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## The state, venture capital and domestic high-tech start-ups in an late-development economy: Ireland

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**The State, Venture Capital and Domestic High-Tech Start-Ups  
in a Late-Developing Economy: Ireland**

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**UCD SCHOOL OF ECONOMICS  
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# **The State, Venture Capital and Domestic High-Tech Start-Ups in a Late-Developing Economy: Ireland**

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## **Abstract**

Ireland, the “Celtic Tiger” economy of today, had for decades been one of the poorest of the Western European economies. This paper analyses the three-pronged approach of the Irish authorities in promoting successful high-tech start-up firms. An investment climate conducive to the emergence of such firms was first created. Emerging firms were then offered substantial public support in developing their capabilities. Finally, the authorities played a significant role in promoting the emergence of a dynamic venture capital industry. Such interventionist policies would have been highly unlikely to succeed in the absence of strong institutional capacity.

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## Introduction

Attempts to establish venture capital (VC) industries have frequently ended in failure. In line with the advice of the OECD (1996, 1997, 2000), these attempts have entailed *inter alia* the loosening of regulations, reductions in capital gains taxes, the provision of other benefits – including preferred loans and government guarantees to investors – and the provision of low-cost capital to VC funds. Avnimelech, Kenney and Teubal (2005), in surveying the litany of failures, suggest that the problem has been one of conceptualisation, where the absence of VC is seen as a supply-side deficiency – a lack of available funds – rather than as a more deep-rooted condition encompassing also the absence of the demand-side factors necessary to sustain a VC industry. As they point out, “a vibrant VC industry is dependent upon a flow of investment opportunities capable of growing in value quickly enough to provide capital gains justifying the investment risks”.

The same point has been made by a number of other researchers. Florida et al (1990 and 1994) in studying the record on government programs aimed at developing sub-national VC industries in the US note that investments made in regions without the appropriate background conditions are likely to perform poorly, while investment of local funds outside the region entails capital transfer from the target area. Mason and Harrison (2002) critiqued British government proposals to increase the amount of VC available in less well-endowed areas on similar grounds, because of the lack of capability on the part of start-ups in these regions to usefully absorb VC.

These considerations have led Avnimelech and Teubal (2006b) to develop a temporal Innovation and Technology Policy Cycle model, drawn upon the Israeli experience, to explain the emergence of a successful domestic VC industry in a late-developing economy. Briefly stated, the early (or “VC background conditions”) phase refers to the emergence of innovation capabilities and the diffusion of R&D within the economy; an intermediate phase sees the strengthening of business-sector R&D, an increased rate of high-tech start-ups and an increase in the demand for VC, and a later phase – if the process is successful – entails the emergence of a VC sector and an acceleration in the growth of high-tech start-ups alongside substantial IPO and M&A activity.

The present paper adds to the literature on the successful emergence of domestic venture capital in late-developing regions by looking at the experience of Ireland over the years leading up to and including the “Celtic Tiger-era” boom of the 1990s and beyond. Until this time, Ireland had been one of the poorest of the Western European economies, with relative income per head remaining static at around 60 percent of the Western European EU average since 1960. Then, over the course of a decade and a half, Ireland succeeded in catching up to and then surpassing average Western European income per capita. The country had long been successful in attracting foreign direct investment (FDI) but the boom period was associated also with the emergence of a highly successful export-oriented domestically-owned software sector and a vibrant VC industry.

A first research question motivating the present paper concerns how well Ireland fits into the temporal Innovation and Technology Policy model proposed by Avnimelech and Teubal. These authors emphasise that VC emergence in the Israeli case has been *policy-*

*led*, as we will see to have been the case in Ireland also. In this, the Irish and Israeli cases stand in sharp contrast to that of the US, where venture capital originated. Indeed, in discussing the US case, Florida and Smith (1993) argue strongly that “the government should be kept out of venture capital”, emphasising the well-known possibilities of abuse inherent in state investments or subsidies of any kind, the unsuitability of public officials to choose the appropriate investment projects and the incompatibility of public-sector logic and the portfolio-based thinking of venture financiers (who accept that some funds will necessarily end up being allocated to companies that fail).

A second research question then asks: under what conditions can the state play a productive role in stimulating venture capital and High-Tech Start-Ups in late-developing economies? While our answer to the first research question can be seen as both providing description and offering a further test of the evolutionary propositions advanced by Avnimelech and Teubal (2006b), our discussion of this second question brings us to another theoretical literature to which our contribution might be seen as more substantial. It is widely recognised that, in theory, the state can play an efficiency-enhancing role in these areas, given that the social returns to research and development, for example, typically exceed the private returns (Jones and Williams, 1998) and that informational asymmetries, which may be counteracted by the signalling effect of public funding, might preclude access to external capital for new small firms (Stiglitz and Weiss, 1981). As against this – as emphasised by Florida and Smith (1993) – state intervention frequently gives rise to problems of rent seeking, crowding out and mismatched incentives. In the language of Krueger (1990), the desire to address ‘market failures’ must be balanced against the risk of ‘government failures’.

Informational asymmetries and other market failures are generally thought to be more pervasive in less developed economies than in more advanced ones, where private institutions – such as VC in the US – have evolved to surmount them. Our hypothesis is that both Ireland and Israel have been characterised by strong institutional capacity relative to their state of development, so that the possibility of effective state intervention being stymied by government failures is likely to have been lower than in other late-developing economies.<sup>1</sup> Our brief review of the state of the VC sector in India offers some corroboration of this position.

The paper is structured as follows. Section 2 discusses the evolutionary perspective on high-tech clustering and contains a brief presentation of the Innovation and Technology Policy model that has been developed to help explain the success of the Israeli VC sector. Sections 3 and 4 respectively chart the evolution of a domestically-owned computer software cluster in Ireland and the emergence of venture capital financing in that case. Section 5 presents data on institutional capacity in the Irish, Israeli and Indian cases and discusses how it might affect the likelihood of successful state intervention in the VC and

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<sup>1</sup> This perspective is consistent with the work of Evans and Rauch (1999), who develop a 14-point scale measuring the extent to which public-sector bureaucracies conform to best-practice principles. In an application to a sample of 35 developing countries for the 1970-1990 period, they show that a country’s ranking on this scale significantly enhances prospects for economic growth, even when initial levels of GDP per capita and human capital are controlled for.

high-tech start up spheres. Our concluding comments summarise and assess the implications of our analysis for other late developing and emerging regions.

## **2. The Evolutionary Perspective on VC Emergence**

Avnimelech, Kenney and Teubal (2006) provide a detailed account of the emergence of VC financing in the US and Israel. The US is of course the birthplace of venture capital. By the late 1970s the industry had consolidated to become a part of the US national innovation system; the flow of pension fund monies into Silicon Valley VC funds had freed the region from dependence on New York and Chicago investors, and, shortly thereafter, the exit process for VC-funded firms on the NASDAQ had been routinised and VC and high-tech start ups had co-evolved to become self-reinforcing. Indeed, Kenney (2004) characterises the Silicon Valley model as an “ecosystem” comprising two intertwined but analytically separable economies. The first is of a conventional nature, consisting of established firms, universities, research laboratories etc.; the second, however, which sets Silicon Valley apart from most other industrial clusters, consists of the institutional infrastructure that has evolved – with venture capital at its core – to enable the creation and growth of new start up firms.

High quality startups are known to be crucial in innovative industries because of the limitations of incumbent companies in undertaking major or radical innovations. Path dependence arises when one considers the source of start ups, many of which – in both the US and Israel – are spun off from incumbent high-tech companies, which also represent an important source of founders and managers of new VC firms.

Israel represents a particularly valuable case study for present purposes because its VC industry was established more recently and more deliberately than that of the US. Crucially, in Israel, unlike in the US, government policy was critical for the emergence of VC. VC was again rooted however in a pre-existing high technology sector that had emerged through the sharp increases in military R&D spending and investment following the Six Day war, significant investment by foreign multinationals in R&D laboratories in the country and a consciously orchestrated process to expand R&D and innovation in the business sector, following the establishment of the Office of the Chief Scientist (OCS) at the Ministry of Industry and Trade in 1969.

The 1992 Inbal programme represented the first significant government effort to create a VC industry in Israel. It was hidebound by bureaucratic oversight procedures, however, and, though the programme insured against downside risk, the funds were nevertheless exposed to the vagaries of the stock market. The Yozma Program that began operations in 1993 proved to be far more successful. Yozma was a \$100 million government-owned VC fund with two functions: the first to operate as a fund of funds. \$80 million was invested in ten private VC funds, which had to be matched by a total of \$120 million in private funding from “significant foreign partners”. The second function saw \$20 million retained in the government-owned Yozma Venture Fund to be invested directly in early stage activities. This represented the backbone of an industry that invested in excess of \$1 billion in Israel in 2001.

The experience of both the US and Israel suggests that a certain level of high-tech activity and sophistication, a continued stream of new technological and business opportunities and the creation of a critical mass of start ups are required as preconditions for the emergence of a successful VC sector. Furthermore, Avnimelech and Teubal (2006a) argue that, in Israel at least, the background conditions could probably not by themselves have triggered the supply of VC without the assistance of a programme like Yozma because of market or system failures including the lack of pre-established VC/SU reputations and critical mass to enable the establishment of partnerships with foreign VCs, and coordination problems between startups, VC organisations and risk capital. Having succeeded in getting the VC sector up and running, by the late 1990s government support had become much less significant and the authorities were able to take a back seat in the process.

