The Role of Different Funding Models in Stimulating the Creation of Innovative New Companies. What is the most appropriate model for Europe?

A study for the European Research Area Board
The Role of Different Funding Models in Stimulating the Creation of Innovative New Companies.

What is the most appropriate model for Europe?

Final report to the European Research Area Board

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Edited by
Alasdair Reid and Paul Nightingale

Authors

Technopolis Group
Andrej Horvath
Michael Kilcommons
Alasdair Reid

University of Sussex
Alex Coad
Paul Nightingale

University of Exeter
Marc Cowling

Estonian Development Fund
Ott Pärna

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Needless to say, the authors alone remain responsible for the contents of the report.

Disclaimer
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Executive summary

This study aims to contribute to the work of the European Research Advisory Board (ERAB) and the European Commission services in the context of the implementation of the 2010 Innovation Union Communication. The Communication foresaw that by 2014 the EU should have in place financial instruments to attract a major increase in private finance and close market gaps that might exist in investing in research and innovation. Accordingly, the study was asked to shed light on the type of funding model that is most likely to stimulate the creation of innovative new companies. The study team, composed of experts from Technopolis Group, the University of Sussex and the University of Exeter, addressed three main questions:

1. **What are the main financial mechanisms in the US, Europe (EU plus associated countries such as Israel) and other industrialised countries for stimulating new high technology businesses (or "Yollies": young leading innovative companies)?**

The study argues that the issue facing Europe is not just a lack of firms that rapidly grow large, but also a wider problem related to a long tail of poor performance enterprises operating in fragmented uncompetitive markets. This leads to wide productivity differences across and within national states. For many European regions, the more important issue is likely to be upgrading existing firms' productivity, rather than seeking to advance the technological frontier. The relative lack of venture funding for European firms compared to the US may therefore simply reflect problems of demand. There may be smaller numbers of European firms worth investing smart-equity in, because they are lower quality, because there is not as much advanced science in Europe, or because they find it hard to grow because of external constraints, such as problems with human capital (in the firms, in their investors and in the ecosystem of professional advisors), rather than a problem with the supply of funds. In the UK, for example, public policy that has increased the supply of VC without properly addressing the capability of either VC funds or firms has had a limited impact.

This said, there exist in Europe a small number of high potential, high quality firms that may not be funded effectively. This is particularly a problem in relation to equity financing. Moreover, the high tech firms investing in R&D and other intangible forms of innovation are the firms most likely to be refused debt even though they are the least likely to fail. This ‘equity gap’ is one factor explaining why American firms have much higher post-entry growth (60% growth in employment compared to European firms 5-35%). These differences in growth rates indicate a more experimental approach to start-ups in the US. Smaller firms in the US get the resources to grow faster if the smaller scale initial experiments are deemed a success. Given that there are very minor differences in market entry rates across the different countries, and larger incumbent firms in the USA, this indicates that policy makers should be concerned about **barriers to growth** for high potential firms in the EU, and not barriers to entry. The key issue for policy makers is therefore not generating more small firms, but focusing on the small proportion of exceptional young firms that grow fast to become large firms.

In this context, the study explores and appraises the main financial mechanisms in the US, Europe, Canada, Israel and Australia for stimulating Yollies. The lifecycle of these firms can be linked to a sequential model of innovation development and funding. Different actors are involved in funding these different stages reflecting differences in the scale of their investments, the ‘smart money’ skills the investors have, and their ability to take on risks. During the earliest stages of a firm’s lifecycle, funding usually comes from research grants, corporate research, government agencies and funding councils, and personal assets of inventors. Once firms are set up the main source of early stage funding is traditional banking services, through small-scale debt, through
the use of credit cards, over drafts and loans. During early stage technology
development firms receive money from (in order of importance) industry, business
angels, government (grants, etc.), VC, regional/State governments, and Universities.
Lastly, funds to development and launch of prototypes are obtained from VC and
private equity funds, and from bank debt.

The studies main findings are:

• The funding system for Yollies is an interconnected system of different funders,
  providing different types of funding at different stages of the firms’ lifecycle.
• Both VC and Angel investors rely on a good ‘deal flow’ (in the form of a stream of
  high potential, investment-ready firms), high value exit markets (IPOs & trade
  sales), professional advisors and skilled investment managers and entrepreneurs.
• Government support has been essential for the development and continued
  success of professional equity investment communities, in part because of the
  great difficulties involved in making commercial returns from early stage
  investment. The difficulty involved in making financial returns from investing in
  start ups is insufficiently appreciated within European policy making circles.
• Government policy can directly improve performance when it is aligned with
  market incentives and the commercial activities of VC funds. Consequently, policy
  that uses VC for social ends tends to be ineffective.

2. What do VC activities in the US, Europe and other selected
   industrialised or emerging economies look like today? Addressing the
   following sub-questions:
   − What is the volume and structure of the VC market in these countries?
   − What is the typology of the VC firms (single portfolio funds, fund in funds)?
   − What is the role of public authorities/policy?
   − What are the specific new initiatives with regard to grand challenges?
   − What is the relationship with universities and big research hubs?

Succinctly, considering the first two sub-questions, the studies key findings are as
follows:

• There are considerable differences between venture investing in the US and the
  rest of the world, not least because the US VC market is twice the size of Europe’s.
  − US funds tend to be larger (approximately twice the median fund size of
    European funds), make larger numbers of larger investments (approximately
    twice as much) in more firms than European funds.
  − They are also more professional, as they are more specialised and syndicate
    more.
• The superior historical performance of US VC reflects the long-term approach the
  US Government has taken towards supporting the industry and co-ordinating the
  large number of actors that must work together to create an effective venture
  investment system.
  − It has taken the US 50 years to generate its current VC eco-system and this has
    required large scale and continuing support.
  − On the demand side, the US spends significantly more on higher-education
    related research (2.4% of GDP), but leaves investment readiness training to
    the private sector, while the Europeans spend much less (an average nearly
    half the US figure: 1.3% of (lower) GDP) and often fund investment readiness
    training through the state.
• The European venture investing community is improving fast and seems to be
effectively learning from the US and its own policy experiments.
In terms of the role of public policy, the available evidence suggests that:

- Indirect measures in support of venture capital markets should aim at creating a transparent and simple legal framework in which investors can operate:
  - There is limited evidence on the effectiveness of tax provisions (front or back end) in encouraging investors and a relatively significant risk of deadweight loss.
  - It is important to resolve outstanding problems related to tax transparency (fund structures, double taxation).
  - The creation of a liquid, unified European IPO market and the lowering of the hurdle for high-growth companies that aspire to list their stock on such markets should be a priority.
  - Incentives to start and grow Yollies could be enhanced by further simplifications to the legal/tax environment for doing business (bankruptcy laws, stock options, etc.)

- Direct measures can provide a substantial boost when designed with a view to incentivising funds of an adequate scale and with flexible parameters:
  - Hybrid funds should be well funded and investment professionals knowledgeable.
  - Regional Funds often perform extremely poorly and should be avoided.
  - Funds should not be constrained to specific funding gaps so as to enable ‘follow-on’ investments in high potential portfolio companies.
  - The evidence on tax incentives and guarantees is mixed but schemes that guarantee against VC losses should be avoided as they distort incentives. Credit guarantee schemes are a better fit with the needs of Yollies.
  - Investor regulations limiting the possibility for pension funds and insurance companies to invest in VC need to be reviewed in a number of EU countries.

3. What is the most appropriate mix of financial support for young innovation companies and what mix of financial methods is optimal at the European level?

The review of the literature, data and interviews highlights a number of key points that inform this policy section. First amongst them is the strong evidence that the problem the EU faces is a problem of lack of growth amongst its firms and not a lack of start-ups. European public policy in relation to entrepreneurship needs to shift its focus from quantity to quality and enhance the performance of the small minority of firms that drive economic growth and job creation. Public policies that encourage excessive market entry of low quality firms can be damaging to the economy if they drive up factor prices for high quality firms, dilute entrepreneurial and managerial talent and create a ‘market for lemons’ for investors.

The second key finding is that venture investing is part of a strongly interconnected system, so that business angels and venture capital funds do not exist in isolation. This system is comprised of institutional and government investors; a flow of high quality, investment ready firms; skilled, specialised and large professional investor funds; exit markets that allow investors to realise high returns; and a network of professional advisors able to advise growing firms. This system has to work effectively for long periods of time in order to develop the necessary human capital for it to sustain itself. Moreover, it has to allow firms to move up the funding ‘escalator’ as they grow and access increasingly large amounts of money. As firms grow they need different kinds of funding. For example, young technology firms often need cash flow which is often more appropriately funded through debt instruments than through equity. Credit (loan) guarantees generally work in a modest, but effective way (although guarantees over 80% reduces the risk to lenders too much and reduces their incentives to evaluate
proposals diligently). Equity, and particularly ‘smart’ equity that provides professional support in combination with money, is also important. Developing a viable VC and venture investing sector is a long term project that has taken over 50 years in the USA. Europe seems to be learning faster, in part because the US provided a model to follow, but policy makers should be thinking in terms of decades rather than years as this gives firms the time to innovate and produce meaningful results.

The third key finding relates to general Policy Guidelines. These are Simplicity, Clarity, and aligning Incentives. The review of the various policy instruments that have been tried around the world suggests that policy should be designed with simplicity of administration, delivery, and wider understanding in mind. Attempts to integrate social policy with economic policy and use VC funds for social objectives are rarely effective. Instead, policy that has clear objectives that are well articulated to private sector and other intermediaries involved in delivery, and is strongly aligned with private sector intermediaries’ incentives is most effective at achieving policy objectives. Schemes with a small number of core parameters (e.g. investment size, sector, age target, investment term) can be the most adaptable and flexible way of reacting to changing economic circumstance or policy shifts. Schemes must be able to adapt quickly, with the minimum of bureaucracy, to respond to the rapidly changing environments that have characterised the 50 year history of venture capital.

The fourth key finding relates to policy learning. There is clear evidence of policy improving through time, and there is now considerable knowledge about which types of funds are likely to be the most successful. For Business Angels the key initial issue is building up capability and addressing demand side ‘investment readiness’ problems; once these are addressed, policies can move onto support and then co-invest with the professional networks that emerge. Such policies can be effective and are often very cost effective. With VC, the review of evaluations highlighted the importance of building up human capacity during the early years of the industry, and continuing to support capacity building as experienced investors move out of early stage investing into later stage investing. As human capacity is built up successful policies tended to move towards strongly incentivising success. These incentives can involve penalising VC intermediaries who ‘misbehave’ and pursue short-term, high risk investment strategies. The experience of the UK hybrid fund schemes suggests that the public sector can make significant indirect returns from its investment in supporting well incentivised private sector venture funds from the increased taxation and job creation that follows. Governments, unlike other investors, can appropriate the benefits of their investments indirectly, and therefore have more to gain from supporting world-leading clusters of technology, firms and investors.

The fifth key finding relates to specific policy guidelines for supporting venture investment funds: This is to build well-funded, long-term, professionally managed schemes that reward success rather than subsidise failure. It is vital to ensure schemes are large, as underfunded schemes guarantees failure. Good policy focuses on both direct and indirect effects (i.e. job creation from policies aimed at achieving commercial returns and technology spillovers) and learns from experience over long periods and drops (improves) bad schemes.

The sixth key finding relates to the design of VC hybrid schemes. These should be large (i.e. >€50m), never regionally focused (as this constrains deal flow and the benefits of specialisation), and properly aligned with realistic commercial incentives. This later point means that funds should be allowed to make commercial decisions and should not be constrained in their ability to make follow-on investments and avoid dilution. Policy should ensure the escalation of smart capital, as both debt and equity funding, seamlessly grows with firms’ expanding funding requirements. As a consequence, low caps on the upper limit on VC type investments (i.e. below €3m) should be avoided. Schemes should rely on co-funding from private sector investors to signal quality, and strongly incentivise success (ideally with the recognition that tax payer returns are likely to be larger through increased tax revenues from the additional jobs and economic activity that is generated). Protecting funds from the consequences of their
poor quality investment decisions by providing downside protection should be avoided. The experience of the USA and Israel highlights the need to continuously support success in areas of global competitive advantage.

Lastly, in such a dynamic environment it is important to evaluate policy and shut down or change ineffective policy instruments. There is evidence that there are a number of highly ineffective schemes for supporting SMEs operating in Europe that if shut down, would free up enough funds to allow a significant shift towards a more effective venture investing system within Europe at no additional cost to the taxpayer.

At the EU level, the main financing initiatives are: the Risk Sharing Finance Facility (RSFF), the High Growth and Innovative SME Facility (GIF) and the SME Guarantee Facility (SMEG). In addition, the Structural Funds, through the European Regional Development Fund (ERDF) and various supporting initiatives (JEREMIE) has led to a significant investment in national and regional early stage and venture capital funds (with mixed results). Evidence on the effectiveness of the EU level instruments is mixed, at best, and there is an on-going debate on how to develop them in the next financial period (2014-20).

The study findings suggest that there should be a significant reorientation from the current model, which simplistically could be described as “multiplying sub-critical regional funds aiming at supporting low growth potential firms”, towards a limited number of European level funds with sufficient flexibility to adapt strategies rapidly to investment trends (e.g. the EU Invest proposal that would operate outside of national regulatory regimes with funds at least 10 times bigger than current national schemes and fund management outsourced to best available private investors).

Similarly, proposals to syndicate, leverage and encourage business angels’ interventions by topping up their investment with co-financing from the public sector including potentially by establishing a dedicated pan-European fund are worth pursuing.

Given the limited deal flow from even the largest research universities or centres, the potential for one or more European level co-investment funds working with groups of research-intensive universities to encourage follow-on investments in the most promising new-technology based ventures could be considered.

Extending the role of the Government sector through European level instruments such as an equivalent of the US SBIR would potentially help to generate a larger deal flow for the venture capital sector and promote Yollies in key sectors of relevance for public policies (e.g. health, transport, security, etc.).

Finally, expanding the supply of venture capital and the rate of creation of Yollies is not a panacea, rather, it is the structural barriers in Europe to growth that need to be solved: too few VCs of sufficient scale and quality; problems arising from a fragmented market with varying national regulations, and the lack of an exit route of sufficient scale (a European NASDAQ).
1. Introduction

1.1 What was the scope of the study?

This study is a contribution to the European Research Area Board (ERAB) recommendations on the implementation of the 2010 Innovation Union Communication proposal that ‘by 2014: on the basis of Commission proposals, the EU should put in place financial instruments to attract a major increase in private finance and close the market gaps in investing in research and innovation’. In particular, the study sheds light on the funding model that is most likely to stimulate the creation of innovative new companies.

The study addresses the following questions:

1. What are the main financial mechanisms in the US, Europe (EU plus associated countries such as Israel) and other industrialised countries for stimulating new high technology businesses (or “Yollies”: young leading innovators)?

2. What do VC activities in the US, Europe and other selected industrialised or emerging economies look like today?
   - What is the volume and structure of the VC market in these countries?
   - What is the typology of the VC firms (single portfolio funds, fund in funds)?
   - What is the role of public authorities/policy?
   - What are the specific new initiatives with regard to grand challenges?
   - What is the relationship with universities and big research hubs?

3. What is the most appropriate mix of financial support for young innovation companies and what mix of financial methods is optimal at the European level?

This study reviews the evidence and suggests options for a revision of the current ERAB recommendations (see ERAB 2010a) on the role for public-private financing measures in stimulating the creation and growth of Yollies. ERAB will use the findings to formulate recommendations on “the optimal initiative the European Commission could take to stimulate the European VC market”.

1.2 How was the study implemented?

Undertaken during the period June to September 2011, a first progress report of the study was submitted at the end of July 2011 and a draft final report at the end of September. The findings were discussed by a meeting of ERAB held on 17 October 2011 and the comments and feedback were integrated into this final report.

The first question was addressed based on a review and synthesis of the literature. Amongst other elements, this provided a ‘conceptual’ basis for the study by sketching out and codifying each of the main possible funding mechanisms for ‘Yollies’.

Secondly, the five sub-questions on the volume and structure of VC activities in Europe and selected comparator countries were dealt with by a review of available literature and statistics complemented by opinions gathered through the interviews. A non-exhaustive list of the principal sources of data used includes:

- Data from European and national venture capital and business angel association; from national public or hybrid venture and seed capital funds.

