment was ready for VC activity. This can help explaining the different impact of both policies.

5. CONCLUSIONS

The motivation for this paper was the differential performance of VC policy across countries, and some differences in the policies adopted. We surveyed VC policies in Israel, Germany, UK, and Scotland. We also surveyed theoretical perspectives on VC policy and discussed the differences between the *traditional* and the *evolutionary perspectives*.

A major focus of the paper was to point out some limitations of the *traditional approach* to VC-policy, including static, narrow, and non-adaptive features; and sole focus on overcoming market failures; via direct investment, financial incentives or institutional change. The traditional approach often implies that those types of policies are sufficient to overcome market failure and will lead to a VC market development. Moreover, the traditional approach would also seem to indicate a VC policy that is somewhat independent of the specific regional context.

Such conclusion does not seem to be empirically acceptable since VC policies have a wide diversity of impacts. This led us to explain the differences between traditional and evolutionary approaches. First, contrary to the evolutionary approach, the traditional approach assumes an abstract definition of a market, a view where a VC market will automatically be created once market failures are overcome. The evolutionary perspective introduced in this paper suggests that, in addition to traditional market failure, there may be *dynamic system failures* blocking the subsequent emergence process of a VC market and associated high-tech cluster.

Our evolutionary perspective suggest few major feature of potential high impact VC policies: i) a strategic objective and a long-term commitment to enhancing VC market and entrepreneurial cluster emergence and development, ii) a phased-policy portfolio, and iii) a dynamic policy process, which is adaptive to the specific regional context and to external changes.

REFERENCES

Abernathy, J. and M. Utterback (1978), 'Patterns of Industrial Innovation', **Technology Review**, June-July: 40-47.

Adelberger, K.E. (1999), "A Developmental German State? Explaining Growth in German Biotechnology and Venture Capital", **BRIE Working Paper** *134.*

Antonelli, C. and M. Teubal (2009), 'Venture Capitalism, New Markets and Innovation-Led Economic Growth', International Center for Economic Research (Torino, Italy), **Working Paper** No. 03/2009

Avnimelech, G. and M. Teubal (2004), 'Venture Capital – Start Up Co-evolution and the Emergence and Development of Israel's New High Tech Cluster', **Economics of Innovation and New Technology,** 13 (1): 33-60.

Avnimelech, G. and M. Teubal (2006), 'Creating VC industries which co-evolve with High Tech: Insights from an Extended Industry Life Cycle (ILC) perspective to the Israeli Experience', **Research Policy**, 35(10): 1477-1498.

Avnimelech, G. and M. Teubal (2008a), 'From Direct Support of Business Sector R&D/Innovation to Targeting Venture Capital/Private Equity: A Catching-Up Innovation And Technology Policy Life Cycle Perspective', **Economics of Innovation and New Technology**, 17(1): 153-172.

Avnimelech, G. and Teubal M., (2008b), 'Evolutionary Targeting', **Journal of Evolutionary Economics**, 18 (2): 151-166.

Bascha, A. and U. Walz (2002), 'Financing Practices in the German Venture Capital Industry: An empirical assessment', **CFS Working Paper**, 2002/08

Baygan, G. and M. Freudenberg (2000), 'The Internationalization of Venture Capital Activity in OECD Countries: Implications for Measurement and Policy', **OECD-STI** Working Paper 2000/7.

Baygan, G. (2003a), 'Venture Capital Policy Review', **OECD-STI** Working Paper 2003/3.

Baygan, G. (2003b), "Venture Capital Policy Review: United Kingdom ", OECD Science, Technology and Industry Working Papers, 2003/1, OECD Publishing.

Baygan, G. (2004), 'Venture Capital: Trends and Policy Recommendations', **OECD-STI** Working Paper 2004.

Becker, R. M. and T.F. Hellmann (2003), 'The Genesis of Venture Capital - Lessons from the German Experience', **CESifo** Working Paper No. 883.

Bottazzi. L., Da Rin M. and T.F. Hellmann (2004), 'The Changing Face of the European Venture Capital Industry: Facts and Analysis', **The Journal of Private Equity** 7 (2): 26-53.

Burgul, O. (2000), "UK Venture Capital and Private Equity as an Asset Class for Institutional Investors", **BVCA Special Report**.

Cowling M., Bates P. Jagger N. and G. Murray (2008), 'Study of the Impact of Enterprise Investment Scheme and Venture Capital Trusts on Company Performance', Research Report **HMRC** No. 44, May 2008.

Da Rin M., Nicodano G. and A. Sembenelli (2006), 'Public policy and the creation of active venture capital markets', **Journal of Public Economics**, 90 (8 - 9): 1699 - 1723.

Don, G. and R. Harrison (2006), 'The Equity Risk Capital Market for Young Companies in Scotland 2000-2004', **Equitas Report**, Belfast.

Fiedler, M. and T. Hellmann (2001), 'Against all odds: the late but rapid development of the German venture capital industry', **The Journal of Private Equity**, Fall 2001, 4(4): 31-45

Florida, R. and M. Kenney (1988): 'Venture Capital, High Technology and Regional Development', **Regional Studies,** 22(1): 33-48.