The generic Innovation and Technology Policy (ITP) Cycle model advanced by Avnimelech and Teubal (2006b) draws on this Israeli experience to outline a medium to long-term policy effort to stimulate innovation and innovation-intensive clusters in industrialising economies.<sup>2</sup> Their perspective suggests that the successful emergence of Silicon Valley-type high tech clusters is driven by the co-evolution of venture capital and high-tech start ups.

The early phase they identify refers to the emergence of innovation capabilities and the diffusion of R&D within the economy, and entails direct government support to Business Sector R&D and innovative SMEs or Start Ups. A later phase – if the process is successful – sees VC emerge through the implementation of targeted VC policies alongside an acceleration in the growth of high-tech start-ups and IPO and M&A activity.

The model is generic in that it allows for different variants reflecting different country contexts, although it emphasises throughout the importance of direct business-sector support, at least in the early stages.<sup>3</sup> Possible country variants can include differences in programs in support of scientific research, university training etc; horizontal versus targeted programs; the function or functions being supported (e.g. whether technology transfer, learning or R&D), and the instrument applied (e.g. whether subsidies, loans, tax benefits, etc). The next two sections show that the Irish temporal experience rather closely mirrors that of Israel.

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<sup>2</sup> Avnimelech and Teubal (2006a) present a lengthy discussion of the methodological issues that arise in this type of research. They describe their approach as being based on *grounded theory*, one of the main purposes of which is to transform tacit knowledge into codified knowledge and which is appropriate to newly emerging research areas (Partington, 2000).

<sup>3</sup> Direct measures in support of innovation and innovative SMEs contrast with indirect measures such as promotion of institutions supporting the business sector (such as universities, technology centres and government laboratories) and promotion of VC itself.

### **3. Stimulating the Demand for Venture Capital in Ireland through Support for Domestic High-Tech Start-Ups**

Table 1 shows foreign-firm employment in Ireland as a share of total employment in each of the country's high-tech sectors. It will be immediately apparent that only in computer software do domestic firms comprise a substantial share of the total. This indicates that entry barriers are of greater importance in the manufacturing sectors, as is suggested also by the evidence cited by Oahey (1995).

**Table 1 here**

The availability of venture capital and the general investment climate prevailing can, however, represent substantial entry barriers for software firms. Tackling these issues as they impact on indigenous firms is one of the tasks of the state agency Enterprise Ireland. The present section of the paper focuses primarily on the emergence of the domestic software sector since, as illustrated in Table 2, Irish venture capital investments were aimed predominantly at this sector, in contrast to the situation prevailing in the US and the rest of Europe.

**Table 2 here**

It might be noted that domestic Irish software firms do not comprise a particularly high proportion of employment by average Western European standards (Barry and Curran, 2004). The highest proportions are recorded by countries such as Sweden, Denmark, Finland, the Netherlands and the UK. These are all countries with high computer penetration rates and other 'information society' attributes, however, pointing to the fact that many computer services are essentially non-tradable internationally. It is the export-intensity of the domestic Irish sector that causes it to stand out from the rest of Europe and that has attracted the attention of software-research specialists such as Arora et al. (2003, 2005) and others. While UK software and computer services companies are found to obtain only around one-third of their revenues from exports, and French and German companies from 25 to 30 per cent, exports accounted for 85 per cent of the revenues of Irish indigenous firms in 2002 (up from 41 per cent in 1991).

The sector grew particularly rapidly in the second half of the 1990s, with per-annum employment growth of 24 percent per annum, revenue growth of 30 percent and export growth of 37 percent (Crone, 2006).

#### *Emergence of an indigenous software sector in Ireland*

Employment in both the foreign and domestic components of the Irish software sector took off only in the 1990s and the two components have largely tracked each other since then, as seen in Figure 1.



## Figure 1 here

Domestic and foreign firms are in quite different segments of the software market however. Around half of foreign software employment in Ireland is engaged in MLD (manufacturing, localisation and distribution) activities for global software giants such as Microsoft, Lotus, Oracle, Symantec, Informix and Corel, and much of the remainder is associated with non-software electronics corporations such as Motorola and Ericsson.<sup>4</sup> About half of Irish domestic firms, on the other hand, are engaged in the development and sale of niche products in sectors such as Banking and Finance, Telecommunications and Computer/internet based training.

Both components were stimulated however by state actions to improve the investment climate with respect to telecommunications and education. These actions were largely driven by the focus of the country on enhancing its attractiveness to FDI, though not specifically with the software sector in mind.<sup>5</sup>

MacSharry and White (2000), for example, – the former an erstwhile Finance Minister in the Irish government and the latter a long-term Managing Director of the IDA – describe how the latter body acted as a channel of communication to government in conveying the concerns of its foreign manufacturing-sector client companies over the poor state of the telecommunications system in the 1970s. This led to control of the system being wrested from the hands of the relevant moribund government department. The telephone service was commercialised and one of the most advanced digital-based networks in Europe put in place shortly thereafter (Burnham, 1998). The timing of this was fortuitous as the country would not have been able to attract the newly-offshoring elements of IT-enabled services if these infrastructural investments had not been made.<sup>6</sup>

A similar conclusion arises with respect to the expansion in tertiary science-based education that occurred over this period. A Manpower Consultative Committee had been established in 1978 to provide a forum for dialogue between the IDA and the third-level education system. The state agency, concerned by the looming disparity between electronics graduate outflows and its own demand projections, convinced the government to fund a massive expansion in educational capacity in these areas. The output of engineering graduates, as a result, increased by 40 percent between 1978 and 1983, while the output from computer science increased tenfold over this same period. Ireland has since then exhibited one of the highest proportions of science and engineering graduates in the 20-34 age range in the world (Barry, 2006a).

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<sup>4</sup> The final segment consists of branches of major computing-services or IT consulting companies such as EDS, IBM, ICL and Accenture.

<sup>5</sup> The fact that the state's development agencies retained a strong focus on global marketplace trends, however, increased the probability that even unanticipated outcomes would have been beneficial rather than detrimental.

<sup>6</sup> Ireland continues to offer the lowest cost in Europe for inbound international toll-free services, when discounts for volume use are taken into account, and offers a further comprehensive range of business telephony services; Fahy et al. (2002).

These infrastructural and educational expansions in turn spawned a substantial number of domestic high-tech start ups. Several of the most important domestic software entrepreneurs for example emerged through involvement with the massive telecommunications development programme referred to above, while the improved infrastructure itself also of course enhanced the environment in which Irish entrepreneurs operated. Many of the most innovative Irish software companies, furthermore, were spun off from the expanded university computer-science and engineering departments.<sup>7</sup>

There were some spillovers also of course from the substantial foreign MNC presence in the economy. These arose through the role that MNCs played as a source of sophisticated early-stage demand, as documented by O'Malley and O'Gorman (2001). This channel had been identified by Porter (1990) as of possible importance for developing economies. As Blomstrom and Kokko (1998) point out, suppliers are frequently reluctant to adopt innovations because of uncertainties as to the trade-off between costs and benefits, and early-stage demand by MNCs can resolve many of these uncertainties. MNCs in Ireland also acted as incubators in supplying future entrepreneurs with some of the managerial and sectoral experience necessary for future success.

### *Industry Support in Ireland: Overview*

What role did the state agency Enterprise Ireland play in response to the emergence of these high-tech start ups? Before addressing this question, some background details on Irish state support to industry more generally are provided.

In the mid to late 1990s, Irish state financial support to industry, in terms of euro per person employed, was some 15 percent above the Western EU average, as seen in Table 3.<sup>8</sup>

### **Table 3 here**

Traditionally, Irish support had been offered in the form of capital and employment grants. More recently, however, Enterprise Ireland has switched its focus from 'capacity' support for employment creation and fixed asset investment to 'capability' support in areas such as human resource development, R&D, marketing and market development. In line with the recommendations of the Industrial Policy Review Group (1992, p.12) that the agency should shift from grants to equity "to meet gaps in financial markets for venture capital and seed capital", it has progressively increased the proportion of support provided through equity (in the form of both ordinary shareholdings and preference

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<sup>7</sup> On the various routes through which indigenous software entrepreneurs came to the surface see Sterne (2004), Ó Riain (2004) and Sands (2005).

<sup>8</sup> The EU has gradually tightened restrictions on member-state aids to industry and has forced it to become more horizontal in nature, focusing for example on activities such as R&D and training.

shares).<sup>9</sup> Equity participation increased from 5 percent of total financial supports in 1989 to 28 percent in 1998 (Forfás, 2000, Table 5.2).<sup>10</sup>

The shift of emphasis towards capability development has required firms to reach agreement with the state agency on an integrated development plan before aid will be forthcoming. While this may sound somewhat draconian, it has the effect of forcing emerging firms to assess as objectively as possible their own strengths and weaknesses, and the agency and firm will then customise a support package that may include helping companies to monitor markets and exploit new market opportunities, encouraging process and operations improvement and the development of better products and services through improved access to appropriate research, and the promotion of increased management and employee training levels.

The agency is particularly supportive of what it defines as high-potential business start-ups (HPSU). These are export-oriented firms that, in the case of international services, are located in a product market that has grown by at least 20 percent in the previous year; are based on technological innovation or the exploitation of a rapidly developing market niche; are founded and promoted by experienced managers, entrepreneurs, academics or highly skilled technical graduates, either from within Ireland or returning from abroad; are deemed to have the potential to grow within two years to have annual sales of EUR1.3 million and employ 10 or more people; and who show clear evidence of being able to continue to grow substantially and of being in a position to fund such growth.