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1 The initial terms of reference requested that the study cover China. However, the ERAB members considered that the Chinese venture capital market was less relevant due to the very specific circumstances (currency board, sovereign wealth funds, etc.). There may be an indirect Chinese influence on funding possibilities for European ‘Yollies’ due to a “drainage of capital towards emerging markets”.
• Data from European institutions: the European Investment Fund (EIF); the European Commission services (e.g. Risk-Sharing Financial Facility, RSFF); etc.

• Available data for non-European OECD countries such as Australia, Canada, Israel, New Zealand, and the US, as well as for China and India.

• Academic databases such as: the SPRU (University of Sussex) dataset on VC investment and the Exeter-SPRU dataset on UK public supported VC investments.

Three main dimensions were considered when analysing the evidence:

• Survivor bias: as many VC funds do not publish data on their failed investment, the data can be biased and look substantially more positive than it is.

• Selection bias: EU datasets on VC investments come from surveys of members of national and European VC associations. These do not include all VC investors and therefore may lead to substantial underestimation of the extent of VC investment.

• The boundary between private equity and VC is much fuzzier in the EU than the US, which can make the interpretation of data very complex and has led to very misleading interpretations of the data in the past. PE funds invest much larger sums, so where the boundary between early stage and PE investment is placed makes a big difference to the results.

Thirdly, the analysis of possible funding models was based on a literature review plus consultations with key stakeholders (including venture capitalists, specialists from the EIB and national public or semi-public financing agencies and sector/academic specialists). The literature reviewed covered:

• VC industry reports and studies;

• studies and evaluation reports on public or hybrid VC and equity funds;

• academic literature on venture capital, young innovative and high growth firms2;

• working papers, conference papers and other ‘grey literature’.

The interviews (a mix of face-to-face and by telephone) were carried out with representatives of the European and national venture capital sector, business angels the EIF and the European Commission. The interview guide used is in Appendix B and a list of interviewees in Appendix C.

Based on the literature review and interviews, short case studies were drafted. The cases were selected using a number of criteria including:

• Coverage of the main types of funding models identified;

• Drawn from different ‘innovation systems’ taking into account the specific characteristics of VC and entrepreneurship ‘framework conditions’;

• Relevance to a EU response to the key ‘barriers and drivers’ identified.

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2 For instance, two FP7 projects, FINNOV and VICO, were particularly useful.
2. Yollies: a panacea for the European economy?

Key Findings

- EU policy should focus on growth not encouraging more start-ups.
  - Market entry in the EU is already very high and possibly excessive (20-40% per year).
  - Excessive market entry by poor quality firms generates unproductive ‘churn’.
  - Europe has similar numbers of new firms to the US, but they grow at much lower post-entry rates (5-35% vs 60% for American firms).
- EU policy should focus on the quality of its start-ups and their environments.
  - Most firms don’t grow because most entrepreneurs don’t want to grow them.
  - The positive impact of entrepreneurship comes disproportionately from a very small percentage of high impact firms.
  - In the USA, these firms are often supported by ‘smart capital’ that provides managerial advice and expertise, as well as financial support. Such smart capital is expensive and only suitable for a small number of high quality firms with the potential to make substantial financial returns for their investors.
  - Constraints on growth can reflect both poor quality firms and problems in the external environment.

The evidence on the role of fast-growing young innovative companies in fostering competitiveness and innovation provides a framework against which the potential effectiveness of the available policy options can best be judged.

Economists have highlighted that growth is explained more by how investment is allocated to enhance productivity (Levine, 2004:7) than it is by how much is invested (i.e. the accumulation of inputs such as investments in physical capital) (Jorgenson, 1995; 2005). The impact of entrepreneurs for example, is highly skewed with the vast majority of the positive impact coming from a small number of firms, while the economic impact of most firms is negligible, and sometimes negative (Santarelli and Vivarelli, 2002; 2006). Shane (2008:164) has highlighted how disproportionately large the impact of a tiny proportion of professionally funded firms has been on the US economy. He notes that since 1970 VC firms have funded ~820 new firms out of the ~2m firms that are started each year in the USA (i.e. less than 0.05% of all firms). Yet, the 2,180 VC funded public companies (1972 to 2000) generated 11% of sales, 13% of profits, 6% of employees, and created about one third of the market value of all public companies in the USA (over $2.7 trillion). Examples such as this has encouraged a reappraisal of how entrepreneurs and investors identify opportunities and allocate resources (Shane and Venkataraman, 2000; Audresch and Keilbach, 2004) and attracted the attention of international policy makers (EC, 2009a).

EU policy makers have sought to understand how the European economy might rebalance towards smart, sustainable and inclusive growth in the aftermath of the financial crisis (EU 2020 Strategy). There is concern about weak growth, a weaker entrepreneurial culture and financial constraints associated with a relatively underdeveloped European Angel investment community, VC industry and IPO market equivalent to NASDAQ. However, the relationship between financing and economic performance is subtle and differs across nations and sectors. Both financing and firms are part of larger economic systems and neither improving financing nor generating more start-ups is, on its own, a policy panacea for Europe.

It is important to move away from the old text-book economic model of entrepreneurship where (1) entrepreneurs allocated resources to maximise value with (2) perfect foresight by (3) starting higher quality firms that (4) displace less efficient firms in the economy, (5) unless they were constrained by barriers to entry, such as (6) problems with access to finance. This model is a poor fit with the empirical evidence, which suggests that market entry by entrepreneurs is very high (~20-40% a year across sectors) and maybe excessive, differs little across countries, and is not
necessarily associated with superior economic performance (Santarelli and Vivarelli, 2002; 2006). Moreover, the very high market exit rates (~40% in the first two years) suggest most entrepreneurs make bad choices, and most entrepreneurial firms perform poorly and have lower productivity than incumbents. So rather than a harsh Darwinian selection environment, we find substantial differences in productivity with many less productivity firms remaining in the economy for extended periods. Consequently, productivity in the economy is driven by the relative distribution of low and high productivity firms.

When economists have analysed the contribution of start-ups to productivity growth they have found that the greatest contribution to labour productivity was learning and organisational change within established firms at 44.6%, while the contribution of new entry by entrepreneurial start-ups (where higher productivity start-ups displace lower productivity start-ups) was 15.9% (roughly half the effect of established firms). This suggests policy should not over-estimate the effect of entrepreneurship on the economy and recognise the role of entrepreneurial firms play in developing technology for established firms (i.e. not just in growing themselves). Moreover, they should also recognise the importance of allowing new firms to displace existing firms (i.e. SME and innovation policy should not be anti-competitive, and could be counter-productive if it prevents poor quality firms exiting the market effectively).

Given the widespread poor performance of most start-ups economists are often sceptical that funding constraints are a major problem, with the possible exception of a small percentage of high potential firms. After all, in a well functioning capitalist economy some firms will not, and should not, be able to access funding and will die as a consequence. Providing support for poor quality firms can therefore damage the economy, by driving up factor prices, reducing competition and creating a “market for lemons” for investors (Santarelli and Vivarealli, 2006). High quality data is limited, but a recent review of UK evidence (Hutton and Nightingale, 2011) suggested that:

1. Most firms eventually receive the funding they seek;
2. Most firms that are refused are refused for good reason (i.e. they are poor quality and high risk);
3. However, small numbers of high potential, high quality firms may not be being funded effectively, particularly in relation to equity financing;
4. The high tech firms investing in R&D and other intangible forms of innovation are the firms most likely to be refused debt even though they are the least likely to fail.

Given this is based on UK data, where the financial sector is well developed, the problems for high potential firms are likely to be worse elsewhere in the EU. If high impact firms should not get the funding they deserve this would be a significant public policy concern for both national governments and the EU.

There is indirect evidence that this may be a problem in the EU. First, and contrary to what is widely believed there is not any clear-cut evidence that US firms are more innovative than European firms. The data from CIS-2008 and the US National Science Foundation InfoBrief 11-300 on the equivalent American survey suggest that the share of US firms reporting a product or process innovation that is new to the firm is lower than many European nations (i.e. Germany, Finland, Italy, France, Austria, Spain, Czech Republic, Sweden, etc) (Hall, 2011). This is supported by data on productivity per hour worked, where a similar list of European nations outperform the US. However, it certainly is the case that the US national system of innovation is particularly effective in certain areas – and American start-ups in biotechnology, IT and software are often extremely innovative, commercially successful and outperform their European counterparts. These are sectors that require substantial investment in
intangibles, such as R&D, and are often backed by VC funds. However, they are also areas that build on the superiority of US academic research. The latest OECD data\(^3\) on elite academic research departments shows that of the top 50 departments in the world in different subject areas, the vast majority were in the US (35/50 in biochemistry & genetics, 39/50 in computer science, 33/50 in engineering, 35/50 in immunology, 37/50 in neuroscience, etc). This is a simple reflection of the much greater percentage of (higher) GDP that the US taxpayer spends on higher education 2.4% which is nearly double the European average of 1.3% of (smaller) GDP. So while the equity financing system is clearly very important in explaining the superior US performance in certain high growth, high tech sectors, it is not the only factor. The presence of US VC funds helps explain the success of US biotechnology, but so does the $35bn a year spent on biomedical research by the NIH.

Other evidence of a problem with European high growth firms comes from an excellent study by Bartelsman et al (2005). They have explored firm growth using data from the USA, Germany, the UK, France, Italy, Denmark, Netherlands, Portugal and Finland. They find that American firms have much higher post-entry growth (60% growth in employment compared to European firms 5-35%). This is partly because US start-ups are relatively smaller than US incumbent firms. US incumbent firms are larger than their European counterparts, even controlling for the sectoral composition of the economy (see also Bravo Biosca, 2010, Figure A4). It also indicates a more experimental approach to start-ups in the US. Smaller firms in the US get the resources to grow faster if the smaller scale initial experiments are deemed a success.

Given that there are very minor differences in market entry rates across the different countries, and larger incumbent firms in the USA, this indicates that policy makers should be concerned about **barriers to growth** for high potential firms in the EU, and not barriers to entry. European firms generally tend to have slower growth rates than their US counterparts, (although this is not true for all European countries) and are less likely to experience prolonged rapid growth, year on year, that leads to young large firms (Bartelsman et al, 2005). The key issue for policy makers is therefore not generating more small firms, but focusing on the small proportion of exceptional young firms that grow fast to become large firms. Such firms have been termed “Yollies” – Young Leading Innovators (Veugelers and Cincera, 2010).\(^4\)

The absence of as many young large firms may play an important role in explaining differences in productivity and R&D intensity between the US and Europe. European large firms do not underachieve with respect to their US counterparts when making comparisons within sectors. In fact, Veugelers and Cincera (2010:5) write that such firms often "outperform their US counterparts when comparing within sectors". However, they highlight that US yollies such as Amgen, Cisco, Google, Microsoft, Qualcomm and Sun are in high tech, high growth sectors. As a result, "almost all of the explanation for the lower R&D intensity of EU yollies can be found in a different sectoral composition" (Veugelers and Cincera, 2010a:3-5). This suggests that the crucial issue for Europe is encouraging the formation and growth of businesses in new, emerging “Schumpeterian” industries like ICT, clean tech, etc., that have the potential to disrupt existing business practices. Again these are sectors associated with ‘smart capital’ and professional equity investors.

There are various suggestions for why the US and the EU differ in their ability to generate the next generation of high impact firms. The rapid growth of young firms in emerging sectors is particularly vulnerable to market failures – related to asymmetric information, uncertainty, lack of collateral for R&D intensive firms, absence of reputation and lack of historical relationships with banks, market uncertainty, etc. The

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\(^3\) [www.oecd.org/sti/scoreboard](http://www.oecd.org/sti/scoreboard)

\(^4\) Although it should be noted that not all high impact firms are young, the average age of high impact firms in German data was 25 years.
US financial system may lower risk aversion for entrepreneurial firms with less collateral and limited cash flows (Bartelsman et al, 2005). Post entry restrictions on firms’ action in the EU may also make growth harder in the EU. US firms operate in larger capital and product/service markets and consequently reach a larger size while European firms operate in smaller national markets that are segmented by cultural barriers. The higher growth rates of European firms, and consequently the smaller equity investment market for such firms in Europe, may simply reflect lack of integration of markets within the EU compared to the US.

There are also differences in competition policy. The EU nations often protect national champions, while the US government policy adopts a proactive ‘dual sourcing’ approach to encourage competition and widely diffuse technology. American technology policy also tends to focus on building world class research in its university system, and developing technology within firms, while in Europe governments seek to develop technology in non-leading edge universities, leading to the development of ‘white elephant’ technologies poorly suited for either manufacturing or the market (Dosi et al, 2006). Lastly, there are considerable differences in skill levels between the US and the EU, and even larger differences within the EU. The US spends considerably more taxpayers’ money on higher education and research than the EU, and this investment translates into superior research, higher skill levels at the graduate and postgraduate levels, and therefore better innovative performance at the technological cutting edge (Dosi et al, 2006). The US has 4.64 academic papers per 1000 people, vs. 3.60 in the EU; 39.7 citations per 1000 population vs. 23.0 in the EU; and 0.09 papers in the top 1% of citations per 1000 population compared to 0.04 in the EU (Dosi et al, 2006).

In summary, the issue facing Europe is not just a lack of firms that rapidly grow large; there are wider problems related to a long tail of poor performance enterprises operating in fragmented uncompetitive markets and wide productivity differences across and within national states. For many European regions the more important issue is likely to be upgrading existing firms’ productivity, rather than seeking to advance the technological frontier. The relative lack of venture funding for European firms compared to the US may therefore simply reflect problems of demand. There may be smaller numbers of European firms worth investing smart-equity in, because they are low quality, there is not as much advanced science in Europe, and because they find it hard to grow due to external constraints and problems with human capital (in the firms, in their investors and in the ecosystem of professional advisors), rather than a problem with the supply of funds. In the UK, for example, public policy that has increased the supply of VC without properly addressing the capability of either VC funds or firms has had a limited impact (BVCA-NESTA, 2009). However, as we shall see later on, when attempts have been made to match improved capability in firms and funders with finance the results have sometimes been very positive.
3. Financial mechanisms for young innovative companies

Key Findings:

- The funding system for young innovative companies needs to be understood as an interconnected system comprised of different funders, providing different types of funding at different stages of the firm’s lifecycle.
- Both VC and Angel investors rely on a good deal flow of high potential investment ready firms, high value exit markets (IPOs & trade sales), professional advisors and skilled investment managers and entrepreneurs.
- Government support has been essential for the development and continued success of professional equity investments communities, in part because of the great difficulties involved in making commercial returns from early stage investment.
- Government policy can directly improve performance when it is aligned with market incentives and the commercial activities of VC funds. Consequently, policy that uses VC for social ends tends to be ineffective.

This study explores and appraises the main financial mechanisms in the US, Europe, Canada, Israel and Australia for stimulating new high technology businesses or "Yollies". The lifecycle of these firms can be linked to a sequential model of innovation development and funding (Auerswald and Branscomb, 2003:229). For example, for science intensive styles of innovation it might look like the Figure 1 that moves from research through conceptual invention, to early stage technology development (ESTD), then product development and finally production and product launch.

Different actors are involved in funding these different stages reflecting differences in the scale of their investments, the ‘smart money’ skills the investors have, and their ability to take on risks. During the early stages funding usually comes from research grants, corporate research, government agencies and funding councils, and personal assets of inventors. The main source of early stage funding is traditional banking services, through small-scale debt, through the use of credit cards, over drafts and loans. During Early Stage Technology Development firms receive money from Industry (31.6%); Angels (27.9%); Government (25.1%); VC (8%); State Governments (4.7%); and Universities (2.6%) (estimated low percentages from Auserwald and Branscomb, 2003:233). Lastly, funds to development and launch prototypes are obtained from VC and private equity funds, and from bank debt.

Figure 1: Innovation development and funding – science intensive model

![Innovation development and funding – science intensive model](image)

5 Their higher estimate broke down 47.2% Industry; 23.9% Angels; 20.5% Federal Government; 2.3% VC; 2.2% State Governments and 3.9% Universities (Auserwald and Branscomb, 2003:233).
These investors use different balances of investment instruments, reflecting their ability to assume risks and add value. Because equity investors, unlike debt investors, have no guarantee that their investment will be returned, equity investment transfers risk from entrepreneurs to investors. This provides equity investors with a significant incentive to support the firm to ensure that it is successful. This transfer of skill and support from knowledgeable investors – the ‘smart’ part of ‘smart money’ – is a key driver of performance, and is often highlighted by entrepreneurs as more important than the funds they receive (Cressy and Olofsson, 1997; Lindström and Olofsson, 2001; Sætre, 2003). Its importance remains under appreciated (BVCA-NESTA, 2009).