Franzke, S., Grohs, S. and C. Laux (2003), 'Initial Public Offerings and Venture Capital in Germany", **CFS Working Paper**, 2003/26.

Gilson, R. (2003), 'Engineering a Venture Capital Market: Lessons from the American Experience', **Stanford Law Review** 55 (4): 1067-1104.

Gompers, P. and J. Lerner (2001), 'The Venture Capital Revolution', **Journal of Economic Perspectives**, 15 (2): 145-168.

Gompers, P. and Lerner J. (1999), **The Venture Capital Cycle**, The MIT Press, Cambridge, Massachusetts, London, England.

Kestenbaum, J. and S. Walker (2009), "From funding gaps to thin markets UK Government support for early-stage venture capital", **BVCA Research Report**, September 2009.

Keuschnigg C. and Nielsen S.B. (2003), 'Tax policy, Venture Capital, and Entrepreneurship', **Journal of Public Economics**, 87 (1): 175-203.

Hood N. (2001), 'Public venture capital and economic development: the Scottish experience, , An international Journal of Entrepreneurial Finance, 2 (4) : 313 – 341

Lerner J. (2002), 'When Bureaucrats Meet Entrepreneurs: The Design of Effective Public Venture Capital Programmes', **The Economic Journal**, 112 (477): 73-84.

Martin, R., Berndt, C., Klagge, B., Sunley, P., and S. Herten (2003), 'Regional Venture Capital Policy: UK and Germany Compared', **Anglo-German Foundation for the Study of Industrial Society**, November 2003.

Martin, R., Berndt, C., Klagge, B. and P. Sunley (2005), 'Spatial proximity effects and regional equity gaps in the venture capital market: evidence from Germany and the United Kingdom', **Environment and Planning A**, 37 (7): 1207 – 1231

Mason, C. and R. Harrison (1995), 'Closing the regional equity capital gap: the role of informal venture capital', **Small Business Economics**, 7: 153-172.

Mason, C. and R. Harrison (1997), 'Business angel networks and the development of the informal venture capital market in the U.K.: is there still a role for the public sector?', **Small Business Economics**, 9: 111–123.

Mason, C. and R. Harrison (2000), 'Informal Venture Capital and the Financing of Emergent Growth Businesses', in D. Sexton and H. Landström (eds.), **Handbook of Entrepreneurship**, Oxford: Blackwell Publishers.

Mason, C. and R. Harrison (2003), 'Closing the Regional Equity Gap? A Critique of the Department of Trade and Industry's Regional Venture Capital Funds Initiative' **Regional Studies,** 37 (8): 855-868.

Mason C. (2009), 'Public Policy Support for the Informal Venture Capital in Europe: A Critical Review', **International Small Business Journal**, Vol. 27, No. 5, 536-556.

Metcalfe J.S. (1994), 'Evolutionary Economics and Technology Policy', **The Economic Journal**, 104 (425): 931-944.

Metcalfe, J.S. and L. Georghiou (1998), 'Equilibrium and Evolutionary Foundations of Technology Policy', **STI Review**, 22, 75-100.

Pfirrmann, O., Wupperfeld, U. and J. Lerner (1997). **Venture Capital and New Technology Based Firms. A US-German Comparison**. Heidelberg: Physica Verlag.

Roper S. Love J., Cooke P., and Clifton N. (2006), **The Scottish Innovation System: Actors, Roles and Actions**, Scottish Executive, Edinburgh

Rosiello, A. (2008) 'Examining Scottish Enterprise's Framework for Action in Life Sciences', **International Journal of Biotechnology**, 10 (5): 496-517

Rosiello A., Avnimelech, G. and M. Teubal (2009), 'Towards a Systemic and Evolutionary Framework for Venture Capital Policy', under review by the **Journal of Evolutionary Economics.**

Rosiello A. and Parris S. (2009), 'The Patterns of Venture Capital Investment in the UK Bio-Healthcare Sector: the Role of Proximity, Cumulative Learning and Specialization', **Venture Capital: An International Journal of Entrepreneurial Finance**, 11(3): 185-213.

Scottish Executive (2001) A Science Strategy for Scotland, Scottish Executive, Edinburgh.

Smith, A. (1776), **An Enquiry into the Nature and the causes of the Wealth of Nations**, Clarendon press, 1976. 2v.

Sunley, P., Klagge, B., Berndt, C. and R. Martin (2005) “Venture capital programmes in the UK and Germany: in what sense regional policies?” **Regional Studies**, 39(2): 255-273.

Sweeting, R.C. (1991), 'UK venture capital funds and the funding of new technology-based businesses: process and relationships', **Journal of Management Studies**, 28(6): 602-622.

Vitols, S. and L. Engelhardt (2005), 'National institutions and high tech industries: a varieties of capitalism perspective on the failure of Germany’s Neuer Markt", **SSRN Working paper**, No. 0722.

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