The agency works intensively with such firms to ensure access to the best external management advice; it helps them to attract expertise to their boards – e.g., through appointment of experienced non-executive directors – and to build an appropriate management team; it provides support for in-company training and for product and process development through direct support for in-company R&D and through establishing technology innovation networks, and it helps them develop contacts with private-sector financiers and, where necessary, offers direct financial support (Forfás, 2000).

The firm-assessment process operates to quite rigorous standards. To be deemed eligible for funding (though with no automatic entitlement), projects seeking support must first successfully pass a formal cost-benefit analysis. Qualitative and other factors that are difficult to quantify are then taken into account in a Quality Ranking Matrix which

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<sup>9</sup> The Review Group was one of the periodic external assessments of the development agencies alluded to earlier in the paper. It recommended that the agency should become much more an "aggressive venture capitalist" and should be prepared to take stakes of up to even 50-60 percent (IPRG, p.72).

<sup>10</sup> Preference shares with a low coupon rate are used to provide a form of long term finance at low cost to SMEs that are unable to raise development finance from the market on similar terms. Evidence on the significant returns earned by Enterprise Ireland from dividend income, the redemption of preference shares and the sale of ordinary shareholdings in client companies is provided in Forfás (2000, Table 5.3). Taking account of the improving success rate and the growing option value of conversion rights, revisions to the cost-benefit model used by the agency reduced the grant-equivalent of a €1 equity injection from the €0.66 level used since 1996 to €0.50 (Murphy, Walsh and Barry, 2003).

focuses in particular on projects from well-managed innovating companies in high-growth, high-productivity export-oriented sectors.<sup>11</sup>

Ó Riain (2004, pps. 98-105) provides details of the hands-on approach that has operated in the case of the indigenous software sector, suggesting that mentoring programmes that pair small companies with experienced industry figures and the Enterprise Development Programme that provides one-on-one support and advice in terms of business plan development have been of particular importance. Indeed, according to Walsh (1985), the latter had been instituted in 1978 partly in response to the lack of venture capital finance available at that time. The state has also provided a substantial proportion of the R&D funding for indigenous software companies and, in the 1990s and beyond – as discussed in the next section – of venture capital funding as well.<sup>12</sup>

Bearing this in mind, Crone (2004) notes that the significant number of indigenous software companies that have attracted VC funding suggests that the Irish sector can be viewed as following the ‘Silicon Valley’ model of high-tech development.<sup>13</sup> Seven such firms were floated on international stock markets including the NASDAQ in the mid-to-late 1990s.

#### **4. The State and the Supply of Venture Capital in Ireland**

Throughout the 1970s and 1980s, the Irish venture capital market was of negligible size. Although the representative and promotional body for the sector – the Irish Venture Capital Association – was established in 1985, it reported only 3 registered members at the end of the 1980s. These were Allied Combined Trust, established in 1972 with Allied Irish Investment Bank as major shareholder, the Industrial Credit Company (ICC Bank), established by the government to encourage investment in industry, and the Dublin Business Innovation Centre, established in 1987 with private, public and EU support.

In 1984, the government introduced a special tax incentive programme – the Business Expansion Scheme (BES) – to encourage long-term equity capital investments in new and small companies operating in particular sectors of the economy that "would otherwise find it difficult to raise such funding and would instead have to rely on expensive loan finance". EVCA data are available only from 1984 so it is not possible to

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<sup>11</sup> The focus of the development agencies on export development has been criticised in some quarters as overly mercantilist (see e.g. O’Rourke, 1994). It has been pointed out in defence however that non-traded-sector firms are likely to be competing largely with each other, which would put the state in a vulnerable position were it to support some and not others. In the case of software, the strong focus of the relevant agency has always been on software-product firms, which tend to be much more export-oriented than software services.

<sup>12</sup> State expenditure on capacity and capability support is a multiple of state investments in the privately-managed VC funds discussed in the next section.

<sup>13</sup> He identifies and tracks a groups of domestic software firms founded since the beginning of 1996 and in receipt of venture capital funding. Half of these firms had 50 or more employees, while mean employment for the sector was less than 10. For the sector overall, the 7 percent of firms with 50 or more employees accounted for almost 60 percent of the sector’s revenues and were more productive (in terms of mean revenue per employee) and more export oriented than smaller firms (Crone, 2002).

evaluate the changes induced by the introduction of the BES. It is noteworthy however that in 1985 the share of private individuals in the accumulated amount available for venture capital funds was almost 25 percent. The scheme was initially planned to run for 3 years but has since been regularly renewed, with amendments introduced in 1989, 1991 and subsequent years to ensure that the BES concentrates on the support of smaller and riskier projects. A further programme, the Seed Capital Scheme (SCS), was introduced in 1993 to encourage individuals to establish new business ventures.

The real breakthrough in Irish VC took place in 1994 when Enterprise Ireland established a five-year plan – the Seed and Venture Capital Measure (1994-1999) – co-financed by EU regional aid. The programme was targeted at establishing venture/seed capital funds. Financing was provided on condition that a minimum of 50 percent of the capital would be privately funded. The EU and national funding amounted to a total of €44 million and this was matched at the beginning by €40 million in private investments. Returns were fed back into further investments. Although at the inception there were difficulties in getting the private sector involved, ultimately a sum of €119 billion had been invested in 130 companies by the 15 operational funds by 2003 (Enterprise Ireland, 2003). Crucially, from a governance point of view, these VC funds are run on a purely commercial basis, with investment decisions taken solely by private-sector VC fund managers.

In 2001, the Seed and Venture Capital Fund Scheme was recommenced under the National Development Plan 2001-2006 with funds amounting to €95 million. The objective of the programme was to leverage €400 million in private funding. This had already been achieved by 2002, and by 2004 the 15 funds (with about €500 million in capital raised) established under the programme had made investments in 75 companies totalling €133 million (Enterprise Ireland, 2005).

A further important event dating to 1994 was the suggestion by government that pension funds "should support the venture capital industry by becoming a recognized form of finance for entrepreneurial companies". This suggestion has its roots in a report commissioned by the Irish Association of Pension Funds (IAPF), the Irish Insurance Federation and the Department of Finance, at the request of the Minister of Finance. The report found that pension-fund investments in the domestic market were negligible in comparison with the situation elsewhere, particularly in the US and the UK.

Initially, the government considered implementing legislation that would have required pension funds to make certain commitments to venture capital. Instead, the method chosen involved the issuing of guidelines, with the IAPF encouraging its members to invest part of their assets in Irish venture capital projects managed by professionals. The guidelines suggested that the pension funds should place 0.08 percent of their assets annually into venture capital funds over the next five years. The application of these guidelines resulted in spectacular growth in the funds available for investment (Figure 2), while the contribution of pension funds and others is as illustrated in Figure 3.

### **Figures 2 and 3 here**

Table 4 shows these data in comparative context, emphasising the importance of the state agencies as venture capital fund investors in Ireland. Government involvement was also of importance in the overall EU15, though less so than in Ireland, while in the US the government plays no role as a venture capital investor.

### **Table 4 here**

There are several approaches to measuring the size of the venture-capital sector in a particular country. One is the "country of management" approach, which focuses on VC funds managed within the country. The alternative prism through which the data can be observed is described in the EVCA statistics as the "country of origin" approach (in the case of funds raised) and the "country of destination" approach (in the case of investments).<sup>14</sup>

We begin with the "country of management" approach. It should be noted firstly, with respect to this approach, that the funds managed in a particular country can be raised from both domestic and non-domestic investors. In Ireland at the beginning of the 1990s, almost all funds raised came from domestic sources. This changed towards the end of the 1990s (Figure 4), in line with the general European trend shown in Figure 5, which displayed an increased internationalisation of funding sources. A large proportion of the Irish funds are known to have come from US sources.

### **Figures 4 and 5 here**

Figure 6 shows the relative size of the sector in the US, Ireland and other Western European countries across groups of years, where in line with Irish convention we use GNP rather than GDP as the national income denominator for the country, in order to exclude the vast profits that foreign MNCs record in Ireland.<sup>15</sup> While the US has a far more sizeable sector than Europe, Ireland matches the Western European average across the periods.

### **Figure 6 here**

While the bulk of Irish-managed VC funds are directed towards domestic industry, as is the case in the rest of Europe as well, Ireland is also a major investment location for VC funds managed from abroad. Hence Figure 6 downplays the extent of Ireland's achievement as a late developing economy. Figure 7 compares the "country of

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<sup>14</sup> The EVCA statistics do not record funds raised by domestic investors which go to non-European countries. The same is true of investments in Europe made by VCs from outside Europe. The latter is especially important for Ireland, as anecdotally Irish software companies seek financing from American VCs especially when expanding their activity to the American market (see e.g. Gaither, 2002).

<sup>15</sup> In none of the other countries shown is there a substantial difference between the two measures; in Ireland the gap between the two is more than 20 percent of GNP.

management" and "country of origin" data for funds raised, and "country of management" with "country of destination" data for investments in Ireland. It shows that Irish industry received significant inflows of funds from other European countries. In the years 1999 and 2002, amounts raised from foreign investors were even larger than those raised from domestic investors. Irish investors' contributions to foreign private equity funds, on the other hand, are negligible.