### 3.1 Private equity instruments- types of funding actors
This section reviews the role of various types of investors in providing private equity to Yollies. Figure 2 below summarises the 10 main forms of ‘investment vehicle’.

**Figure 2 Types of investors**

<table>
<thead>
<tr>
<th>Equity Funder Name</th>
<th>Characteristics</th>
<th>Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Informal Investors</td>
<td>‘Friends, Fools and Family’ providing a mixture of debt and equity to family members, work colleagues and friends. Unprofessional investment with limited added value and returns.</td>
<td>Early stage, small-scale investment, but very substantial in terms of the total amount of early stage investment.</td>
</tr>
<tr>
<td>Business Angels</td>
<td>Informal venture investment that is increasingly important to early stage investment. Covers a wide range of activities, some BA money is ‘smart money’ with significant added value.</td>
<td>Early stage, and geographically widely spread. Increasingly undertaking investment that was previously undertaken by VC.</td>
</tr>
<tr>
<td>Business Angel Networks</td>
<td>Increasingly professional networks of BA investors, who generate additional value added.</td>
<td>More professionally focused and better managed. Supporting high potential firms.</td>
</tr>
<tr>
<td>Venture Capital</td>
<td>Professional investors, who provide ‘smart money’ and significant value added for firms.</td>
<td>From seed to exit. Focus on high-tech sectors that can deliver the very high returns that the structure of VC funds requires.</td>
</tr>
<tr>
<td>Private Equity</td>
<td>Professional investors how provide risk capital for existing assets.</td>
<td>Later stage investment.</td>
</tr>
<tr>
<td>Hedge Funds</td>
<td>Professional investors, who overlap to a small extent with private equity but typically hold onto their investments over much shorter periods</td>
<td>Playing an increasingly important role providing short-term liquidity to high performance firms undertaking costly activities that add significant value.</td>
</tr>
<tr>
<td>AIM</td>
<td>A source of additional later stage rounds of equity funding for many UK and EU firms.</td>
<td>Later stage focus. Provides ‘dump’ money, and hence requires firms to boost their managerial capabilities in other ways.</td>
</tr>
<tr>
<td>Sovereign Wealth Funds</td>
<td>Idiosyncratic source of equity funding.</td>
<td>No clear pattern.</td>
</tr>
<tr>
<td>Charities</td>
<td>Charities involved in research, such as the Wellcome Trust in medical technologies, offer grants for high risk research. The charity does not expect a return; however, when the technology is commercialised the charity shares in the financial benefits.</td>
<td>Biotechnology and drug discovery focused. Increasingly important feature of the funding landscape, already producing successes.</td>
</tr>
<tr>
<td>Corporate Venture Capital</td>
<td>This involves equity investment by funds associated with large corporate enterprises that invest in order to access strategically important technologies.</td>
<td>CVC typically invest in biopharmaceuticals, software and ICT sectors.</td>
</tr>
<tr>
<td>Governments</td>
<td>States sometimes make investments in technology development in strategically important areas, typically via grants and public procurement contracts.</td>
<td>Strategically important areas and areas influenced by political negotiations.</td>
</tr>
<tr>
<td>Equity Funder Name</td>
<td>Characteristics</td>
<td>Focus</td>
</tr>
<tr>
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<tr>
<td>Hybrid Funds</td>
<td>In response to the repeated failures of government direct investments, states now co-invest with private sector investors in funds managed by commercial investment managers.</td>
<td>When well designed these hybrid funds have been effective in targeting smart capital to high potential firms. Badly designed funds perform poorly.</td>
</tr>
</tbody>
</table>

### 3.1.1 Informal Investors

Informal investors, often captured by the phrase ‘friends, fools and family’ play an important role in funding small firms and innovation. Mason (2006) integrated survey responses from 18 countries to estimate that 3.4 per cent of adults are informal investors and provide funding to small firms equivalent to 1.1 per cent of the GDP of their countries. Some 50 per cent of this informal investment goes to relatives; 20 per cent to friends and neighbours; 11 per cent to work colleagues; and 8 per cent to strangers (ibid). This amounts to between 60 and 90 per cent of total capital invested, including capital from institutional sources. Research suggests that this money is often unwisely invested (Shane, 2008) and most investment takes the form of debt.

### 3.1.2 Business Angels

Business angels can be defined as “high net worth individuals who invest their own money, along with their time and expertise, directly in unquoted companies in which they have no family connection, in the hope of financial gain” (Mason, 2006a). The term was coined in the early 1900s to describe wealthy theatre-goers who invested in theatrical productions to meet the theatre personalities they admired. The term was then transferred to the business context (Benjamin and Margulis, 2000:5) to describe an activity that had existed for a long time (Sohl, 2003), but became more significant after the 1950s. Today "a thriving informal venture capital market is a pre-requisite for a vigorous enterprise economy” (ACOST, 1990:41).

Angels are distinguishable from both ‘friends, fools and family’ investors and venture capital funds because they invest their own money and may be motivated in part by non-financial considerations that they trade-off against a lower financial return (Wetzel, 1981). Unlike informal investors, angels seek commercial returns and provide ‘smart money’ in the form of hands-on experience, knowledge and contacts. For example, Madill et al (2005) report that 57% of a sample of Canadian angel backed technology firms raised venture capital, compared to 10% of firms without angel backing.

Gaston (1989a;229) estimated that US angel investment “is more than double the next largest external equity source and eight times larger than professional venture capital commitments.” Similarly, Sohl (2003:37) suggests “between 300,000 and 350,000 angels are investing approximately $30 billion every year in close to 50,000 ventures”. By contrast, venture capital funds invest a similar amount in less than 3000 companies. In Europe angel activity is less developed and even in the UK is only half that of the USA. Even so, Mason and Harrison (2000a:144) estimate that angels “make nearly eight times as many investments as venture capital funds in early stage businesses”.

Angel funding plays a complementary role to VC funding, as Angels cost structures allow them to make investments below the minimum deal sizes considered by VC in early stage, seed and start-up firms. Business angels are also more widely distributed (Gaston, 1989) and make most of their investments within 50-100 miles of where they live (Harrison et al, 2009).

### 3.1.3 Business Angel Networks

Angel investing has been dominated by individual and small ad hoc groups of informal investors who typically make investments of under €100,000. Since 2000, Angel investing is becoming more organised into increasingly professional syndicates. This merging has reduced the number of networks. These professional networks have
published routines for accessing and screening deals, undertaking due diligence, negotiating and investing. They also generate better deal flow, due diligence, allow better investment diversification, make larger investments and follow-on their investments to avoid dilution over multiple rounds of investment over more extended periods of time. As a consequence, some professional networks are moving into areas of investing traditionally covered by VC. Research suggests professional Angel Network perform better than Angels.

Governments have been active in developing these Angel Networks, through Business Angel Networks (BAN) in the UK, NEBIB in the Netherlands, the SITRA Matching Service in Finland, the Vlerick BAN in Belgium, the Spanish UNIBAN, the Italian (IBAN) and the German (BAND) (Tochi and Murray, 2010:27). In 1999 the European Business Angel Network (EBAN) was created with 66 BANs in Europe. By 2010, the number of networks involved had grown to 298 (ibid). Such networks have also been channels for government co-investment, such as through the Scottish Co-Investment Fund, a passive investor, or the London Seed Capital Fund that invests through the London Business Angel Network.

There seem to be three models of BANs operating in Europe. The first, which is the most common involves business angel networks that are managed by a professional manager, typically appointed by an economic development agency, incubator unit or other organisation seeking to find investors. This has been called a ‘dating agency’ model by Colin Mason, and involves using the network to reduce search costs, but once introductions are made, the network steps back and lets the investors, who may not have worked together, undertake the investment.

In the second model, the role of gatekeeper is undertaken by an investment professional who can put larger deals together while getting a finder’s fee (i.e. 5%). This model can be appealing to passive investors, and therefore often does not provide valuable ‘smart money’. The investment professionals can also provide ‘investment readiness’ training to build up human capital. A third model, which is common in the USA, Australia and Scotland (see Case 1) involves investors working as a group or club, who collectively vote for investments and get behind the firms to provide them with smart capital. This means that more groups of investors get to look at a project as it is not tied to a particular angel network. This model tends to be more knowledge intensive, and consequently doesn’t require a paid investment manager. Moreover, the teams work together repeatedly to build up capability and trust allowing them to form more standardised deals more quickly. This provides firms and international co-investors with easier routes to effective due diligence. This structure also allows the networks to co-invest, either with government funds, or with syndicates of other investment institutions or networks. This may be more capital efficient, but requires considerable training that can take many years to build up (see Case 1).

Case 1: East of Scotland Objective 2 Programme 2000-2006

The East of Scotland Objective 2 programme (ESOP) was a formative policy in developing the current successful Scottish Business Angel community. Its focuses on both capital provision and addressing knowledge deficiencies. For example, many firms were seeking equity investment without understanding that it was not appropriate for them as they lacked the high growth potential required.

Initial support was given to two relatively small funds headed by professional managers. These were aimed at increasing the supply of funding and increasing its demand by publicising its availability to entrepreneurial firms. This demand side focus involved training investors and professional advisors about equity investment, and how to undertake effective due diligence, valuation, deal structuring, legal structuring etc. While business angels are often wealthy, (but often not super rich), and have business experience, they often still need training because they lack experience of investing in other peoples’ firms (so have to learn about due diligence etc), or of managing an investment portfolio (so have to learn about diversification of risk, retaining funds for follow-on investments, and focusing on potential exits).

On the demand side, additional funding for training addressed three distinct problems – poor quality business concepts that were insufficiently developed to be attractive to investors, poorly presented proposals that lacked depth, and the ability of entrepreneurs to find investors willing to invest. Training helped make early stage investing more attractive to other investors and improved the quality of the deals that were being made.

By 2003 the investment in demand side human skills and knowledge had reached a point where a number
of competent investors had increased and the funding instruments could move to a co-investment model. This involves replacing a central fund manager, with a pool of decentralised partners who make investment decisions, but do not receive a fee for doing so. The fund had a total value of some €126m to co-invest on a pari passu basis with the partners, which allowed the fund to under-take investments without having to manage deal flows, undertake due diligence, valuations, structuring or provide post-investment support. All of which could now be done by a number of established and trained angel investor groups.

The improvements in the performance of the firms and funds resulted from a balanced approach that addressed both supply side problems (lack of capital) and demand side problems (associated with under-developed firms, entrepreneurs, investors and advisors). The value of this approach can be seen by comparing the East of Scotland’s performance with the west of Scotland that faced similar economic circumstances and starting points but has not generated a self sustaining Angel networks capable of the sorts of successful Angel investment found in the East.

The main lessons to be learned from the Scottish experience are:

- Demand side problems associated with inexperienced investors and under developed firms need to be addressed alongside supply side problems associated with limited capital.
- Effective public policy can be generated with very limited financial outlays.
- Developing effective networks and building up their ability to develop firms can take many years.
- Expecting fund managers to engage in training while running a fund reduces their ability to engage with firms and is costly for the fund. Additional sources of funding will typically be required.
- Once Business Angel Networks are set up and reach a level of capability where they are self supporting, government support can be reduced and focused more on passive co-investment rather than active capability building.

### 3.1.4 Venture Capital

In Europe, Venture Capital (VC) often refers to risk capital, which down-plays the important ‘smart money’ role of VC investors in providing managerial support to firms. We therefore use the term in its American sense to refer to “the process of external equity finance provision by professional investors in a new or young (i.e. early stage) company to create new assets for the primary purpose of reaping substantial economic gain through a market flotation (initial public offering) or trade sale” (BVCA-NESTA, 2009). In this sense VC is a ‘form of corporate governance for putting together complementary assets’, where ‘complementary assets’ refers to the parts of a firm that allow it to capture the value of innovations (i.e. intellectual property, links to customers, production, marketing channels, etc).

Venture capitalists are professional investors who primarily invest equity for part ownership of a small/young business that they expect to have exceptional growth prospects and help the entrepreneurial management team grow the company towards a successful exit. VC can be characterised within the 8S framework: VC (BVCA-NESTA, 2009) is:

- Small as a percentage of the total number of investments in firms. Only a small cadre of high-growth companies as suitable for VC funding. Even in the USA only approximately 3000 firms get VC funding each year and only between 500 and 750 of these are start-ups (Shane, 2006:90). However, the larger size of VC investments (compared to Angel investments) means this small number makes up about 1.9% of US early stage investment (ibid). Even among high-tech, fast growth young firms in the UK and Germany in the mid 1990s only 11% received VC funding (Burgel et al, 2004).
- Skilled in its implementation. Because VC funding, unlike debt funding, transfers risk from the entrepreneur to the investor, it encourages Venture Capitalists to provide managerial support to entrepreneurs (Sapienza et al, 1996). The persistent superior performance of the top funds reflects this skill (Gompers, 1995), as does the poorer performance of unskilled and passive funds.
- Specialised as VC need to know a sector well to add value. VC is a costly form of capital, and is therefore concentrated in industries that develop innovations with exceptional commercial potential such as biotechnology and healthcare, information and communications technology, and green-tech.
Skewed in its returns. VC is the most skewed alternative investment asset class (even more skewed than Hedge Funds). The majority of profits come from the top quartile of funds, and within these funds most investments in a portfolio either fail, or make a negligible return (Murray and Marriott, 1998).

Scale intensive, as small funds, under €50,000, generally perform poorly (Murray, 2009; Murray and Marriott, 1998; Jääskeläinen et al, 2007). VC funds typically have a “2+20” structure where about 2% of the fund is used each year operating costs, and then when the fund ends, 20% of the profit, after investors have received their guaranteed returns, is shared with the fund managers. Two per cent of a small fund is often not enough to pay for a viable investment team and the infrastructure needed to find, evaluate, and support investee firms. Higher yearly percentages have a dramatic negative impact on investors’ returns. Small funds also find it harder to diversify risk over fewer investments and have difficulty making follow-on investments to maintain their ownership share, so their returns get diluted as new shares are issued.

Significant in its impact on the US economy despite its small size, as the Shane quote earlier highlighted (2008:162).

Systemic, as VC funds operate in a symbiotic way with other institutions that must also be present for the VC market to function well (see box below). These include (i) institutional investors prepared to accept high risks and skewed returns, (ii) good deal flow from a supply of high potential, investment-ready firms, (iii) supportive experts, managers and advisors such as lawyers, accountants, consultants and industry contacts, and (iv) viable exit routes that generate large enough returns for investors to justify the higher risks involved (i.e. either trade sales (particularly for computer, communications and media firms) or IPOs (particularly for life science firms)).

Supported by national governments, as it has been impossible to generate a viable VC industry without long-term support (Learner, 1999). The VC system is fragile and suffers from ‘simultaneity problems’ (Gilson, 2003; Gompers and Learner, 1999) because the different parts of the system are systemic and need to work effectively over long periods to build trust, managerial and entrepreneurial skill. Once this generates commercial returns for investors, they support new funds that support the next wave of entrepreneurial firms. As the following sections will show in the US, and increasingly in Europe, substantial and continuing government intervention is needed to ensure VC investment works effectively. The US Government took 50 years to build their VC system, and today spends roughly four dollars for every dollar of private VC investment in early stage technology development.

For a VC funding system to be effective a number of key elements need to be in place for extended periods. Given that the system can be ineffective if a component is missing, Government intervention has always been needed to set the system up and keep it working in an effective manner. The key parts of the system are:

- A stream of high potential, investment ready firms, with entrepreneurial management teams, capable of generating the high returns that VC investors seek.
- Skilled and specialised VC investors, who are able to provide managerial support as well as funding to firms, to help them grow.
- A liquid exit market for firms comprising both an IPO market and a trade sale market.
- Investors willing to invest in VC funds, which is mainly driven by the returns that investors can realise.
- Funds that are large enough to provide follow on funding and avoid dilution.
- An eco-system of supporting professional services firms, such as specialised lawyers, accountants and consultants.
3.1.5 **Corporate Venture Capital**

Capital (CVC) is an expanding area of investing that involves non-financial firms making equity investments in entrepreneurial companies. Large firms increasingly use such equity investments to acquire technology and build new competencies as part of a larger trend for firms to build competitive advantage using external resources. Levels of CVC have been historically relatively small compared to traditional VC. CVC funds often provide clear signals to other investors about the value of technologies to potential corporate customers. CVC investing gives large firms important information that they can use to guide their strategic technology investment. As a consequence, they can gain value from ‘failures’ if their involvement allows them to make faster, better strategic decisions about their own technology portfolios. In the USA CVC activity is now being undertaken by Government agencies such as the CIA and Department of Defence.