**Figure 7 here**

Figure 8 illustrates the relative importance of international flows in the Irish cases.<sup>16</sup> In the period 1999-2003, Ireland recorded the largest average net flows of all European countries on both the funds raised and funds invested sides of the market. The figures of more than 100 percent indicate that on average funds coming to domestic venture capitalists from foreign investors are as important in Ireland as funds raised within the country. Likewise, they show that foreign venture capitalists invest as much or more than domestic ones in Irish companies.

**Figure 8 here**

Irish companies themselves are not biased against foreign investors. FitzGerald (2002) points out that "overseas founders are often considered attractive to Irish companies due to their established far-reaching networks and international presence which bring added value with their investments".<sup>17</sup>

## **5. Institutional Capacity and the Likelihood of Successful Intervention**

Institutional capacity has been defined in general terms as "the ability to perform functions, solve problems and set and achieve objectives" (Fukuda-Parr et al., 2002). For present purposes it may be useful to think of it as a feature of the political/institutional system that increases the likelihood that growth-enhancing rather than growth-inhibiting policies will be adopted and implemented. Strong institutional capacity in this sense reduces the scope for government failures and thereby allows for more effective tackling of market failures. The Israeli and Irish experiences will be much more difficult if not impossible to replicate elsewhere if attempts to tackle market failures are hampered by government failures. It is illustrative in this regard to compare institutional capacity and the evolution of venture capital in Ireland, Israel and India, each of which has a dynamic software sector that has attracted much international attention.

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<sup>16</sup> As the data comparing the country of management, country of origin, and country of destination approaches are limited in respect to non-European countries, only flows to and from European countries are shown.

<sup>17</sup> On the other hand, some practitioners maintain that when foreign venture capitalists invest in the Irish market, they would usually do so "thorough" Ireland's domestic venture capitalists (funds of funds) or simply by co-investing (syndication) with Irish venture capitalists. If they invest directly, in turn, it would be in companies with some "track record", financing later stage transactions (post first- or even post second-round financing) and frequently only when domestic VC is already in place. Unfortunately, however, EVCA data do not specify the stages of transactions in which non-domestic PE houses are involved.

The governance indicators of Kaufmann, Kraay and Mastruzzi (2003) provide one measure of the strength of institutional capacity across economies.<sup>18</sup> These indicators lie between -2.5 and 2.5, with higher scores corresponding to better outcomes. Here, as seen in Table 5, Ireland and Israel are ranked well above India. Our hypothesis is that the interventionist policies towards high-tech start ups and venture capital observed in the Irish and Israeli cases will have far less successful outcomes if countries or regions that rank poorly on these indicators attempt to implement them. Either interventionist strategies are eschewed in these economies or growth will be hindered.

### Table 5

One of the key indicators of institutional capacity is a low level of corruption. It will be clear for example that government intervention is more likely to be counter-productive if the political and public-administration arenas exhibit high levels of corruption. The best-known corruption perceptions index is that published by Transparency International, which polls mainly managers of multinational companies, staff of international accounting firms and financial journalists. Here Ireland has maintained a consistently high ranking. In the most recent (2006) poll, Ireland was ranked 18th (least corrupt) out of 163 countries, Israel joint 34<sup>th</sup> alongside Taiwan, and India 70th.<sup>19</sup>

A similar hierarchy emerges from the World Bank's "Ease of Doing Business" indicators, in which Ireland is ranked 10th out of 175 countries, Israel 25<sup>th</sup> and India 134<sup>th</sup>.<sup>20</sup> A poor ranking here is indicative of substantial red tape encountered in establishing, running and liquidating new ventures – the latter being of particular importance in the present context since the venture capital process is complete only when the company is sold or wound up. For this reason, Dossani and Kenney (2002) warn that "countries that erect impediments to any of the exit paths (including bankruptcy) are choosing to handicap the development of the institution of venture capital". Significant red tape can also serve as a further indicator of corruption, since, as Tanzi (1998) suggests, corruption can thrive when regulations are complex and non-transparent.

One further set of indicators come from the *World Competitiveness Yearbook* compiled by the International Institute for Management Development. Relevant indicators include the extent to which government policy is deemed to be transparent and the public service deemed to be independent of political interference. As Table 6 shows, of the 60 countries for which 2005 data are displayed, Ireland again comes out ahead of Israel, which in turn dominates India.<sup>21</sup>

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<sup>18</sup> For an analysis of the causality running from governance to growth, see Kaufmann and Kraay (2002).

<sup>19</sup> It is important to note that allegations of suspected corruption in Ireland in recent times have all been directed towards politicians and local-authority officials rather than civil servants and employees of the state development agencies.

<sup>20</sup> <http://www.doingbusiness.org/EconomyRankings/>

<sup>21</sup> Lall (2001) argues that the philosophies underlying the World Economic Forum's *Global Competitiveness Report* and, to an even greater extent, IMD's *World Competitiveness Yearbook* are biased against government intervention. For example, "proactive measures to strengthen capabilities and promote the exploitation of externalities or overcome the costs and coordination problems of learning are not



## Table 6

Our emphasis here on the importance of institutional capacity is reflected in Dossani and Kenney's (2002) recent exploration of VC and the environment for VC in India. The critical precondition of a thriving software services sector has been achieved but bureaucratic control of the economy remains tight and, as seen above, the bureaucracy maintains its reputation for corruption. "Such an environment", they point out, "would be considered hostile to the development of an institution dependent upon a stable, transparent institutional environment".

They analyse the evolution of VC in India in three phases: 1986-95, 1995-99 and the more recent period. In the first phase, VC operations were "highly constrained and bureaucratically controlled" – the conditions under which, based on the US experience, VC was least likely to succeed. This forced the World Bank, in part funding the project, to engage in substantial supervision, which raised the transactions costs involved. They chart a further array of missteps in the second period, including regulation by multiple agencies, restrictions on the industries in which VC could be invested, government micromanagement of investments, restrictions on investments abroad (which make it more difficult to exploit synergies and spread risk), difficulties in terminating funds and restrictions on the use of stock options. Even today, they conclude, India remains a difficult environment for venture capital because of over-regulation and excessive bureaucracy.

The strength of institutional capacity in Ireland and Israel has helped these countries to adopt more appropriate policies towards newly emerging and dynamic sectors and to implement them more effectively.

The main element of the public-sector bureaucracy with which we are concerned in the Irish case is the Industrial Development Authority (IDA)/Enterprise Ireland. The IDA has been a key state body in Ireland for many decades. In 1994 it was split into several separate bodies, with the new stand-alone body IDA-Ireland tasked with attracting foreign industry to the country, and Enterprise Ireland allocated the task of promoting the development of domestic industry.<sup>22</sup> The broad family of industrial promotion agencies in Ireland is widely cited internationally, along with Singapore's Economic Development Board, as an example of best-practice in the field.<sup>23</sup>

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considered". This does not preclude us from using these indicators to determine the contexts in which intervention is more or less likely to be counterproductive.

<sup>22</sup> The terminology here is slightly confusing. The title IDA-Ireland, which was applied to one of the component parts of the original Industrial Development Authority, refers to the Industrial Development Agency. While the precursor of Enterprise Ireland was also established in 1994 it took its present name after amalgamation with a number of other bodies only in 1998. The present discussion refers to the broad family of development agencies; i.e. to what had formerly been the Industrial Development Authority.

<sup>23</sup> See e.g. Loewendahl (2001), Wells and Wint (2000) and Morisset and Andrews-Johnson (2004). The strongest evidence of this is that the IDA is frequently commissioned to assist developing countries in establishing their own industrial promotion agencies. See Clark (1997) and Wells and Wint (2000), for

One reason for this is the embedded process of external review to which the agencies are subject. One such review conducted in the 1960s led to the IDA being granted autonomy from the civil service. This allowed it recruit employees with industry and international interests and experience, helped insulate it from political pressures, arguably facilitated its functioning as a repository of requisite organizational learning (by being able to retain key staff for longer than the typical civil service department) and allowed it build on its successes to achieve a highly influential position within the public sector hierarchy. Other external reviews in 1982 and 1992 saw further substantive changes adopted.

Another aspect of the IDA's "embedded autonomy" (Evans, 1995) is what business analysts refer to as its transnational strategic network, consisting of its broad range of overseas offices and of the close relationship it maintains with investors already in Ireland. Both components provide it with information about global trends in the sectors in which it is interested and about newly emerging sectors and trends that warrant its attention. The degree of "clout" it has accumulated over time within the Irish public administration system ensures that legislation that it perceives to be necessary to exploit new trends can be introduced and passed expeditiously.

An example of this can be drawn from the history of the development of Ireland's International Financial Services sector, with regard to the UCITS Directive of 1985. UCITS (Undertakings for Collective Investment in Transferable Securities) are collective investment portfolios dedicated to the investment of assets raised from investors. UCITS were to benefit from a 'single passport' allowing them, subject to notification, to be offered to retail investors in any EU jurisdiction once authorized in one Member State. Ireland was the second country after Luxembourg to implement the Directive in 1989. In addition, the Irish government decided that VAT and inheritance taxes, which in principle apply to some activities of investment funds, should be forgone. Also a new Unit Trust Act of 1990 and the new Companies Act of 1990 were designed in a way to facilitate the development of investment funds. As a result Ireland witnessed spectacular growth in the international investment funds industry.

Similarly, the Irish authorities have been commended on establishing a fiscal and legal framework that has been conducive to the development of venture capital. The 2003 report of the European Venture Capital Association published an evaluation of the extent to which member countries maintained an environment which was favourable both for the demand side (venture capital investors) and the supply side (entrepreneurs) of the industry. On a scale running from 1 (most favourable) to 3 (least favourable), the average composite score for the Western European EU (the EU15) was 2.04. Ireland achieved a score of 1.58, placing it second after the UK, which scored 1.2.<sup>24</sup> The report

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example, on the contribution of the IDA to the development of Costa Rica's successful investment promotion programme CINDE.

<sup>24</sup> The report was critical of some aspects of the Irish environment, such as merger regulation (with notification mandatory in every case and deals having to be suspended until a decision is issued by the relevant authority), the high capital gains tax prevailing at the time, and the application of stock option taxation upon exercise rather than upon sale of the underlying securities.

highlighted as beneficial aspects of the Irish environment: (i) overall tax policy, with a low corporate tax rate and tax incentives for private individuals – including the Business Expansion and Seed Capital schemes discussed later in the paper – as well as R&D incentives; (ii) the most favourable entrepreneurial environment in the EU, with the lowest time, cost and capital requirements for setting up private or public limited companies; (iii) the lack of restriction on pension funds investments in private equity; and (iv) the availability and optimal regulation of limited partnership funds which provide a suitable legal structure for venture capital funds.<sup>25</sup>

## Conclusions

This paper has analysed the role of the state in promoting high-tech start up firms in Ireland. The Irish authorities have been active both in promoting the types of firms for which venture capital is important and in ensuring that an adequate supply of VC funding is available. On the VC demand-side, we have documented the widely-recognised dynamism of the indigenous export-oriented software sector. We have pointed to the origins of the sector in the programmes adopted to increase the supply of social overhead capital in the fields of telecommunications and education, and through interactions with the broad range of foreign manufacturing and services companies attracted to Ireland as part of the country's long-standing FDI-oriented development strategy. We have provided details also of the range of support services offered to indigenous high-potential start-up firms.

On the VC supply-side, we have charted the role of the authorities in kick-starting venture capital provision in Ireland in the mid-1990s. One way this was achieved was by convincing pension funds to support the industry from 1994 onwards. The major growth in investments from 1996 however coincided with the direct provision of VC funds by Enterprise Ireland. This triggered further private-sector flows and indeed was offered only on condition that a minimum of 50 percent of the capital in the newly established VC funds would come from the private sector. Only later, in the late 1990s, did the substantial inflows from foreign VC funds begin. As noted by Michael Murphy, chairman of the Irish Venture Capital Association: "Enterprise Ireland acted as a catalyst; it helped draw in matching funds faster and accelerated the on-going development of the market".<sup>26</sup>

In all these respects the Irish experience bears similarities to that of Israel, which is the most intensively-studied VC industry apart from that of the US. The role played by the state agency Enterprise Ireland in driving the VC sector forward bears a particularly strong resemblance to the successful Yozma programme in Israel, variants of which are now being instituted in a number of other countries, though not always within the context

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<sup>25</sup> The suitability of this as a vehicle for venture capital activities had already been demonstrated in the US market. It allows investors to obtain double taxation relief as it is taxed on the level of partners only. In practical terms the funds organised in this form are treated as if they are direct investments in the underlying companies.

<sup>26</sup> Quoted by Cowley (2003).

of the model considered here, which has emphasised the necessary pre-emergence conditions.

The present paper goes further than most of the literature on the Israeli VC sector, however, in emphasising a further precondition for the successful implementation of interventionist programmes directed towards VC and high-tech start ups. We are referring here to the need for strong institutional capacity to ensure that the attempt to rectify market failures will not be stymied by government failures. We have seen that, by most measures, Ireland and Israel exhibit stronger institutional capacity than does India for example. Hence it is likely to be more difficult to create a vibrant VC sector in India through state intervention than has been the case in the other two economies discussed. As Dossani and Kenney (2002) suggest, it may be more productive for the Indian government to concentrate on making the environment more conducive to VC – by addressing the remaining problematic tax, regulatory/legal and currency exchange issues – than to intervene more directly through public financial institutions. In societies characterised by weaker institutional capacity, the kind of support offered to high-tech start ups in the Irish case would be likely to be ineffective or even counter-productive because of the rent-seeking to which it might be expected to give rise.

## References

- Arora, A., A. Gambardella and S. Torrisi (2003) "In the Footsteps of Silicon Valley? Indian and Irish Software in the International Division of Labour", in T. Bresnahan and A. Gambardella (eds.) *Building High-Tech Clusters*. Cambridge: Cambridge University Press.
- Arora, A., and A. Gambardella, eds. (2005) *From Underdogs to Tigers: The Rise and Growth of the Software Industry in Brazil, China, India, Ireland and Israel*. Oxford: Oxford University Press.
- Avnimelech, G., and M. Teubal (2006a) "Creating Venture Capital Industries that Co-Evolve with High-Tech: Insight from an Extended Industry Life Cycle Perspective on the Israeli Experience", *Research Policy*, forthcoming.
- Avnimelech, G., and M. Teubal (2006b) "From Direct Support of Business Sector R&D/Innovation to Targeting Venture Capital/Private Equity", *Economics of Innovation and New Technology*, forthcoming.
- Avnimelech, G., Kenney, M. and M. Teubal (2005): "The Life Cycle Model for the Creation of National Venture Capital Industries: The US and Israeli Experiences", in E. Giuliani, R. Rabellotti and M.P. van Dijk (eds.): *Clusters Facing Competition: The Importance of External Linkages*. Ashgate, forthcoming.
- Barry, F. (2006a) "Third-Level Education, Foreign Direct Investment and Economic Boom in Ireland", *International Journal of Technology Management* (forthcoming).
- Barry, F. (2006b) "Foreign Direct Investment and Institutional Co-Evolution in Ireland", Centre for Economic Research WP06/03, University College Dublin.
- Barry, F. and D. Curran (2004) "Enlargement and the European Geography of the Information Technology Sector", *World Economy*, 27, 6, 901-922.
- Blomstrom, M., and A. Kokko (1998) "Multinational Corporations and Spillovers", *Journal of Economic Surveys*, 12 (3), 247-77.
- Burnham, J. (1998). "Global telecommunications: a revolutionary challenge". *Business and the Contemporary World*, (2), pp. 231-248.
- Clark, M. (1997) "Transnational Alliances and Development Policy in Latin America: Non-traditional Export Promotion in Costa Rica", *Latin America Research Review*, 32, 2, 71-97.
- Cowley, L. (2003), *Irish venture: a winning formula?* European Venture Capital Journal, London, September.

Crone M (2002) *A Profile of the Irish Software Industry*, unpublished report, (available at: [www.qub.ac.uk/nierc/Themes/software.htm](http://www.qub.ac.uk/nierc/Themes/software.htm)).

Crone, M. (2004) "Celtic Tiger Cubs: Ireland's VC-Funded Software Start-ups", paper presented at Institute of Small Business Affairs National Entrepreneurship and SME Development Conference, Newcastle-Gateshead, November.

Dossani, R., and M. Kenney (2002) "Creating an Environment for Venture Capital in India", *World Development*, 30 (2), 227-253.

Easterly, W. (2002) *The Elusive Quest for Growth: Economists' Misadventures in the Tropics*, Cambridge and London: MIT Press.

Enterprise Ireland (2005), *Seed and Venture Capital Programme 2000-2006*, 2004 Report, available at: <http://www.enterprise-ireland.com>.

Evans, P. (1995) *Embedded Autonomy: States and Industrial Transformation*. Princeton, NJ: Princeton University Press.

Evans, P., and J. Rauch (1999) Bureaucracy and Growth: A cross-national analysis of the effects of "Weberian" state structures on economic growth, *American Sociological Review*, 64, 5, 748- 7654.

EVCA (2003) *Benchmarking European Tax & Legal Environments: Indicators of Tax and Legal Environment Favouring the Development of Private Equity and Venture Capital in European Union Member States*.

Fahy, M., S. Cacciaguidi-Fahy and J. Currie (2002) Financial Shared Services Centres: Opportunities and Challenges for the Accounting Profession; ACCA Research Report No. 79; <http://www.accaglobal.com/research/summaries/735833>

FitzGerald, E. (2002), *Venture capital opportunities in the Irish market* A&L Goodbody, Dublin, 30/04/2002 available at <http://www.altassets.com/casefor/countries/2002/nz2937.php>, accessed 20 June 2005.

Florida, Richard and Donald Smith, Jr. (1993) "Keep the Government Out of Venture Capital." *Issues in Science and Technology* (Summer): 61-68.

Florida, R. and D.F. Smith (1994) *Venture Capital and Industrial Competitiveness*, Report to the U.S. Department of Commerce, Economic Development Administration, May, Washington, D.C

Florida, R., M. Kenney and D.F Smith (1990) *Venture Capital, Innovation and Economic Development*, Report to the U.S. Department of Commerce, Economic Development Administration, June, Washington, D.C.

Forfás (2000) *Enterprise 2010: New Strategy for the Promotion of Enterprise in Ireland in the 21<sup>st</sup> Century*, Dublin: Forfás.

Fukuda-Parr, S., C. Lopes and K. Malik (2002) "Overview: Institutional Innovations for Capacity Development", in *Capacity for Development, New Solutions to Old Problems*, UNDP/Earthscan.