3.1.6 **Private Equity**

Private Equity (PE) investing involves the refinancing and restructuring of existing assets (rather than creating new asset) such as management buy-outs, buy-ins and other later stage development finance. Private equity funds invest across a range of areas, from late stage Venture Capital, through Mezzanine, to Buy Outs and Distressed assets. Given that PE has grown into a highly profitable asset class, in part due to the favourable tax environment it enjoys, governments rarely intervene to promote PE. In the USA PE and VC are distinct while in Europe the terms are often used interchangeably. This makes international comparisons difficult and generates considerable confusion, particularly if PE associations refer to themselves as VC when lobbying for favourable tax treatment. The effectiveness of this lobbying has made PE investment very profitable, which has attracted VC investors and institutional investors away from early stage investing.

3.1.7 **Hedge Funds**

Hedge funds used to be a distinct asset class from Private Equity (PE), but the boundaries between them are blurring. Like PE, hedge funds also invest in late stage Venture Capital, through Mezzanine, to Buy Outs and Distressed assets, but also invest in public securities to make quick profits through short term trades. Since Hedge Funds invest with higher frequency, their investors can assess their money faster and withdraw funds on a quarterly or yearly basis. PE funds by contrast typically lock-up investors’ funds for substantially longer periods. Hedge Funds mainly overlap with private equity in investing in distressed assets, but they are becoming important investors in some sectors as low frequency equity traders – for example, funding biotech funds with large amounts of money for very short periods of time as they move through value inflection points that have the potential to deliver substantial returns – higher even than VC funds seek. For example, moving from PI to PII stage of clinical trials in under 18 months. A potentially more important overlap is with Venture Hedge Funds (Baden-Fuller, 2005) that invest equity to access information about potential disruptions generated by new market entrants or technology. They then use this information to profit from the share price movements of competitors stocks. This type of investing is underdeveloped in the EU compared to the USA, and highly profitable ‘side bets’ of this kind are often used by Super Angels.

3.1.8 **AIM**

The Alternative Investment Market (AIM) in London was originally designed to be an exit market like NASDAQ. However, the market is now more focused on natural resources than technology and it has developed into a source of equity investment for firms seeking later stage funding rounds. AIM investors do not provide smart money, which requires firms to source advice that VC investors might provide externally (Baden-Fuller, 2010).
3.1.9 Sovereign Wealth Funds

Sovereign Wealth funds are investment funds that are owned and funded by sovereign nations, such as Norway, Qatar and Kuwait. Sovereign wealth funds are largely used to manage budgetary surpluses. However, sovereign funds can be used to invest in industries and technologies that are considered strategically important, which has raised public policy concerns about investments in high-tech new and established firms. Funds controlled by more informal networks, particularly in Gulf States, have been making smaller scale equity investments in European technology firms.

3.1.10 Charities

Medical charities are playing increasingly important roles in providing equity investment and support to biotechnology firms in the EU. They provide grants for technology development, recognising that most research projects are unlikely to be successes. However, for the small minority of successes, they seek to share in the financial benefits and recycle their profits to fund more research commercialisation. The Wellcome Trust in the UK is an example of a leading charity supporting drug discovery and development and providing smart money and advice to help scientific entrepreneurs either start firms or license their technology.

3.1.11 Governments

Governments sometimes make strategic investments in technologies and firms that they feel are important. In general, the picture is mixed about the results of these interventions, but it seems to be the case that governments are often very bad at ‘picking winners’ at the firm and technology levels (though sometimes successful at the sectoral level), because their investment decisions are influenced by non-commercial considerations.

3.1.12 Hybrid Funds

Hybrid funds are now the main source of venture funding for European early stage firms. They arose in response to the failures of direct government interventions in VC type investing. As a result, Governments increasingly co-invest with private sector in funds run by professional, private sector fund managers. These funds are explored in detail later in this report.
3.2 Types of public support for venture capital and Yollies

**Key findings:**

- Indirect measures in support of venture capital markets should aim at creating a transparent and simple legal framework in which investors can operate:
  - There is limited evidence on the effectiveness of tax provisions (front or back end) in encouraging investors and a relatively significant risk of deadweight loss.
  - It is important to resolve outstanding problems related to tax transparency (fund structures, double taxation).
  - The creation of a unified European new market and the lowering of the hurdle for high-growth companies that aspire to list their stock should be a priority.
  - Incentives to start and grow Yollies could be enhanced by further simplifications to the legal/tax environment for doing business (bankruptcy laws, stock options, etc.).
- Direct measures:
  - Hybrid funds should be well funded and investment professionals knowledgeable.
  - Regional Funds often perform extremely poorly and should be avoided.
  - Funds should not be constrained to specific funding gaps so as to enable ‘follow-on’ investments in high potential portfolio companies.
  - The evidence on tax incentives and guarantees is mixed but schemes that guarantee against VC losses should be avoided. Credit guarantee schemes are a better fit with the needs of Yollies.
  - Investor regulations (e.g. limiting the possibility for pension funds and insurance companies to invest in VC) need to be reviewed in a number of EU countries.

3.2.1 Indirect measures in support of venture capital markets

Indirect measures mainly relate to the creation of appropriate economic, institutional and legal frameworks within which markets can effectively channel resources to new and innovative enterprises (OECD, 1997). Such measures include:

**Tax transparency** – The principle of tax transparency prevents double taxation at the fund level, when it receives income or realises an investment, and when an investor receives income or capital from the fund. Certain fund vehicles are considered tax transparent in most European member states (e.g. limited partnerships in England, KG in Germany or CV in the Netherlands) and funds for joint account (e.g. FCPF in France, FCR in Spain or FCP in Luxembourg). The fund structures are however not a harmonised or fully regulated on a pan-European basis (EVCA, 2010).

**Tax provisions** – In theory capital gains tax rate should have an influence on the willingness of entrepreneurs to start up new businesses, but the empirical evidence is inconclusive. Governments such as Sweden and Denmark that have striven to maintain neutrality and have not introduced tax measures to spur venture capital activity do not seem to have suffered. Other European nations have adopted a range of tax incentives targeted at venture investors. These include front-end incentives or tax credits against personal or corporate income for investments in small companies and for qualified venture funds (e.g. the Enterprise Investment Scheme and the Venture Capital Trust Scheme in the UK; the Certified Capital Companies (CAPCOs) in the United States; the Labour Sponsored Venture Capital Corporations (LSVCCs) in Canada). Evaluations of these schemes have generally not been positive.

An alternative approach involves back-end incentives, which provide capital gains tax relief on profits realised from venture investments. Examples include the lower tax rate on shares of small business IPOs in the United States; certified venture firms in Korea, Portugal and Spain; and a capital gains exemption for foreign venture investors in Israel. Some countries also have tax deferrals for corporations and/or individuals to encourage rollover of capital gains into small firms or funds, e.g. Canada, the United States and the UK. However, these targeted tax incentives for venture investors can introduce added complexity into fiscal systems in the form of varied rates for corporations and individuals, types of assets, holding periods, types of investments, etc.” (OECD, 2005). Moreover, there is limited evidence of their effectiveness.
The role of tax policy in determining the incentives of individuals to start up new firms and of venture capitalists to finance and advise them is explored by Keuschnigg (2009) who identifies a positive relationship between increased level of entrepreneurship, high taxes on wages and low taxes on capital gains, leading him to support measures to incentivise young innovative firms with a potential for high growth. Unfortunately, he is unclear about how they might be identified ex ante, and therefore is unclear about how to avoid the substantial dead-weight problems of such policy interventions.

One interviewee noted that the tax authority discriminates against Finnish businesses’ choice of investment. If they “flipped” their ownership to a US company, it would be seen as a taxable event. Not so, if the ownership was “flipped” in to any EU nation’s legal entity. Thus the barrier for US VC’s to invest in Finnish business has been increased unnecessarily, as they would prefer to invest in a US vehicle. An “up round” after a “flip” to the US would then cause significant taxes to the initial shareholders and options holders, despite a financing round not being a liquidity event. Hence, changes in public policy are often required to avoid distorting investors decisions.

**Intellectual property protection** – Intellectual property (IP) is a core asset for many high potential firms (Nuechterlein, 2000). Consequently, the ability to process patents in a timely and efficient manner and have effective patent enforcement is important to their commercial success (OECD, 1997). IP provides entrepreneurs and venture capitalists with a signal about the quality of the firm and the ability of its business model to capture value. Effective IP protection regimes help young firms avoid expensive and time consuming legal proceedings. Consequently, increased venture capital activity and higher patenting rates tend to correlate (Kortum and Lerner, 2000). For this reason has EVCA identified integrated, clear and efficient system for property rights as one of the action-oriented priorities and measures needed to achieve the Lisbon objectives. As they state, a working IPR system is of “particular concern for VC funds whose investees, [high-growth, innovation-oriented companies], have a high propensity for patenting” (EVCA, 2005).

Unlike the USA, patent protection in Europe and Asia is not as strong (Nuechterlein, 2000). In Europe, protecting an invention remains expensive (EC, 2010a) and the European Commission has sought to improve patent protection. Two recent regulations involved the creation of a unitary patent protection system in Europe and secondly improvements in the applicable translation arrangements (European Commission, 2011a).

**Capital markets** – Appropriate exit mechanisms are crucial for a well-functioning venture capital market (Da Rin, Nicodano and Sembenelli, 2006). Indeed, exit provides an important benchmark of the profitability of venture capital relative to other investments (OECD, 2005). Unfortunately, Europe does not have an exit market equivalent to Nasdaq despite several attempts to build one. This reduces the opportunities for successful exits and hence negatively affects fund-raising cycles. Other non-European countries have also sought to build stock markets that provide exits for venture investors. For instance, in 1999, the Canadian stock exchanges and Government consolidated and specialised the Canadian exchanges and created a small

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6 The model also points towards the role of success taxes (such as corporate taxes, dividend and capital gains taxes) in discriminating against VC financing, compared to pure bank financing.

7 For example, patent lawsuits cost about $500,000 per claim if brought to trial, and trade secret suits cost from $300,000 to $500,000.

8 The Alternative Investment Market (AIM) in London began trading in 1995, followed by Le Nouveau Marche in France; the German Neur Market and the Belgian New Market in 1997; etc. AIM is now a market focused on mining. Similarly, the Swedish-based Nordic Growth Market established the Nordic MTF in 2003 to provide a common platform for trading small unlisted companies.
cap IPO market. This model has been praised in the 2001 Start-up America report ‘Reducing Barriers’ which called for a ‘light version of Sarbanes-Oxley’ to be introduced and for a smaller cap market such as the Canadian publicly-traded market for small shares of VC funds. In short, the improvement of the fragmented European stock market environment and the lowering of the hurdle for high-growth companies that aspire to list their stock is considered a main impediment to a well-functioning innovation ecosystem (EVCA, 2010).

Bankruptcy laws – Effective liquidating strategies for instances when an investment does not perform as planned are as important as appropriate exit channels for VC firms. Sanctions for delay in filing insolvency, encouragement of involuntary bankruptcy by parties other thancompany’s managers and loss of control over the firm in liquidation after the bankruptcy has been filed are all impediments for entrepreneurs setting up a “high risk-high growth potential” venture (Gregoriou et al, 2007).

Stock options – For many entrepreneurs, stock options represent a large part of their financial incentive. Securities rules governing the issuance of stock options, and fiscal rules determining their taxation, influence whether investors (informal investors, business angels or venture capitalists) find it sufficiently attractive to risk investing in a young innovative company (OECD, 1997). In general, in the EU, even countries like the UK, are considered to have less incentivising stock-option tax regimes than the US (EVCA, 2005).

Information flow and education – Governments can improve the dissemination of information by putting those seeking financing in touch with possible investors. They can publish directories of venture capital sources or support the development of business angel networks to improve the flow of informal venture capital from wealthy individuals to innovative start-ups (OECD, 1997). This type of government support is described in detail in section 3.1.3. Other, type of government initiatives relate to entrepreneurship education for both investors and investees and an overall creation of VC ecosystem (see section 3.3).

3.2.2 Direct measures in support of venture capital markets

Direct public measures consist of government-funded schemes that result in higher supply of venture capital financing for young innovative firms. The beneficiaries of such investments can be venture capital firms and/or young innovative companies directly. The instruments can be grouped into three main categories: direct supply of capital to venture capital funds or small firms; financial incentives to investing in venture capital funds or small firms; and investor regulations determining the types of investors in venture capital taken the form of financial incentives, but also include more high-risk equity investments and government loans (OECD, 1997).

Direct supply of capital can be provided through government equity investment (e.g. early years of operation of the Investment Company for Flanders (GIMV) in Belgium) or through low-interest, long-term and/or non-refundable loans to VC firms or SMEs (e.g. VækstFonden in Denmark). One specific type of such support are funds that receive government investment, but where investment decisions are made by private VC partners – ‘hybrid’ funds (see next section).

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9 In 2000, the main stock exchanges in Canada (the Montreal Exchange (ME), the Toronto Stock Exchange (TSX) and the Alberta Stock Exchange) were restructured. The trading of senior securities was consolidated on the TSX, while the TSX Venture Exchange specialises in trading junior securities.

10 Some countries, such as the US, organise the bankruptcy process to facilitate reorganisation and the pursuit of activities under the direction of the incumbent management team. Others, such as France or Belgium, support the claims of creditors and owners, favouring an orderly liquidation under the supervision of a court-appointed trustee, a sale-of-assets route to bankruptcy (Leleux & Surllemont, 2003).
**Financial incentives** include tax incentives, particularly tax credits to those investing in young innovative companies or VC funds (e.g. Venture Capital Trusts in the UK); loan guarantees, to guarantee a proportion of bank loans to qualified SMEs (e.g. Sofaris in France); equity guarantees, to guarantee a proportion of the losses of high-risk VC investments (e.g. Finish Guarantee Board). The effectiveness of these schemes varied. Credit guarantee schemes are a particularly good fit for support of Yollies because of their simplicity and relatively low risk for public finances.

**Investor regulations** to allow institutions such as pension funds or insurance companies to invest in VC (e.g. modifications to Employment Retirement Income Security Act in the US) are an additional incentive. However, in certain EU countries there are qualitative and/or quantitative restrictions impeding or limiting investments by pension funds and insurance companies. For example the Czech Republic, Romania, Slovakia and Slovenia all place some form of restriction on pension funds while Austria, the Czech Republic, Hungary, Italy, Latvia, Luxembourg, Slovakia and Slovenia have restrictive regulations for insurance companies (EVCA, 2008). One interviewee went as far to argue that pension funds should be obliged to invest a mandatory small portion of their funds in early-stage funding vehicles.