Gaither, C. (2002), *Irish companies seeking green – and help – from Valley firms*, Boston Globe, 18 November.

Industrial Policy Review Group (1992) *A Time for Change: Industrial Policy for the 1990s*, Dublin : Stationery Office.

Institute for Management Development (2005) *World Competitiveness Yearbook*, Lausanne: IMD.

Jones, C., and J. Williams (1998) "Measuring the Social Return to R&D", *Quarterly Journal of Economics*, 113(4), 1119-35.

Kaufmann, D., and A. Kraay (2002) "Growth Without Governance", *Economia*, Volume 3, Number 1, available at:  
<http://www.worldbank.org/wbi/governance/pubs/growthgov.html>

Kaufmann, D., A. Kraay and M. Mastruzzi (2003) "Governance Matters III: Governance Indicators for 1996-2002", unpublished ms., World Bank.

Kenney, M. (2004) "Supportive Economic Institutions: Silicon Valley's Lessons for Developing Countries", in A. Bartzokas and S. Mani (eds.) *Financial Systems, Corporate Investments in Innovation and Venture Capital*, Edward Elgar.

Krueger, A. (1990) "Government Failures in Development", *Journal of Economic Perspectives*, 4, 3, 9-23.

Lall, S. (2001) 'Competitiveness indices and developing countries: an economic evaluation of the Global Competitiveness Report', *World Development*, 29(9), 1501-25.

Loewendahl, H. (2001) 'A framework for FDI promotion', *Transnational Corporations*, 10, 1, 1-42.

MacSharry, R. and White, P. (2000). *The Making of the Celtic Tiger: the Inside Story of Ireland's Booming Economy*, Mercier Press, Dublin, Ireland.

Mason, C. and R. Harrison (2002) "Is it Worth it? The Rates of Return from Informal Venture Capital Investments." *Journal of Business Venturing*, 7: 211-236.

- Morisset, J., and K. Andrews-Johnson (2004) *The Effectiveness of Promotion Agencies at Attracting Foreign Direct Investment*, Occasional Paper 16, Foreign Investment Advisory Service.
- Murphy, A., B. Walsh and F. Barry (2003) *The Economic Appraisal System for Projects Seeking Support from the Industrial Development Agencies*, Dublin: Forfás.
- Oakey, R. (1995) *High-Technology New Firms: Variable Barriers to Growth*, London: Chapman Publishing.
- OECD (1996) *Venture Capital and Innovation*, Paris.
- OECD (1997) *Government Venture Capital for Technology Based Firms*, Paris
- OECD (2000) *The Internationalisation of Venture Capital Activity in OECD Countries: Implications for Measurement and Policy*, STI Working papers 2000/7, authored by G. Baygan and Michael Freudenberg; Paris.
- O'Malley, E., and C. O'Gorman (2001) *Competitive Advantage in the Irish Indigenous Software Industry and the Role of Inward Foreign Direct Investment*", *European Planning Studies*, 9 (3), 303-321.
- Ó Riain, S. (2004) *The Politics of High-Tech Growth: Developmental Network States in the Global Economy*, Cambridge: Cambridge University Press.
- O'Rourke, K (1994/95) "Industrial policy, employment policy and the non-traded sector," *Journal of the Statistical and Social Inquiry Society of Ireland*, XXVII, Part II, 61-80.
- Partington, D. (2000), "Building Grounded Theories of Management Action", *British Journal of Management*, 11, pp. 91-102.
- Porter, M. (1990) *The Competitive Advantage of Nations*, London: Macmillan.
- Rauch, J., and P. Evans (2000) *Bureaucratic Structure and Bureaucratic Performance in Less Developed Countries.* *Journal of Public Economics*.
- Sands, A. (2005) "The Irish Software Industry", in Arora and Gambardella (2005), *op cit*.
- Sterne, J. (2004) *Adventures in Code: the Story of the Irish Software Industry*, Dublin: Liffey Press.
- Stiglitz, J., and A. Weiss (1981) "Credit Rationing in Markets with Imperfect Information", *American Economic Review* 71, 393-410.



Tanzi, V. (1998) Corruption Around the World, *IMF Staff Papers*, Volume 45, pp. 559-594.

Walsh, M. (1985), *Venture Capital in Ireland*, Irish Journal of Irish Business and Administrative Research, 7, 1, 33-45.

Wells, L.T., and A.G.Wint (2000) *Marketing a Country: Promotion as a Tool for Attracting Foreign Investment* (revised edition), Occasional Paper 13, Foreign Investment Advisory Service, Washington, DC.

**Table 1: Foreign-firm employment as share of sectoral total; high-tech sectors**

	Employment in foreign-owned firms	Foreign employment in % of sector total
Chemicals	17,874	77.0
Office and data processing	18,303	88.3
Electrical machinery and apparatus	9,438	62.3
Radio, TV and communications	12,785	85.3
Medical and optical equipment	15,335	84.7
Software	15,300	54.8

Source: Irish Census of Industrial Production (2000) for manufacturing;  
National Software Directorate (2002) for software.

**Table 2: Sectoral distribution of VC investments (%) in the US, Ireland and Europe, 1995-2003**

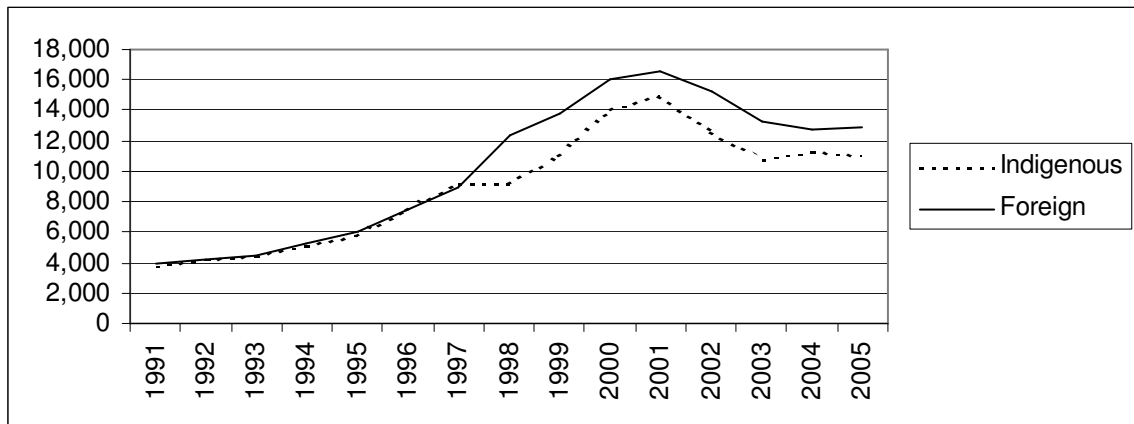
US	1995	1996	1997	1998	1999	2000	2001	2002	2003
communications	27.3	25.3	23.8	29.2	35.7	37.3	34.3	26.7	23.1
computer related	23.6	31.0	33.9	31.5	31.3	36.5	38.2	37.6	36.7
electronics/instrumentation	1.7	1.6	1.9	1.0	0.5	0.8	0.9	1.5	1.3
biotechnology	9.5	10.1	9.7	7.3	3.8	4.0	8.1	14.6	18.8
medical/health related	14.0	11.9	12.6	10.1	5.6	3.8	6.3	10.1	9.2
industrial/energy	6.8	4.6	5.4	6.7	3.2	2.2	2.7	3.2	3.9
consumer related	11.1	9.1	7.3	6.1	10.2	6.5	2.9	1.9	1.3
financial services	2.5	3.0	2.5	4.3	4.1	3.9	3.6	1.7	2.1
other	3.4	3.4	3.0	3.7	5.6	5.0	3.0	2.6	3.5

Ireland	1995	1996	1997	1998	1999	2000	2001	2002	2003
communications	12	13	15	2	24	21.6	7.9	23.8	11.1
computer related	12	19	19	38	37	47.2	75.4	42.4	83.3
other electronics related	10	2	12	12	7	12.5	6.4	8.9	1.1
biotechnology	0	7	8	2	0	0	0	2.3	0.3
medical/health related	0	n/a	0	0	2	5.8	3.1	11.5	2.2
energy/industry	0	4	14	4	8	1.8	0.7	1.6	0
consumer related	40	9	10	4	4	3.1	0.4	2.6	0
financial services	0	0	0	0	0	0	0	0	0.4
other	26	35	23	39	18	7.9	6	6.9	1.5

Europe	1995	1996	1997	1998	1999	2000	2001	2002	2003
communications	4.7	4.4	5.7	8.6	11.6	13.8	13.9	9.1	16.9
computer related	7	5.1	6.6	9.3	10.8	13.3	12.3	5.5	6
other electronics related	4.5	4.1	4.6	2.9	2.1	3.9	2.4	2.4	1.9
biotechnology	2.1	2.7	2.6	2.4	2.6	2.9	3.5	4	2.3
medical/health related	5.5	3.6	4.3	4.7	4	7.9	6.7	7	6
energy/industry	17.6	21.3	17.5	16	18.6	15.7	18.9	21.9	11.9
consumer related	22.6	18.1	22.2	14.9	18.8	18.5	15.5	21.7	19.4
financial services	2.7	6.4	4.1	2	1.8	1.8	2.6	3.9	2.3
other	33.2	34.3	32.4	39.1	29.7	22.2	24.2	24.5	33.3

Source: Own calculations on the basis of EVCA Yearbooks (various years) for Ireland and Europe and PricewaterhouseCoopers/Thomson Venture Economics/NVCA Money Tree Surveys (available at: [www.pwcmoneytree.com](http://www.pwcmoneytree.com)) for the US.