### Figure 3 Public funding instruments

<table>
<thead>
<tr>
<th>Indirect Measures</th>
<th>Direct Measures</th>
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</thead>
<tbody>
<tr>
<td><strong>Name of the instrument</strong></td>
<td><strong>Characteristics</strong></td>
</tr>
<tr>
<td><strong>Tax transparency</strong></td>
<td>Efficient tax structure for investments in private equity and venture capital, prevention of double taxation.</td>
</tr>
<tr>
<td><strong>Tax provisions</strong></td>
<td>Capital gains tax rate.</td>
</tr>
<tr>
<td><strong>Intellectual property protection</strong></td>
<td>Processing patents in a timely and efficient manner and having an effective enforcement system for patent protection.</td>
</tr>
<tr>
<td><strong>Capital markets</strong></td>
<td>The existence of appropriate exit mechanisms.</td>
</tr>
<tr>
<td><strong>Bankruptcy laws</strong></td>
<td>Effective liquidating strategies.</td>
</tr>
<tr>
<td><strong>Stock options</strong></td>
<td>Securities rules governing the issuance of stock options, and fiscal rules determining their taxation.</td>
</tr>
<tr>
<td><strong>Direct supply of capital</strong></td>
<td>Government equity investment or low-interest, long term and/or non-refundable loans.</td>
</tr>
<tr>
<td><strong>Financial incentives</strong></td>
<td>Tax credits to those investing in SMEs or VC funds, loan guarantees, to guarantee a proportion of bank loans to qualified SMEs, equity guarantees, to guarantee a proportion of the losses of high-risk VC investments.</td>
</tr>
<tr>
<td><strong>Investor regulations</strong></td>
<td>Permission of institutions such as pension funds or insurance companies to invest in VC.</td>
</tr>
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#### 3.2.3 Hybrid (public-private) models

Many VC funds have found it difficult to make commercially viable returns from early stage investment and have moved to larger, lower risk later stage investment. This reduction in early stage funding has created an ‘equity gap’ that Governments in virtually every major economy have attempted to address (Bottazzi and Da Rin, 2002; Lerner, 2002; Murray, 2008). The extent of the problems making commercial returns in early stage investing has generated a dramatic decline in private investment in early stage funds, so that hybrid funds are now the largest body of investors in early stage equity in Europe.

These interventions are justified in terms of the market failures that emerge because investors rarely appropriate all the benefits from innovations. These spill-overs (Griliches, 1992) cause private returns and public benefits to diverge leading to socially suboptimal levels of investment (Cressy and Olofsson, 1997; OECD, 2004; EC, 2005; Toschi and Murray, 2009:23). Low levels of equity investment can also be caused by VC’s high transaction and running costs, high firm risks and limited exit...
options on the supply side. Similarly, on the demand side, equity investment can be low because entrepreneurs are poor quality, cannot present their business plans well to investors, have limited understanding of equity, and do not wish to cede control of their firms (Toschi and Murray, 2010).

Improving the supply of equity and particularly smart equity is not easy. Government VC funds have been tried and largely abandoned because public officials are subject to political influences and make poor investment decisions (Murray and Maula, 2003; OECD, 2004). Guarantees and subsidising management costs weaken fund managers' incentives to make good investments and signal institutional investors that VC investing is not commercially viable (Murray and Harrison, 2003:857). As a result, today, government involvement typically takes the form of capital participation where Governments invest as a special Limited Partner in a fund managed by a commercial VC or as a co-investor with VC firms. The commercial VC takes responsibility for commercial investment decisions (OECD, 2004). Such funds are termed 'hybrid' funds (OECD, 2004). Investment can either be on a par with private sector investors, or the returns to the public investors can be either capped and/or 'subordinated' so that the public funds take the first loss (DTI, 1999, para 2.5). Schemes can therefore involve downside protection against losses or upside leverage of private Limited Partners' investments (Jääskeläinen et al, 2007). Upside leverage is often preferable as it incentivises success, although protection against losses may be needed during early policy interventions before investors skills levels have developed.

Examples of such hybrid funds include the Australian Industry Investment Fund, the German High-tech Gründerfonds, the Israeli Yozma programme and the New Zealand Venture Investment Fund. These schemes provide both funding and a certification effect to attract private sector investment. Early schemes were often poorly designed and underfunded, making them commercially unviable. The EU Seed Capital Fund Scheme in the early 1990s, for example, had funds so small that a number of funds would exhaust their investment capital in less than five years even if they did not make any investments (Murray, 1998; Mason and Harrison, 2003:862).

In the early 1990s public policy increasingly recognise the complementary role of the informal 'Angel' VC market, particularly in geographic and investment areas that traditional VC was not active in. Mason (2009) highlighted six interventions that were used to support Angel type investing – fiscal incentives, networks, new securities legislation, capability building (of both investors and entrepreneurs) and co-investment schemes.

Expectations that these interventions would have a catalytic effect and allow the State's role to be gradually reduced over time have proved to be overly optimistic. The difficulties of making money from innovation are now better recognised and today ‘there is little practicable possibility of the state completely abandoning its active support role in the venture capital market’ (Toschi and Murray, 2010:3).

Case 2: Regional Venture Capital Funds (RVCFs) (UK)

The Regional Venture Capital Funds (RVCFs) were an England-wide programme designed to ensure that small and medium size enterprises (SMEs) with growth potential in every English region had access had access to risk capital funding. The schemes were targeted originally in amounts up to £500,000, but this was later increased to £660,000. Nine funds were set up between 2002 and 2003, with the majority of investments made by the end of 2008. The funds were managed by professionals on behalf of the UK Department of Business Innovation and Skills, the European Investment Fund, and institutional and private investors.

The funds had an additional aim of demonstrating to private investors that commercial returns can be made by investing in the SME equity gap, to address a policy objective of promoting the private sector venture capital industry in the UK. The funds are regionally bounded and run as ten to twelve-year Limited Partnership Agreements. The total size of the scheme was £244 million with the average fund size of £25 million. By 2008 they had made 358 investments (with a total value of £127 million).

At the time of their establishment strong concerns were raised that the policy was poorly designed. Mason and Harrison (2004) highlighted that the funding gap had been poorly identified and was being addressed by Angel investors, that the scheme paid no attention to the lack of demand for capital. They highlighted that at the time the schemes were being set up VC funds were complaining of a lack of good firms worth
investing in, rather than a lack of money. As the RVCFs were implemented some had to return money to investors as they could not find firms worth investing in. They also highlighted strong concerns about a lack of human capital and investment capability within the funds, given the lack of professional active VC investing in the past. The funds were often managed by finance professionals with limited understanding of the entrepreneurial process, and limited ability to add value.

The RVCFs have recently been evaluated on behalf of BIS by Cowling et al (2011). The findings are that their performance has been extremely poor, suggesting that Mason and Harrison (2004) had been correct in their concerns. Using a full data set and advanced econometric techniques Cowling et al find that:

- Survival is substantially worse for RVCf backed firms than for other hybrid funded firms. The firms are more likely to be in liquidation and more likely to be at risk of liquidation. This reduction in likelihood of being alive is approximately 25%.
- In contrast to all the other schemes RVCF firms, compared to matched controls, achieved much poorer effects in terms of increased assets.
- Investments through the RVCF scheme had no impact on employment.
- The scheme had no positive impact on GVA
- The returns to the government through both direct and indirect routes were extremely poor. The RVCF scheme generated a loss of approximately 0.94 for every £1 invested even when taking into consideration additional revenue generated by increased levels of taxation.

The main lessons to be learned from the RVCF experience are:

- Do not constrain funds to regions. Regions in the UK are too small to support a viable VC fund.
- Do not constrain funds to small ‘equity gaps’ so that they cannot follow on.
- Ensure that funds are professionally managed, and large enough to be commercially viable.
- Do not mix social and economic policy.
- Financial professionals involved in distributing regional funding do not have the correct skills to actively manage a VC fund that adds significant value to its investee firms.
- Recognise that only a small number of firms need VC style investment, as it is a costly form of capital.

The lessons of recent evaluations of hybrid funding schemes were captured in a study undertaken by the British Venture Capital Association and NESTA (2009). These lessons can be summarised as:

- Hybrid funds should be well funded and investment professionals knowledgeable.
- High quality deal flow and human capital development is essential.
- Regional Funds often perform extremely poorly and should be avoided.
- Constraining funds to invest within funding gaps can prevent them generating commercial returns as it prevents them ‘following-on’ their investments in high potential portfolio companies through syndicating with later stage VC funds.
Case 3: Enterprise Capital Funds (UK)

Enterprise Capital Funds were launched in 2006 in the UK, building on substantial hybrid fund experience, to address a market weakness in the provision of equity finance to SMEs requiring up to £2 million and can provide a good commercial return. Government funding is used alongside private sector funds. The funds focus on provision of capital, improving human capacity in the industry and increasing private investor confidence. They are designed to provide a prioritised fixed return to the Government. The funds themselves are structured as fixed life English limited partnerships (LPs) and are managed by professional fund managers (GPs), with overall scheme co-ordination managed by Capital for Enterprise Ltd (CfEL). They invest equity or quasi-equity (Mezzanine) capital.

ECF investments are not restricted to particular sectors or geographical areas, but most focus on seed, early stage and expansion phases. There is no maximum fund size for an ECF, but the Government will commit no more than £25 million to a single fund. Current ECF fund size ranges from £10 million to £30 34 million with an average of about £26 27 million. With respect to each deal, there is no lower limit but ECF may not invest, or agree to invest, more than £2 million (first and subsequent investments) in a single company, and where public funding must not exceed 2/3 of the total investment value.

Cowling et al’s (2011) evaluation suggests that the funds have performed very well. They are strongly focused in technology areas, with 43% of the investee firms in high tech sectors. This compares to only 12% for RVCFs. The evaluation found:

- ECF backed firms had a 21% greater chance of being alive than matched controls.
- ECF funding had a significant impact on total assets of the investee firm which went up £369,000.
- ECF funding increased the employment of the investee firms by 3.3. people compared to the control firms.
- ECF funded firms had improved sales growth in the medium term (though not short term).
- ECF had a significantly positive impact on GVA, with each £1 invested by the government generating an estimated additional GVA of between £8.20 and £8.70.

The main lessons to be learned from the UK experience are:

- Well designed hybrid funds can have a significant positive impact on the performance of firms that substantially exceed their cost to the taxpayer. Given that governments find it much easier to benefit from investments in innovation than investors, this strongly suggests well designed hybrid schemes are effective public policy. By contrast the experience of the RVCFs suggests poorly designed schemes are very poor policy.
- Effectively incentivising private sector investment managers can generate effective policy.
- Do not mix social and economic policy.
- A government owned, but arms length fund manager, Capital for Enterprise Ltd, seems to have been a very effective way of ensuring that private sector expertise can be used to channel public sector funds without political interference in investment decisions.
- Effective evaluation, flexible policies and policy learning can generate substantial improvements in performance.
- A strong focus on financial returns is potentially a more effective way of indirectly achieving other policy aims, such as employment generation that direct measures that work against private sector incentives. The UK High Tech Fund of Funds for example generated additional jobs at the extremely low cost to the government of £1,900, without having a specific focus on job creation.

3.2.4 Other forms of public (financial) support for Yollies

At national level, member states provide grants to SMEs, to engage in R&D projects in areas of science, engineering and technology that are considered strategically important. These grants tend to be available to single companies, have a maximum budget and cover a percentage of project costs. This percentage varies from programme to programme, depending on the type of beneficiary and the needs of the programme to comply with State Aid framework. Generally the grants available to individual SMEs represent three different types of projects:

- **Proof of Market** – this involves funding for market research and testing, competitor analysis, intellectual property issues, as well as planning costs associated with taking the product or service to market.
- **Proof of Concept** – this involves funding feasibility studies, prototyping, testing, protection of intellectual property and analysis of likely production techniques.
• **Development of prototype (demonstrator project)** – this involves funding demonstration models, protection of intellectual property, any trials or testing (including market testing) required.

In addition to these three types of grants, there are also initiatives that enable businesses to bid for public sector contracts to develop innovative technology products and services. Such schemes include, for example, the UK Department of Health’s Research and Development programmes (BusinessLink, 2011) or Small Business Innovation Research (SBIR) programme in the US. On both, national and EU, levels there are also pre-competitive R&D programmes to encourage collaboration or consortium-formation between academic institutions and industrial companies. The policy rationale is generally based on a market failure argument: as pre-competitive R&D is an uncertain and risky activity, the results cannot be fully appropriated by any single organisation due to the public good nature of its output. Therefore, subsidies are necessary to provide incentives to private investment and reap the collective benefits of collaborative R&D in order to create critical mass, share costs, pool risk and internalise knowledge spill-overs (Roediger-Schluga & Barber, 2006). However, more recently, the acceptance of innovation as a complex, interactive learning process that involves a variety of actors and a need for functioning innovation system. This has led to more complex policy mixes where grants and non-financial support for individual companies or clusters are complemented by demand side policy instruments (lead markets, SBIR type instruments, etc.) and linked to seed, early-stage and growth capital mechanisms. Scottish Enterprise has developed such a model in the form of a pipeline of innovation support starting from its successful proof of concept programme (Inno-Partnering Forum, 2011b).

Over the last two decades, **R&D tax credits** have grown to become one of the major instruments used by many governments to encourage business R&D activities (including those of young innovative companies). They are primarily a tax relief for research and development, which aims to achieve a scientific or technological advance. There is a great diversity in the schemes introduced, particularly in their form and general design features (EC, 2006). The form of R&D tax credits can be volume-based or incremental - applying the tax incentive to the volume of R&D spending or to the increase over a previous year (CREST, 2006). Some design features built into the schemes are for example: targeted eligibility (for example only small firms and cooperative public/private research); different rate of relief depending on type of beneficiary; and the definition of R&D (OECD, 2002). In 2005, the European Commission supported making of a how-to guide for policy-makers looking to implement an R&D tax incentive package for young and innovative companies. It described in some detail the instruments at hand, case-studied the development in France and two years later resulted in a report, by the biotech industry associations from Estonia, Finland, Norway and Sweden, proposing new business wide R&D tax incentives for young innovative companies. For each of these countries have the contributors proposed the level and type of tax incentive (Estonia, Finland and Sweden proposed reductions in the payroll taxes for Yollies, Norway proposes an improved tax credit for Yollies) (YIC Status, 2007). “Other forms of tax breaks that are broadly available include capital allowances for investment in equipment and premises, and stamp duty relief in disadvantaged areas” (BusinessLink, 2011).

One non-European example is the Angel Investors Tax Deduction Scheme in Singapore, an incentive that aims to stimulate business angel investments into Singaporean-based start-ups and encourage more angel investors to add value to these start-ups. The scheme will be effective for qualifying investments made from 1 March 2010 to 31 March 2015. An approved angel investor who invests a minimum of S$100,000 in a qualifying start-up within a given year will enjoy a tax deduction at the end of a two-year holding period based on 50% of his investment cost, subject to an annual cap of S$500,000 of investments. The tax deduction will be offset against total taxable income.

In practice it is often challenging to evaluate R&D tax incentive schemes. According to the European commission (2006) relatively few such schemes have been evaluated
due to their relative newness and the lack of adequate data. That said, the available data was found to be more limited for smaller companies (Oxera, 2006). From a public consultation on R&D tax credits, one of the key messages was that “the schemes are generally well liked and seen as making a positive contribution to ensuring the UK is a place where high-growth, high-tech and innovative businesses can thrive” (HM Treasury, 2011).

Figure 4 Other forms of public financial support of Yollies

<table>
<thead>
<tr>
<th>Name of the instrument</th>
<th>Characteristics</th>
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| **Research Grants**    | • Proof of Market - funding market research and testing, competitor analysis, intellectual property issues and planning costs associated with taking the product or service to market.  
  • Proof of Concept - funding feasibility studies, prototyping, testing, protection of intellectual property and analysis of likely production techniques.  
  • Development of prototype (demonstrator project) - funding demonstration models, protection of intellectual property, any trials or testing (including market testing) required. |
| **Pre-competitive R&D** | • Mainly directed at encouragement of collaboration or consortium-formation made up by academic institutions and industrial companies. |
| **R&D tax credits**    | • A tax relief for R&D activities, which aims to achieve a scientific or technological advance. |

3.3 Non-financial instruments: creating an ‘investor eco-system’ for Yollies

Financing is just one part of the wider system that supports high impact firms. Other elements of the system might include proximity to research universities, a mix of large firms and start-ups, an international talent pool, and an effective mix of private and public sector funding. Wider cultural issues can also play a role, in Israel, for example, economic success has been linked to a culture that combines individualism, egalitarianism (a penchant for organisational flatness) and nurturing11, even if Israel has also suffered from a recent dip in funds raised as noted above. Another example is the case of Singapore where new development in water technologies and medical technologies are partly in response to well-publicised national political goals to solve Singapore’s water shortage challenges and to become the regional medical hub. Success in fostering start-ups may also be linked to the presence of multinational firms’ R&D units and their linkages to local research centres and universities. In short, regional or national “start-up eco-systems” require a ‘special’ concentration of factors.

Important non-financial supports of the eco-system for high impact firms include:

• Start-up community building and networking;
• Technology incubators and start-up accelerators;
• Entrepreneurship education;
• Professional communities: venture capital & private equity associations, business angel clubs and networks;
• Regulations and tax incentives, pre-competitive public procurement; (see section 3.2.4)

• Inter-linkages between venture capital, educational & research hubs and development of Yollies (see section 5.2).