**Figure 1: Employment in indigenous and foreign-owned software firms in Ireland**



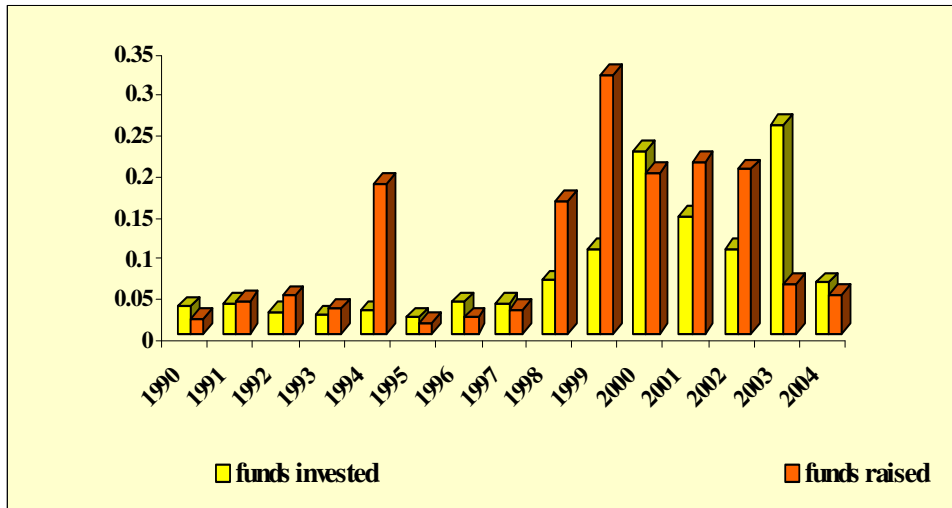
Source: National Software Directorate ([www.nsd.ie](http://www.nsd.ie))

**Table 3: State Aid to Manufacturing Industries in the EU15.**

	euro per person employed	
	1993-1995	1995-1997
<b>Italy</b>	2,512	2,302
<b>Germany</b>	2,102	1,569
<b>- New Lander</b>	8,206	5,537
<b>- Old Lander</b>	470	456
<b>Denmark</b>	1,292	1,478
<b>Ireland</b>	1,322	1,454
<b>Belgium</b>	1,376	1,382
<b>Luxembourg</b>	1,328	1,358
<b>France</b>	1,074	1,077
<b>Greece</b>	982	1,043
<b>Finland</b>		965
<b>Spain</b>	659	958
<b>Netherlands</b>	669	793
<b>Austria</b>		782
<b>Portugal</b>	475	525
<b>Sweden</b>		504
<b>United Kingdom</b>	313	381
<b>EUR 15</b>		1,261
<b>EUR 12</b>	1,460	1,298

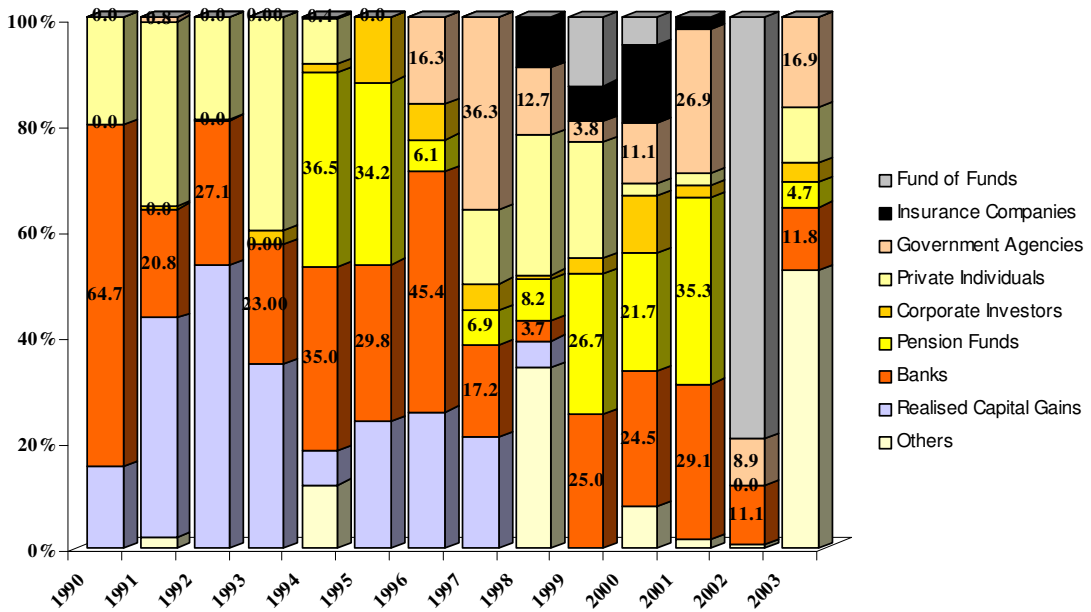
*Source: EU, 1999.*

**Figure 2: Private equity (including venture capital) in Ireland (funds invested and funds raised 1990 -2003 in billion euro)**



Source: Own calculations on the basis on EVCA yearbook data (various issues).

**Figure 3: Sources of new funds raised (%) in Ireland; 1990-2003**



Note: Total funds raised by the domestic private equity industry. "Others" include: academic institutions, capital markets, and unavailable data

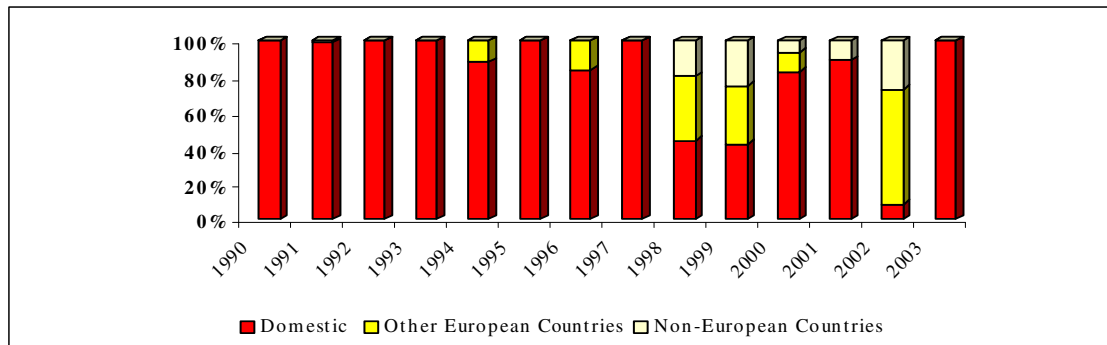
Source: own calculations on the basis of EVCA Yearbooks (different issues).

**Table 4: Sources of new funds: Europe, Ireland and the US (percentage by type of investor)**

		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Corporations	EUR	4	5	5	5	10	5	4	11	11	10	11	6	7	5
	IRE	0	0	0	3	2	12	7	5	1	3	11	2	0	4
	US	7	5	4	8	9	5	20	25	12	14	4	3	2	2
Private	EUR	4	5	3	3	3	3	7	4	8	7	7	7	6	3
	IRE	20	35	19	40	9	0	0	14	26	22	2	2	0	10
	US	13	14	12	7	12	17	7	12	11	10	12	9	9	10
Financial institutions	EUR	55	48	44	40	41	36	41	42	40	46	35	36	39	22
	IRE	65	21	27	23	35	30	45	17	13	32	39	31	11	12
	US	10	6	17	12	10	20	3	6	10	16	23	25	26	25
Pension Funds	EUR	16	16	13	16	20	27	23	25	26	20	24	27	16	19
	IRE	0	0	0	0	37	34	6	7	8	27	22	35	0	5
	US	56	48	46	61	47	38	58	39	60	44	40	42	42	43
Government	EU	3	2	9	7	3	3	2	2	6	5	6	6	11	7
	IRE	0	1	0	0	0	0	16	36	13	4	11	27	9	17

Source: own calculations on the basis of EVCA and NVCA data.<sup>27</sup>

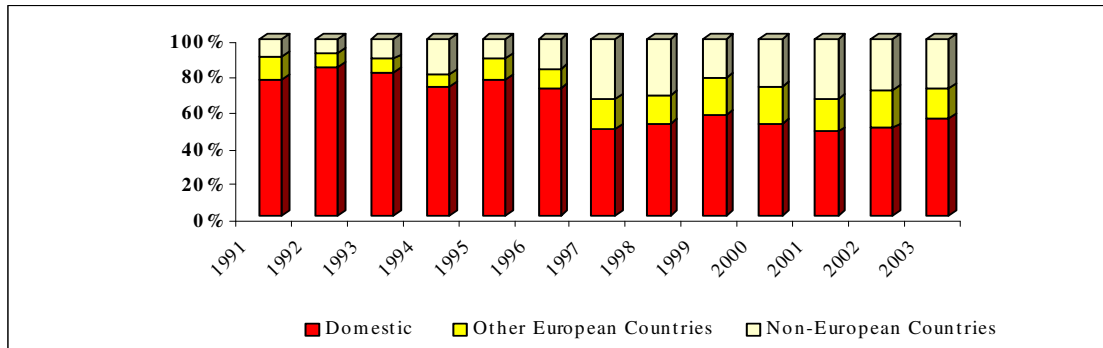
**Figure 4: Sources of funds raised by the Irish PE industry in 1990-2003; geographical breakdown**



Source: Own calculations on the basis of EVCA Yearbooks (different issues)

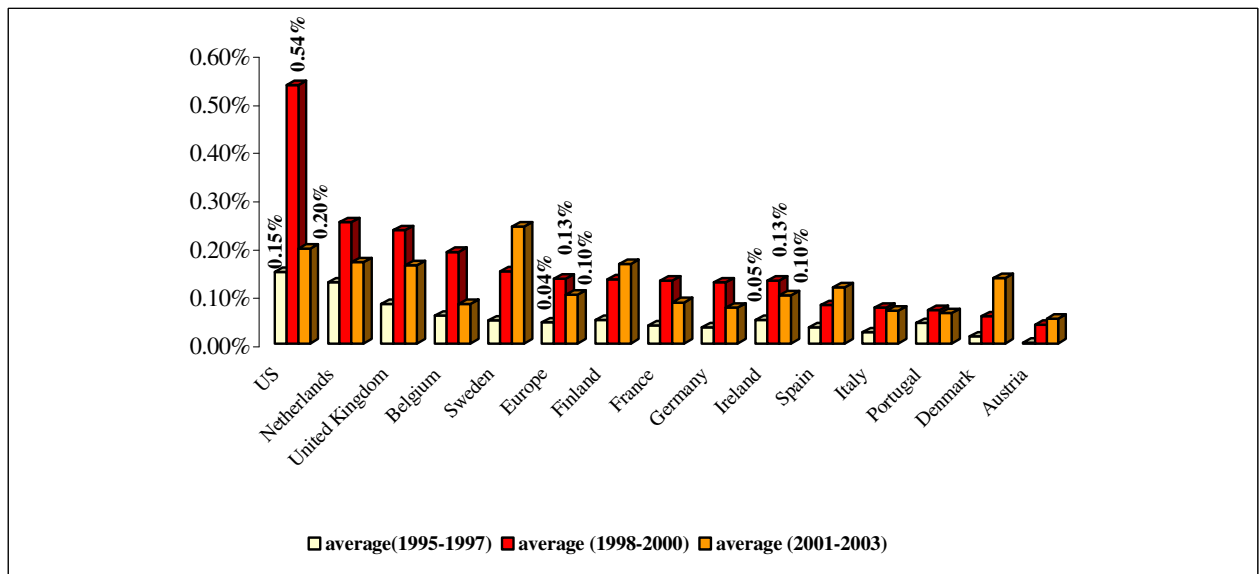
<sup>27</sup> Figures for particular countries and regions do not sum to 100 as only certain categories of investors are included here. Categories excluded for Ireland and Europe are funds of funds, academic institutions, capital markets, realized capital gains and the class of "not available" data, while those excluded for the US are endowments & foundations.

**Figure 5: Sources of funds raised by the PE industry in European countries, 1990-2003; geographical breakdown**



Source: Own calculations on the basis of EVCA Yearbooks(different issues)

**Figure 6: Venture capital investments as a percentage of national income in the US, Western Europe, Ireland (GNP) and other European countries; average values for periods 1995-1997, 1998-2000 and 2001-2003.**

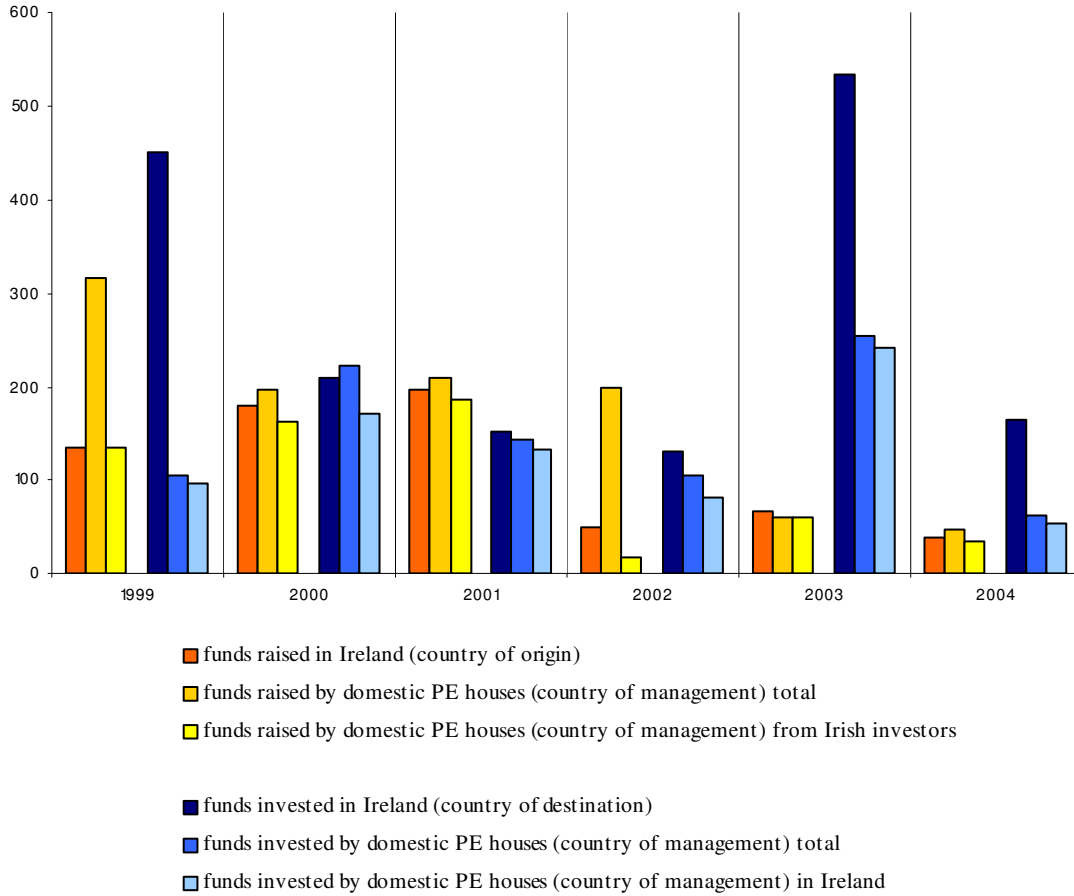


Source: Own calculations on the basis of EVCA Yearbooks and NVCA Yearbook (2004<sup>28</sup>), OECD data (GDP and GNP measures-at current prices); exchange rates: Eurostat.

<sup>28</sup> Europe and Ireland: early stage investments include: "seed" and "start-up", the US- early includes: "start-up/seed" and "early". To make comparison between European and American data possible, category "later" was excluded from the US VC activity. GDP

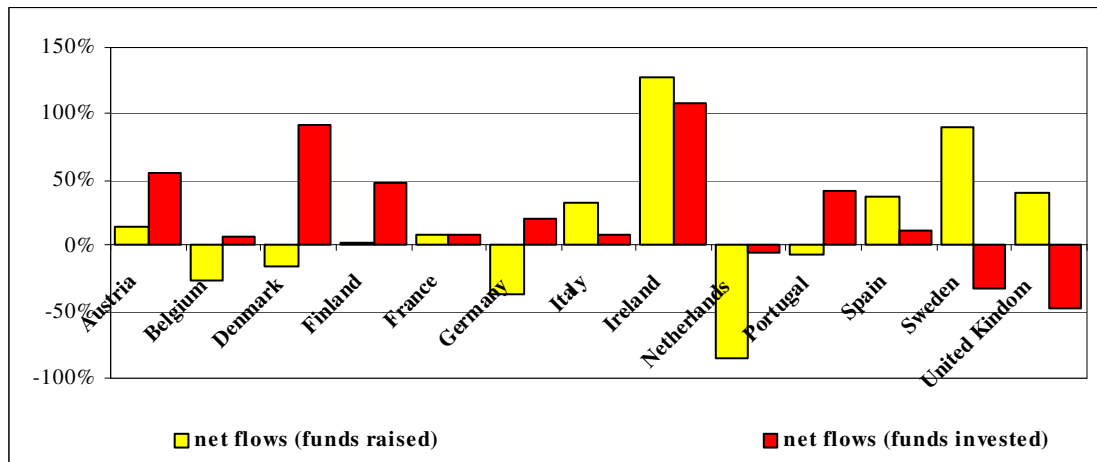


**Figure 7: Comparison of "country of management", "country of origin" and "country of destination" figures: Ireland 1999-2003 (euro millions)**



Source: own calculations based on data from EVCA yearbooks.

**Figure 8: Net flows in funds raised and invested in Ireland and other European countries; average for 1999-2003**



Source: own calculations based on data from EVCA yearbooks

**Table 5: Governance Indicators (2002) for Ireland, Israel and India**

	Account-ability of Government	Political Stability and Absence of Violence	Quality of Public-Service Bureaucracy	Regulatory Quality	Confidence in Legal System	Control of Corruption
Ireland	1.40	1.31	1.62	1.64	1.72	1.67
Israel	0.61	-1.35	1.02	1.03	0.97	1.08
India	0.38	-0.84	-0.13	-0.34	0.07	-0.25

Source: Kaufmann, Kraay and Mastruzzi (2003)

**Table 6: Governance Indicators (2005) Rankings out of 60 Countries**

	Ireland	Israel	India
Transparency of government policy	13	21	39
Independence of public service from political interference	23	40	51

Source: IMD (2005)