**Start-up community building and networking.** Entrepreneurship is strongly related to community building – entrepreneurs often interact, learn and grow in like-minded communities. Historically, this community building has taken place in university campuses, in science or technology parks close to them and/or in different incubators. Increasingly, it is happening also virtually and perhaps much less formally. Today’s start-up world is global by its nature supported by dedicated media (e.g. [http://techcrunch.com/](http://techcrunch.com/) or [http://www.arcticstartup.com/](http://www.arcticstartup.com/)) and investor networks (formal and informal, consisting of professional investors and/or business angels).

For instance, in the Baltic Sea region there are many different initiatives and places boosting networking (e.g. Aalto Venture Garage [http://aaltovg.com/](http://aaltovg.com/) and/or idea-generation phase (e.g. Garage48 [http://www.garage48.org/](http://www.garage48.org/) or Startup Sauna [http://startupsauna.com/](http://startupsauna.com/)) of start-up entrepreneurs with growth ambition.

**Technology incubators and start-up accelerators.** There were more than 800 business incubators in Europe already ten years ago which can be broadly divided into two segments: first, “Multi Purpose Incubators” focused on general business support, and, second, “Specialised Incubators” focused on certain technological areas (information technology, biotechnology, etc) or the carrying out of goals of their founders (pre-incubation in case of educational institutions, development of innovative ideas in case of business entities)\(^\text{12}\). Whether a multi purpose or a specialised incubator, its main idea is to provide entrepreneurs with a supportive environment to help establish and develop their projects. By providing services on a “one-stop” basis and enabling overhead costs to be reduced by sharing facilities, business incubators can improve the survival and growth prospects of start-ups and small firms at an early stage of development. Indeed, too many of these incubators have remained mostly office & facility providers with relatively weak soft support in terms of mentoring, business model developing advice, fundraising and networking assistance.

Over the past six years, a new method of incubating technology start-ups has also emerged, driven by investors and successful technology entrepreneurs: the accelerator programmes\(^\text{13}\). The underlying philosophy behind these programmes is that pre-seed start-ups become successful ventures with the coaching of the region’s/world’s best serial entrepreneurs and investors. Examples of these include **Y-Combinator** and **Techstars** in the United States and **Seedcamp** and **Springboard** in Europe. The number of accelerator programmes has grown rapidly in the US over the past few years and there are signs that more recently the trend is being replicated in Europe. There are currently dozens of accelerator programmes in the US that are funding hundreds of start-ups per year. There have already been a number of high profile start-up successes from accelerator programmes. However, there is a ceiling to the number of accelerators because societies just do not have enough experienced mentors. Therefore, activation of entrepreneurs in residence, former financial and business leaders should be widespread across Europe.

**Entrepreneurship education.** Start-ups often require fundamentally different skill-set from traditional management education. Start-ups often have different metrics from large companies – such as customer acquisition cost, customer lifetime value, average selling price/order size, monthly burn rate, etc (traditional accounting looks at balance sheet, cash flow statement and income statement). Entrepreneurship

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\(^\text{13}\) Miller, P & Bound, K. (2011), The Start-up Factories: The rise of accelerator programmes to support new technology ventures, NESTA, UK.
education is, therefore, distinct from management education, and has more focus on creativity and innovation, technology business model testing, patent law, global marketing, and finance/fundraising. There are a number of good European examples of graduate education in entrepreneurship. For example, the Kaospilots (http://www.kaospilot.dk/) an experimental school in Denmark where students learn how to build a viable business. A similar interdisciplinary approach of university education is pioneered by Aalto University, Finland (http://www.aalto.fi/en/) which aims to create a new multidisciplinary science and arts community by bringing together three existing universities of technology, economics and art. A third example is Ecole Européenne des Métiers de l’Internet (EEMI), a European Internet Start-up School opened by French Internet entrepreneurs in 2011 (http://www.eemi.com/).

Professional communities: venture capital (VC) & private equity (PE) associations, business angel clubs, networks and education. A typical aim of industry associations is to foster greater understanding of the role of venture capital. These professional bodies act as community building organisations, they disseminate best industry practices, provide courses, collect statistics, help in syndication, interact internationally, act as lobby organisations towards government and funding institutions (including limited partners), etc.

As European VCs in general tend to be less hands-on than VCs in the US. To raise the number of good VC firms, their performance and fundraising abilities, requires both, more short and long term educational programmes related to VC industry. Take for example, VC/PE executive education programmes at Harvard Business School (http://www.exed.hbs.edu/programs/pevc/Pages/default.aspx) or longer term and VC education programmes like the Kauffman Fellows Program (http://www.kauffmanfellows.org/curriculum.aspx). The latter provides a structured, experiential curriculum with the purpose of identifying, developing, and networking the next generation of venture capitalists. Hence, there is a case for a European flagship VC education programme with strong US/international linkage.

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14 Aalto University was established on 1 January 2010, by the merger of the Helsinki University of Technology, the Helsinki School of Economics, and the University of Art and Design Helsinki.
4. The availability of venture capital funding for young innovative companies: a comparative analysis

Key Findings:
- There are considerable differences between venture investing in the US and the rest of the world, not least because the US VC market is twice the size of Europe's.
  - US funds tend to be larger (approximately twice the median fund size of European funds), make larger numbers of larger investments (approximately twice as much) in more firms than European funds.
  - They are also more professional, as they are more specialised and syndicate more.
- The superior historical performance of US VC the long term approach the US Government has taken towards supporting the industry and co-ordinating the large number of actors that must work together to create an effective venture investment system.
  - It has taken the US 50 years to generate its current VC eco-system and this has required large scale and continuing support.
  - On the demand side, the US spends significantly more on higher-education related research (2.4% of GDP), but leaves investment readiness training to the private sector, while the Europeans spend much less (an average nearly half the US figure of 1.3% of lower GDP) and often fund investment readiness training through the state.
- The European venture investing community is improving fast and seems to be effectively learning from the US and its own policy experiments.

This section compares the venture funding markets in Europe, the US, Canada, Israel and Australia. Such comparisons are subject to potential biases because of poor quality data, and international differences in definitions of VC, and where the boundaries lie between VC, Angel and Private Equity investing (Maats et al. 2011). Fund performance reflects the quality of the VC industry and the quality of the investee firms, which differ substantially within and across nations, so international comparisons of VC performance that do not control for firm quality can be misleading. Funds' performance also follows a well established 'J' or Hockey curve, which can make comparisons difficult. Consequently, while individual comparisons should be treated with caution, collectively they present a consistent picture.

4.1 Europe

Europe includes firms and nations of varied economic performance and financial requirements. It has a sophisticated economy, high living standards, productivity levels per hour worked that are often superior to the US, a global financial centre (London) and many of the world’s most innovative firms. Consequently, it is not clear that the financial system is necessarily under-developed in much of Europe. As this section will show, the problems it faces are often not so much lack of capital, but that Europe like the United States is still developing the infrastructure needed to regularly produce commercial returns from venture investing. At the end of 2010, while the most successful VC funds in the top quartile show strong performance most European

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15 Similarly, the definitions of seed, early stage and growth stage investment are not standardised, which complicates analysis because investments grow in size from seed funding to exit. Missing and under-reported data is a problem at the extremes of poor performance, where releasing performance data would be commercial suicide for many funds and high performance where many very successful VC investors are not members of the VC associations that aggregate data. Industry definitions, statistical methodologies and the time periods under review also differ across countries (CVCA, 2009;26) which is a problem because the VC industry goes through boom and bust cycles. Also, a distinction should be made between venture capital funds raised and venture capital funds invested, because the former may remain high year-on-year simply because there are no suitable investment opportunities (Matts et al, 2011). Differences in the extent of VC investment across countries can simply reflect the sectoral compositions of their economy.

16 This section draws strongly on the FINNOV and VICO FP7 projects.
funds produce negative returns, but even these are better than US VC funds, whose 10 year IRRs are on average now below EU funds.

VC investment in Europe was some €3.8bn and €3.2bn in 2009 and 2010 respectively, having declined from €6bn in 2007 and €6.4bn in 2008 respectively, (EVCA, 2010). Figure 5 and Figure 6 provide some raw data on the European VC industry. They show that the European VC industry is roughly half the size of the US industry, despite the EU being one and a half times the size of the US in terms of population. This EU-13 figure hides substantial variation between European states with more firms receiving VC funding in the UK, France, Germany and the smaller high tech Northern European economies, compared to other European nations where the VC sector is less developed. This difference may simply reflect the sectoral composition of their economies, that are less focused towards the high tech industries that traditionally receive VC funding.

When we decomposes VC funding into early and later stages of investment we see that main difference is during early stage VC investing, where the number of European firms receiving investment is roughly a quarter of US levels, rather than a half. By contrast, the differences between Europe and the US in later stage investing are much less marked. This is probably a reflection of institutional investors’ perceptions of the levels of returns that can be obtained at different stages17. It is particularly pronounced for the UK, where early stage investing is substantially smaller than one would expect from the size of the economy compared to the US and much larger for investments in mature firms. Heger et al’s (2009) data set suggests that in the US roughly equal numbers of young and mature firms are funded, but in the EU three times as many older firms are funded. A slightly different picture emerges from Bertoni et al (2010)’s analysis of the VICO dataset18. They find EU funds investing relatively evenly spread across young firms, with 20% in firms under a year old, 30% in firms between 1-2 years, 30% in firms between 2-3 years, but they find only 20% invested in firms over 5 years (ibid). This breaks down as 22% seed, 36% start up, 40% expansion and 2% later stages. This difference suggests that their data focuses more on venture and not private equity and has a different boundary for VC. Over time, the number of European and US firms that receive VC funding has been converging, as have the numbers of IPOs, although not M&As (Krause, 2010).

Figure 5 Distribution of firms (by number) receiving VC funding by country

<table>
<thead>
<tr>
<th>Country</th>
<th>Total</th>
<th>Seed and Start-up</th>
<th>Early Stage</th>
<th>Mature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>222</td>
<td>32</td>
<td>27</td>
<td>163</td>
</tr>
<tr>
<td>Belgium</td>
<td>390</td>
<td>73</td>
<td>65</td>
<td>252</td>
</tr>
<tr>
<td>Denmark</td>
<td>410</td>
<td>119</td>
<td>61</td>
<td>230</td>
</tr>
<tr>
<td>Finland</td>
<td>668</td>
<td>219</td>
<td>121</td>
<td>358</td>
</tr>
<tr>
<td>France</td>
<td>2,788</td>
<td>308</td>
<td>402</td>
<td>2,078</td>
</tr>
<tr>
<td>Germany</td>
<td>1,721</td>
<td>297</td>
<td>291</td>
<td>1,133</td>
</tr>
<tr>
<td>Ireland</td>
<td>310</td>
<td>65</td>
<td>74</td>
<td>171</td>
</tr>
<tr>
<td>Italy</td>
<td>527</td>
<td>45</td>
<td>44</td>
<td>438</td>
</tr>
</tbody>
</table>

17 European funds raised came mainly from pension funds (23%), banks (15.6%), insurance companies (10%), fund of funds (14.7%), government agencies (7.8%), private individuals (6.6%), academic institutions (2.2%), capital markets (2.9%), foundations 0.4%, and corporate investors (4%), (with 11% not disclosed) and came mainly 65.8% from Europe, with 24% from the US and 10.2% from the rest of the world (EVCA, 2011).

18 The VICO dataset is composed of 1,903 VC investments, by 948 VC investors, in 751 European firms (from Belgium, Finland, France, Germany, Italy, Spain, United Kingdom) between 1994 and 2004 (i.e this data covers the dot.com bubble).
<table>
<thead>
<tr>
<th>Country</th>
<th>Total</th>
<th>Seed and Start-up</th>
<th>Early Stage</th>
<th>Mature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Netherlands</td>
<td>731</td>
<td>74</td>
<td>81</td>
<td>576</td>
</tr>
<tr>
<td>Portugal</td>
<td>250</td>
<td>72</td>
<td>14</td>
<td>164</td>
</tr>
<tr>
<td>Spain</td>
<td>679</td>
<td>70</td>
<td>35</td>
<td>565</td>
</tr>
<tr>
<td>Sweden</td>
<td>831</td>
<td>170</td>
<td>129</td>
<td>532</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>4,135</td>
<td>433</td>
<td>562</td>
<td>3,140</td>
</tr>
<tr>
<td>United States</td>
<td>27,583</td>
<td>5,233</td>
<td>8,543</td>
<td>13,807</td>
</tr>
<tr>
<td>EU-13</td>
<td>13,683</td>
<td>1,977</td>
<td>1,906</td>
<td>9,800</td>
</tr>
<tr>
<td>All countries</td>
<td>41,266</td>
<td>7,210</td>
<td>10,449</td>
<td>23,607</td>
</tr>
</tbody>
</table>

Source: Kraeussl and Krause (2011, Table 1). Note: This table summarises the data of all firms receiving venture capital financing between 1985 and 2005. Firms are classified by country and industry; and also by whether they received the first round of funding as a seed and start-up, early-stage, or mature stage firm.

Bertoni et al (2010) also break the VICO data set down to show how European funds invest across software (34%), biotech and pharmaceuticals (25%), Internet and TLC services (20%), ICT manufacturing (17%) and R&D and Engineering Services (2%) and other high tech manufacturing (2%). Kraeuussl and Krause (2011)’s data, in Figure 10, provides a similar picture, highlighting more investment in the US in ICT industries, and a large focus in Europe in investing in non-high tech sectors, which may reflect the greater emphasis on private equity in the datasets and in European venture investing (see also, EVCA, 2010). Learner et al (2011) find US, UK and Continental European funds to be reasonably consistent in the sectors they focus on – roughly two fifths internet and computers, a fifth communications and electronics, a fifth biotech, and 10% consumer, with US funds slightly more likely to invest in internet and computer. Lastly, EVCA data for 2010 finds the key sectors remain life sciences (€0.9bn), Computers/electronics (€0.6bn) and communications (€0.4bn), followed by energy and environment, business and industrial products and consumer goods and retail (EVCA, 2010).

Figure 6 Distribution of VC investments by number of firms by sector and country 1985-2003

<table>
<thead>
<tr>
<th>Country</th>
<th>Computer hardware &amp; software</th>
<th>Semi-conductors Electronics</th>
<th>Biotech</th>
<th>Non high-tech sector</th>
<th>Medical, health &amp; life sciences</th>
<th>Communication s &amp; media</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>52</td>
<td>14</td>
<td>9</td>
<td>118</td>
<td>10</td>
<td>19</td>
<td>222</td>
</tr>
<tr>
<td>Belgium</td>
<td>113</td>
<td>17</td>
<td>24</td>
<td>184</td>
<td>23</td>
<td>29</td>
<td>390</td>
</tr>
<tr>
<td>Denmark</td>
<td>100</td>
<td>28</td>
<td>46</td>
<td>153</td>
<td>43</td>
<td>40</td>
<td>410</td>
</tr>
<tr>
<td>Finland</td>
<td>171</td>
<td>49</td>
<td>22</td>
<td>328</td>
<td>48</td>
<td>80</td>
<td>698</td>
</tr>
<tr>
<td>France</td>
<td>670</td>
<td>135</td>
<td>94</td>
<td>1,568</td>
<td>137</td>
<td>184</td>
<td>2,788</td>
</tr>
<tr>
<td>Germany</td>
<td>516</td>
<td>113</td>
<td>163</td>
<td>627</td>
<td>99</td>
<td>203</td>
<td>1,721</td>
</tr>
<tr>
<td>Ireland</td>
<td>120</td>
<td>20</td>
<td>13</td>
<td>98</td>
<td>18</td>
<td>41</td>
<td>310</td>
</tr>
<tr>
<td>Italy</td>
<td>69</td>
<td>18</td>
<td>9</td>
<td>369</td>
<td>17</td>
<td>48</td>
<td>527</td>
</tr>
<tr>
<td>Netherlands</td>
<td>155</td>
<td>24</td>
<td>29</td>
<td>424</td>
<td>32</td>
<td>67</td>
<td>731</td>
</tr>
<tr>
<td>Portugal</td>
<td>23</td>
<td>8</td>
<td>4</td>
<td>191</td>
<td>14</td>
<td>11</td>
<td>250</td>
</tr>
<tr>
<td>Spain</td>
<td>102</td>
<td>10</td>
<td>13</td>
<td>463</td>
<td>34</td>
<td>48</td>
<td>670</td>
</tr>
<tr>
<td>Sweden</td>
<td>197</td>
<td>41</td>
<td>44</td>
<td>364</td>
<td>80</td>
<td>105</td>
<td>831</td>
</tr>
<tr>
<td>UK</td>
<td>954</td>
<td>162</td>
<td>145</td>
<td>2,252</td>
<td>298</td>
<td>324</td>
<td>4,335</td>
</tr>
<tr>
<td>United States</td>
<td>8,915</td>
<td>1,591</td>
<td>1,188</td>
<td>9,518</td>
<td>2,591</td>
<td>3,780</td>
<td>27,583</td>
</tr>
<tr>
<td>EU-13</td>
<td>3,241</td>
<td>639</td>
<td>612</td>
<td>7,139</td>
<td>853</td>
<td>1,199</td>
<td>13,683</td>
</tr>
<tr>
<td>All countries</td>
<td>12,156</td>
<td>2,230</td>
<td>1,800</td>
<td>16,657</td>
<td>3,444</td>
<td>4,979</td>
<td>41,266</td>
</tr>
</tbody>
</table>

Source: Kraeussl and Krause (2011)

In terms of the types of VC funds, it seems that there are differences in the types of European Funds that support Yollies. Bertoni et al (2011) find that in Europe VC funds...
backed by banks and the public sectors are more important, while CVC investors play a larger role in the USA\(^{19}\). There are also important differences with independent VCs in Europe less likely to invest in very young, small firms in early development stages. Instead they tend to invest over shorter durations in more mature firms, reflecting the greater emphasis on private equity in Europe. The firms they invest in are slightly more likely to IPO, and they also have better performing portfolio firms (in terms of TFP, sales growth and innovation) (Bertoni et al, 2011). Again this suggests that it is harder to generate commercial returns from early stage investing.

This is supported in the multivariate analysis in Dimov and Murray (2008) that finds that US VC funds are more likely to make more seed investments than their European counterparts. Of the funds that make seed investments, the US funds are more focused and have a high proportion of seed investments in their portfolios compared to VC funds from other countries. By contrast, Europe tends to have a stronger focus on the management buyout (MBO) side of private equity than the US (Dimov and Murray, 2008).

There is also evidence that US funds behave more professionally than their average EU counterparts (Hege et al, 2009) although this is probably not true for the top performing funds. They tend to co-operate more, and organise larger syndicates that grow over time, they also involve corporate VC more frequently and are more specialised. All these features are associated with superior performance. Interestingly, Hege et al (2009) find that while there has been convergence between the EU and US in respect to levels, amounts and performance of VC investment in mature firms, the EU continues to invest less and underperform in early stage investment. US funds invest almost twice as much in their portfolio firms, which has a significant impact on performance, and US funds, unlike EU funds, respond to this good performance with increased funding (ibid). Dimov and Murray (2008, Table 1) also find that the US has a larger number of funds, and that they are larger on average compared to European funds. However, there are differences within Europe with the UK having more funds in than other European countries, but they tend to be smaller on average than funds in Germany and the Netherlands.

Lerner et al (2011) find similar differences between US and European funds\(^{20}\). They find that US funds are substantially larger at $163.3m compared to $78m in Continental Europe (median fund sizes), make more than twice as many investments (32 v 15), in more firms (16 v 10.5), with more money ($4.7m v $2.9) per firm, and syndicate more (4.1 v 3.0 partners). When they compare the performance of a their (probably unrepresentative) subsample of UK and US funds they again find that UK funds are smaller, less specialised, make fewer investments, in a smaller number of firms, and invest less money when they do. This is an interesting finding, because the UK (and the EU) are relatively more focused on later stage investing where funds tend to be larger and make a relatively smaller number of larger investments (Dimov and Murray, 2008, Table 1). Hege et al (2009:9) also find that “US venture capitalists invest almost twice as much in their portfolio companies, [and] make a larger portion of funding contingent on the completion of the first round”\(^{21}\).

These differences have implications for performance. At the end of 2010 the 3 year pooled IRR of European venture capital was -4.3%, at 10 years it was -3.8 and only after 20 years does it scrape into positive territory at 0.3% (Kelly et al, 2011). However, successful funds in the top quartile have shown strong performance and have reported

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\(^{19}\) These were independent US style private funds (56%), corporate VC that are affiliated to a (non-financial) corporations (10%), bank-controlled VC (15%), and public VC that have either a government owned or backed management company (19%).

\(^{20}\) They compare 2835 US funds with 825 continental European funds and 401 UK funds (1990-2005 i.e. covering the dot.com bubble). There may be sampling problems with the data (i.e. the UK data includes VCT funds, and the fund sizes from $3.9m to $4.8bn, indicating a rather motley collection that includes both specialist public funds and private equity funds).
average IRR of 13.4% since inception in 2010. Moreover, EU funds has not declined as much as US VC funds, whose 10 year IRRs are on average now below EU funds. Previously, Hege, et al (2009) found US venture capital funds generate significantly more value through their investments than European funds (when measured by the Internal Rate of Return between the first investment and the final round valuation prior to exit) so it is unclear how durable these findings are.

This difference in performance does not seem to be caused by US venture funds being superior as they do not create more value than their EU peers when investing in Europe (Hege et al, 2009). Instead, it seems to reflect the difficulty of making commercial returns from early and seed stage investment in Europe (Murray and Marriot, 1998; Hege et al ,2009; Kraeussl and Krause, 2010). Investments in European young firms perform poorly, with less than 1 in 8 European firms making a successful exit via an IPO or trade sale in Hege et al's (2009) data. Similarly in Kelly's (2010) sample the most common form of exit in Europe were write-offs (42%), ahead of trade sales (30%) and IPOs (17%). The differences between the two studies reflect different starting samples and time periods. The difficulties of making commercial returns from early stage investing are why EU funds have focused their investing more on mature firms.

The difference in performance between Europe and US funds does not seem to be influenced by observable differences in portfolio companies in performance at exit via IPO or (to a lesser extent) trade sale. Nor do they seem to be influenced by differences in tax treatment or differences between Common Law and Civil Law legal systems (ibid). Similarly, while there might be cultural, national and linguistic barriers in the EU that could potentially put European VC at a disadvantage, this does not seem to be the case. Bottazzi et al (2004) present questionnaire evidence that the European VC market is surprisingly integrated, with 27% of their sample of firms having a secondary office in a foreign country, 25% of VC firms having partners from abroad, and 24% of investments being made in foreign companies. Although they acknowledge that the EU VC market is surprisingly harmonised, they nonetheless recommend that “further removing barriers to cross-country investments could provide an important boost to the industry” (26).

This suggests the major performance difference is due to poor performing investments, and the issue Europe faces relates to the quality of its young firms, their managers, their investors and the environment in which they operate. This is consistent with recent work in economics that finds that productivity differences across nations are largely due to the long tail of poorly-managed low productivity businesses (Bloom and Van Reenen, 2010). There are a small number of good firms that are funded by good investors in Europe, and achieve success that is reflected in the superior performance of the top quartile European VC funds.

The difficulties of making commercial returns from European start ups has put institutional investors off investing in early stage VC funds outside the top quartile of funds, which is changing the structure of European early stage investing. Kelly et al (2011, Small Business Outlook) find that many VC funds are finding it difficult to raise money, and in 2010 only managed to raise half the funds they raised in 2008. This has led to a decline in the average size of funds, which as noted earlier is associated with poorer overall performance. However, as European VC remains depressed, Business Angels are increasing their venturing activity, particularly the 400 or so Business Angel networks operating in Europe (EBAN, 2010). They typically invest in smaller,

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21 These differences might be caused by VC firms having different sources of funding. In the UK, pension funds and banks account for a relatively large share of funds raised, while in France the two largest sources of VC funds were banks and insurance companies (Leleux and Surlenont, 2003:90-91). Institutional factors, such as restrictions on the ability of pension funds to invest in ‘risky assets’ such as VC funds may play a role. Armour and Cumming (2006) suggest that countries with less liberal personal bankruptcy laws have significantly lower demand for VC by hopeful entrepreneurs. However, their evidence is not overwhelmingly strong (see e.g. their Figure 2).
younger business and invest around €75k to produce approximately €4bn of investment in European firms in 2010. At the higher end of VC, private equity (i.e. PE and VC) exits have risen, as venture exits have slightly declined, and PE funds are being raised.

In summary, it seems that European venture investing is still underdeveloped. Despite some success stories (Skype, Cambridge Silicon Radio, Q:Cells, MySQL) and a number of funds that are performing well, overall the European venture system is still maturing. The average fund in Europe remains significantly smaller than in the US, the European industry is less focused on early stage technology firms, (i.e. has a higher proportion of investments in business services and consumer goods), and has less developed exit routes with fewer. The problem it faces is not necessarily a lack of small firms in general (in contrast to the recommendations in EVCA, 2010:6, Figure 1), but a lack of high-quality (often high-tech) small firms that might grow rapidly to become large. This in turn might reflect poorer quality technology (reflecting much lower spending on research in Europe), a lack of concentrations of entrepreneurial and managerial talent (that one interviewee considered were too widely spread among poor quality firms), a lack of capability within VC funds that are not yet fully developed, and problems with the external environment, with not enough professional advisors skilled in assisting high potential firms to grow, and too hurdles for the firms to overcome.

Case 4: The unsuccessful German WFG programme

This scheme adopted a passive approach and provided no incentive for investors to be actively involved in the firms they invested in. Entrepreneurs were not disciplined or dismissed which can be contrasted with (p1096) Silicon Valley where “professional managers replace more than half of founding entrepreneurs. WFG [German VC organisation] never replaced an entrepreneur”. The Government chose the WFG board who selected the business ventures, but the process was not interventionist in the firms themselves with entrepreneurs often viewing monitoring and intervention by the VC fund as intrusions. The incentive structure of the scheme was on the upside to entrepreneurs but not investors, as the entrepreneurs were given the option to buy government’s shares at cost plus low interest rate, while the losses were guaranteed up to 75%. Gilson (2003:1096) notes that “In every year of its existence, proceeds from the government guarantee exceeded revenue from investments”.

Source: Gilson, 2003

4.2 Other countries

While European VC funds outside the top quartile find it hard to make commercial returns from early stage investing in Yollies, so do VC funds from other countries.

4.2.1 China & India

Despite China’s spectacular economic growth its venture capital industry has grown slowly and "a relatively large amount of money [is] chasing relatively few quality deals" (Ahlstrom et al, 2007:251) (see Figure 1). As of 2008, the Chinese Venture Capital Association [CVCA] has more than 150 member firms, that manage over US$100 billion in VC and PR funds, but these funds are mainly directed towards private equity. The Chinese VC industry seems to be largely targeted towards its domestic market (unlike the Indian VC industry, for example, see Kenney et al, 2008) and faces a number of difficulties. There is a major problem with government interference directing investment for political rather than commercial reasons (Fuller 2010; Ahlstrom et al, 2007) reflecting the importance that is attached to ‘guanxi’ (connections and relationships among key business and government officials). Intellectual Property (IP) protection is problematic in China and stock exchanges are relatively underdeveloped even compared to India, although China has produced a few successful IPO exits in the US (Kenney et al, 2008). These problems are reflected in the limited amount of VC investing in China, despite the substantial private equity

As Ahlstrom et al (2007:257) note, "Sometimes the background and connections of the top management team may be among the most valuable resources the firm possesses".
funds that are available. As Zeng (2004:61) observes, between 1991 and 2001 it was rare for there to be more than 20 VC style investments and today, while some foreign VC funds invest in China, their industry remains under developed.

Similarly, the VC industry in India is relatively young, although more mature than in China and does not suffer from some of the problems found in the Chinese sector. India has relatively transparent stock markets (Kenney et al, 2008), and a more international style of IP protection, financial institutions, ownership and focus of the sector. The Indian VC industry is based around Bangalore, Mumbai, Chennai and New Delhi (Kenney et al, 2008) and has gradually recovered since 2000 to generate 300+ deals a year worth over $7.5bn a year (IVCA, 2007). More recent data on the impact of the financial crisis is not available.

4.2.2 Israel and Canada

The Israeli and Canadian VC sectors follow a similar pattern of development to the European. The Israeli venture capital sector emerged from Israeli investments in education and research (specifically the 1969 R&D Industrial Fund), and a series of high level policy interventions to ensure that Israel was self sufficient with respect to advanced high-tech military technology. This led to a significant shift towards high tech manufacturing and exports during the 1970s, that linked to the United States through a 1977 policy intervention called BIRD (Bi-national Industrial R&D), funded at $60m, to support joint US-Israeli projects. The industry was kick started by two policy initiatives. First, the government-owned Yozma $100m fund, started in 1992, that seeded 10 funds that like the best European hybrid funds were run by private sector fund managers and focused on early stage investment. This fund also invested some $20m itself. Secondly, the Technological Incubators’ Program (1992) that provided some $20/30m a year to Seed Phase entrepreneurs. Together these schemes helped grow the industry over the 1990s from 2 to over 100 funds (Avnimelech and Teubal, 2003). As the skills developed in Government programmes diffused to the private sector, technology entrepreneurs have provided Israeli venture capital funds with a steady stream of deals that they have funded, often with support from US VCs, and often managed to bring to a Nasdaq IPO. After Canada, Israel is the second most important source of foreign firms on Nasdaq.

Despite this early success the Israeli VC industry has been squeezed by competition from US VC funds, a difficult exit market (because so many IPOs have under-performed) and an unwillingness of institutional investors to support funds in the economic downturn. In 2010, no new funds were raised, while in 2009, of the $234m that was raised, $200m went to one fund - Sequoia Israel. This is a reflection of the 10-year average negative return that VC funds have provided for investors. By 2011, the sector had improved, with 285 firms raising just over a billion USD in the first half of the year. However, this was largely in relation to mid and late stage investing. As with the European industry, the investments are mainly focused (2011 data) on Internet sectors ($255 million or 24%), life sciences ($237 million or 23%), and communications ($176 million or 17%). Again, in common with Europe, this money was focused less on seed companies (3%) than on early stage companies (26 %) and mid stage companies (46%). As a consequence of this decline in fund raising, there is a perception, but no clear data, that like Europe, Israel is seeing Business Angels taking on more early stage investment.

The Canadian Venture Capital industry has followed a relatively similar, though not as impressive history as Israel. Where it differs is that although it has declined in size since the dot.com boom of the early 2000s, the maturing sector is increasingly focused
on funding early stage firms (CVCA, 2009:3). Before 2000 less than 10% of the money invested went to seed investments, while since then it has increased to 18% (MacDonald and Associates, 2005). The Canadian VC industry is about half the size of the US VC industry as a share of GDP (CVCA, 2009, Graph 5), and unlike the US most of the venture capital funds raised (2003-2007) came from the “Government and Retail” sector, with a smaller share coming from Private Independent sources. There are also structural differences with Canadian funds spending proportionately less money on more companies than US funds (although foreign funds invest more per deal when investing in Canada).

The focus on retail and government supported funds partly arises because of the LSVCC scheme that provides a 15% tax break for retail investors, that is sometimes matched by provincial governments to give a 30% break. Case 5 shows that the performance of these funds has been poor for both investors and investee firms, mainly due to lack of value-added smart-money and high management fees in part caused by their poor design (i.e. being regionally focused, poorly aligned with private sector incentives and lacking effective oversight).

Case 5: Labour-Sponsored Venture Capital Corporation (Canada)

<table>
<thead>
<tr>
<th>The experience of the Canadian Labour-Sponsored Venture Capital Corporation (LSVCC) scheme highlights the dangers of running regional funds, with poor oversight and insufficient emphasis on the value added associated with ‘smart’ capital. The schemes were expensive for investors, regenerated poor returns, and do not seem to have had much positive effect on either the investee firms or the investment managers who were rarely actively engaged with the firms in their overly large portfolios.</th>
</tr>
</thead>
</table>
| Labour-Sponsored Venture Capital Corporations (LSVCCs) are tax-subsidized retail investment funds that are sponsored by labour unions and invest in privately held companies, typically, in high-growth technology sectors. While the broad policy objectives for their introduction include increased employment and regional economic development, their declared aim is increased shareholder value. They began in Quebec in 1983 and expanded across Canada so that by 2005 125 funds were operating. The funds are designed so that tax credits are capped, but the size of investment is not restricted, and is locked in for 8 years. Funds are typically constrained to invest within geographic areas, and on the size and nature of investments, which can force funds to make poor investments. Oversight is limited because retail investors are too small to influence fund managers behaviour and Unions are passive sponsors. As a result some funds, such as Manitoba’s Crocus Fund have been shut down, because of investment problems. They amounted to $10bn in 2004 and are roughly half of Canadian VC investment. The funds have very high management fees and substantially larger numbers of investee firms per manager (6.5 v 2.5 for private Canadian VCs), making them costly and potentially ineffective forms of smart capital. The performance of the funds has been very poor and they typically underperform risk free Government bonds. Only three earned a positive rate of return over the 5 years studied by Cummings et al (2004). The main lessons to be learned from the Canadian experience are:
- Do not constrain funds to regions, as regions are too small to provide sufficient deal flow for funds to specialise and learn how to effectively invest in particular sectors and technologies.
- Firms require smart capital, rather than simply funding, so schemes need to be designed to ensure professional investors are both capable and incentivised to improve firm performance. Design active not passive investment vehicles.
- Do not mix social and economic policy.
- Retail investors are poor judges of the quality of VC funds. Government’s should free-ride on the decisions of professional investors and only invest when professional investors are prepared to put their own money at risk. |

Source: Cumming, D.J., and J.G. MacIntosh. 2003a, 2003b, 2004

For the year 2009, IT received 53% of disbursements, Life Sciences (mainly Biopharmaceuticals) secured 20%, and Cleantech received 9% of the 2009 total. The Cleantech sector has taken an increasing share of VC investment in the years leading up to 2009.
Policy-making in Canada is informed by industry surveys that reflect problems commonly found within Europe. MacDonald and Associates’ (2005) survey found that the main problems (1 to 5 scale) facing the sector were:

- Lack of human capital associated with skilled VC fund managers (4.4 out of 5), especially in relation to sector specific knowledge (3.5 out of 5)
- Funds being too small (4.3 out of 5), so that firms are under capitalised (4.3)
- Demand side problems associated with managerial and entrepreneurial skills (3.9 and 2.8 out of 5 respectively).

By contrast, lack of government support for financing was lower down the list and only scored 2.5 out of 5 in the survey. Where government support is seen as important by the survey respondents, it is in relation to increasing the role of institutional investors, providing hybrid funding, improving the demand-side by enhancing the quality of entrepreneurs and their firms, removing barriers to US-Canadian investing and organising and professionalising local Angel networks (MacDonald and Associates, 1995). These suggestions and problems are consistent with the EU experience.

4.2.3 Australia

In 2010, the Australian VC industry had approximately AUS$ 2.5 billion in funds under management (growing about ten-fold since 1998), making it the leading VC market in the Asia Pacific region. This figure corresponds to about 0.2% of GDP. Between 2000 and 2009 the industry made some 1,228 investments in over 400 firms for a total of AUS$2.3bn of which AUS$1.9 was in equity (AVCAL, 2010 a and b). Australian VC tends to focus on retail and consumer sectors (30% of investments) IT and life sciences (29% of investments are in high tech), although a fast-growing area of investment is Cleantech (with 22% of investments). As with the rest of the world, the recent recession has hit the industry hard with VC fundraising decreasing by almost half in FY 2010 compared to FY 2009 (AUS$ 298 v AU$ 168, having been AUS$ 343 in 2008 and AUS$435 in 2007) (AVCAL, 2010b). Only 2 funds raised money for seed investments totally only AUS 15m, with AUS 135m for early stage in 9 funds (ibid).

Australia is another example where government initiatives were used to encourage and support the development of a VC industry. Before the successful Innovation Investment Fund (IIF) was established in 1997, hardly any start-up and early stage investments existed (Cumming, 2007; Cowling et al, 2010), because institutional investors were more interested in financing buyouts than risky early-stage technology ventures. In the period until 2010, 13 IIF funds (matched funded with private capital in a ratio of 1:2) have supported over a hundred investee companies (Cowling et al, 2010), and a larger number of investee companies have received funding from either IIF-affiliated funds (95 companies) or non-affiliated funds (106 companies). The IIF aimed to encourage the development of new small high-technology companies, train fund managers and support VC-related infrastructure using a program that would become self-funding in the medium-term to help develop a sustainable VC industry in the longer term. Funds were invested in equity of small technology Australian ventures seeking to commercialise their R&D. IIF funds are required to invest 60% of their fund within 5 years, and cannot invest more than AUS$4m in each firm (or 10% of the fund’s capital, whichever is smaller) and are expected to last ten years. The returns to the funds are distributed on a 90:10 basis with private investors after the subscription investment has been returned, which encourages commercial investing.

By aligning with commercial incentives the funds were successful in directing finance towards early-stage ventures. Cumming (2007:195) observed that “IIFs are 46% more likely to finance seed stage companies ... and 27% more likely to finance early stage companies”. Another advantage of IIFs is that they tend to monitor their portfolio companies more intensively than other types of private funds, because they have fewer portfolio companies per fund manager (on average 0.3 fewer firms per manager, Cumming, 2007:195). Again we see an example where Government intervention was
needed during the early stages of the industry to build human capital, provide finance and reduce the risks for institutional investors.

4.3 Why is the USA exceptional in early stage investing?

There are many ways in which the US VC industry is not exceptional: it makes on average poor returns, and as a result is being squeezed by institutional investors who are not prepared to invest. Moreover, outside a few regions, Boston, Silicon Valley etc., the VC industry performs poorly. However, the industry has in the past performed well, and there are a number of exceptional US funds. To understand how they have emerged and prospered this section explores the history of the industry to put in context its current position and why it is twice the size of Europe’s and more importantly able to focus on early stage investment to a greater degree.

One reason is that the USA has the world’s largest, most developed, most professional and best performing VC industry is that it is also the oldest and the Americans have had more time to create the institutional structures needed to get VC to work. The industry emerged in 1946 when George Doriot started up the American Research and Development Corporation (ARDC) as a publically traded company. The firm was successful and returned its investors 15.8% over its 25-year history, (7.4% if their $70k investment in DEC computers is removed). In 1958, the sector was given a boost by the establishment of the Small Business Association (SBA) and the Small Business Investment Corporations (SBIC) that provided tax incentives for VC type investment and backed each dollar from financial institution with three dollars of government money (up to $300k). By 1968, SBIC backed funds were providing three quarters of all US VC investment, highlighting the key role the Government played in supporting the industry.

On the demand side, in 1956, Shockley Semiconductor Laboratory was set up in Mountain View, and after 15 months eight employees left to set up Fairchild Semiconductor which was to spawn many of the major Silicon Valley firms such as Intel, and Kleiner Perkins a leading VC fund. The ‘fission’ backed pattern of economic development whereby new firms, with established technologies and solid managerial skills, spin off from established firms can be contrasted with the European focus on spin offs from university research centres, which often lack a commercial-market focus and are undersized and underperform (BVCA–NESTA, 2009).

In 1958, the National Defence Education Act sought to make major changes in US investments in high tech research and education in response to Sputnik. It set up DARPA, which has played a key role in developing many of the computers, semiconductors, software and electronics technologies that underpin the US VC industry. It complements the investments made through the National Science Foundation (founded in 1950), and the National Laboratories at Los Alamos, Scandia, Lawrence Berkeley and Oak Ridge.

In the 1960s the organisational structure of the sector moved towards limited partnerships, but the size of the sector was relatively small and was under $1bn a year through the 1970s. In 1979, the legal constraints on pension funds investing in VC was removed and the sector gradually grew over the 1980s (Seipel, 2009). The introduction of a 35% capital gains tax reduction for entrepreneurs increased VC investment that grew from $68m in 1977 to $2.1bn in 1982 (Poterba, 1989).

During the 1970s, in response to protests about military research being conducted on university campuses, the US technology development model shifted universities using military research contracts to generate technology for large firms, to a more decentralised model where the National Science Foundation (NSF) funded research, that was then commercialised by small firms, often with VC backing. A range of legislative changes (Block, 2010) supported this shift staring with the D’Adderio Kennedy Act (1969) which allowed the NSF to fund applied research, then the 1980 The Stevenson Wydler Technology Innovation Act, the 1982 Bayh Dole Act, (that encouraged patenting of federally funded research), the 1982 Small Business
Innovation Development Act, (which developed the SBRI scheme), the 1984 National Co-operative Research Act, (which provided a blanket anti-trust exemptions), the 1984 NSF Programme for Engineering Research Centres, the 1986 Federal Technology Transfer Act (that allowed Cooperative Research & Development Agreements), the 1987 launch of SEMATECH and the Human Genome Project, the 1988 Omnibus Trade and Competitiveness Act (that set up the Manufacturing Extension Programme to support production, and the Advanced Technology Programme), the 1991 Defence Industrial and Technology Base Initiative, the 1991 High Performance Computing and National Research and Education Network Act, and the 1992 Small Business Research and Development Enhancement Act (which set up the Small Business Technology Transfer Programme, SBTTR) (Block, 2010).

These Federal programmes were complemented by local demand-side support for innovative firms, through a multitude of boot camps, seminars, workshops, entrepreneur-training programmes run by the private sector. State governments provide support, but they tend to be offered by Angel groups, facilitators or matching networks that combine financing and business mentoring (Toschi and Murray, 2010:5).

These schemes complement the substantial levels of investment in universities and research that substantially exceeds investment in Europe. Some 26% of American adult population has a four-year degree (Galbraith, 2009). With the emergence of new biotech and ICT industries the VC industry grew substantially nearly doubling in size between 1994 and 1995 (from $4.1bn to $7.9bn) so that by 1998 it was $20.9bn, by 1999 $53bn and by 2000, at the height of the dot.com boom, it was $104bn (about 1% of US GDP). With the bursting of the dot.com bubble the levels of VC investment have declined and levelled off at around $20-30bn a year (about 0.2% of US GDP). Investments are mainly in developing high-tech sectors and emergent technologies, but are also broadly spread in smaller amounts across a wide variety of sectors (see data from the US National Venture Capital Association in Appendix D).

In relation to the framework outlined earlier, the emergence of the US VC industry has been heavily dependent on Government interventions: this has involved investments in Cold War defence technology, followed by support for biological and ICT research, that is proactively managed into commercialisation by a variety of government agencies. The US also benefits from the existence of exit markets, such as NASDAQ that allow investors to realise high values, together with a critical mass of expertise to evaluate investments; a world class, a research intensive university system, and research investments that exceed those of the other G7 nations combined. These investments generate new knowledge on the supply side, and large numbers of highly skilled technologists to work in US firms. This makes innovation easier for firms on the demand side reinforced by a proactive industrial policy related to procurement, through schemes such as SBRI. Finally, the US benefited from the emergence of a cadre of very skilled VC investors, many of whom developed their initial capabilities in public and hybrid funds.

The 50 years it has taken the US to develop its VC industry involved a considerable amount of experimentation in public policy, much of which can be assessed in hindsight as of limited value. While for various reasons (Block, 2010) US policy makers down play the role of Governments in the marketplace, the history of the US VC industry highlights a close working relationship between public policy and industry and substantial investment of both time and money to support all parts of the VC ecosystem. This involved building up human capital in funds, supporting them with large amounts of capital and allowing pension funds to invest, aligning investment along commercial lines, supporting a technology focused IPO market, ensuring high quality, investment ready deal-flow through a very substantial two-pronged strategy of large scale investment in research in universities, and proactive commercialisation of technology in firms, within an overarching framework that rewarded commercial success rather that subsidised failure.
5. Public support for young innovative companies

The approach of governments to support of venture capital markets varies across countries and had evolved over time (Murray, 2007) from loan guarantee schemes, through provision of venture capital to the relatively recent phenomenon of hybrid venture capital schemes, all of which were supported by changes to the infrastructure that fosters VC funding system. These marked differences between roles of public authorities/policy in supporting the VC are rooted in their national setting and are potentially subject to political influence (Mason, 2008:4). Many governments have introduced direct and indirect measures (described in detail in sections 3.2.2.1 and 3.2.2.2) designed to foster venture capital financing (Cumming, 2007). The vast majority of purely government ran venture capital funds has been abandoned due to lack of capabilities of Government officials to assess and manage investment opportunities and their potential to “crowd out” private sector investors (Nightingale et al, 2009). On the other hand so-called hybrid funds (introduced in section 3.2.3) have recently gained popularity in various countries (Jääskeläinen et al, 2007).

Munari and Toschi (2010) concluded that, “several public venture programmes established over the last decade in a wide variety of countries - including Belgium, Canada, France, Germany, Italy, Spain, and the United Kingdom - have had an important regional dimension”. These programmes were in most cases promoted and/or managed by regional authorities.

5.1 National approaches to public support for young innovative firms

There are significant differences in the role of public authorities in support of early-stage financing of Yollies and the 'level of sophistication' of such support. Based on available information (see Appendix E) on the extent and type of support of VC for young innovative companies, the EU27 countries and several comparator countries are assigned to one of four categories, ranging from leaders to catching up countries (those with low or no support of this type). This mapping is broadly in line with results of a benchmarking study by the European private equity and Venture Capital Association (EVCA) (2008) about the overall tax and legal environments in the EU27. The top four scoring countries on the total composite score devised in the EVCA benchmarking study are in the 'Leaders' category while Cyprus, Romania and the Czech Republic (catching up countries in support for young innovative companies) are in the bottom of the EVCA ranking. There are however countries that have a relatively low level of tax incentives and complex legal environment for VC and have at the same time government-funded schemes that support VC industry. This is for example case of Germany and Finland that both have a developed public VC support despite scoring low in EVCA ranking. Appendix F compares the categorisation and results of the benchmarking study, highlighting the countries, which have an advanced form of public support despite low score on tax and legal incentives.

Leaders in terms of government’s role in support of early-stage financing are listed in Figure 7. These countries usually have a 20-30 year history of support of VC markets. For example the Belgian venture capital industry, one of the most developed in Europe, is characterised by the presence of several important public players of which two were established already in mid 1980s. The key players are SRIW and Sowalfin (in Walloon region), GIMV and LRM (in Flanders region), SRIB (Brussels region). SRIW and GIMV have the longest history as they were established around 1980, SRIB was founded in 1984, LRM in 1994, and Sowalfin in 2002. All but one are in full public control and operate as stand-alone VC funds. Only GIMV has undergone a substantial change in 1997 when the Government reduced its stake to about 30% and the fund itself was floated on the Euronext Brussels stock exchange. Over the past decade, the GIMV had about €1.7b of assets under management, while the SRIW, SRIB, and LRM had available in 2008 about €770m, €153m and about €293m under management respectively (Alperovych et al, 2011). Together, they account for about half of the
venture capital-backed deals and a study by Manigart et al (2002) concluded that publicly backed portfolio firms have better survival rates than their private counterparts. A recent study by Alperovych et al (2011) on the other hand indicates that publicly backed entrepreneurial firms are consistently underperforming compared to their privately-backed peers by a margin of about 10%.

Since the 1990s, Germany has been providing equity as a main policy instrument. The key policy tools are guarantees, refinancing loans and direct investment by wholly or majority publicly funded agencies, especially as co-investment and in the form of 'silent capital'. Two long-standing national public institutions, the Kreditanstalt fur Wiederaufbau (KfW) and the Deutsche Ausgleichs-bank (D TA), specifically its subsidiaries Technologie-Beteiligungs-Gesellschaft and Beteiligungs-AG, play a crucial role.

Many of the ‘leaders’ have launched hybrid venture capital schemes. One such example is the UK, which has in the period since 1995 run several such funds. Recent evaluation (Nightingale et al, 2009) suggests that these schemes had a positive impact on firm performance when compared to a matched control sample and that there is evidence of improvement over the years showing that the more recent schemes are better structured to respond to lessons learnt in the former years. This is also one of the common characteristics of countries in this category. Nightingale et al (2009) also concludes, that “the UK government has produced an innovative organisational arrangement for allocating funds by setting up Capital For Enterprise Limited. The creation of an arms-length public body staffed by both professional financial staff and ex-civil servants allows commercial decision making to take place without political interference while retaining government access to valuable knowledge. While it is too soon to evaluate CfEL, this initiative appears a timely and intelligent response to the problem of civil servants increasingly having to act as commercial fund managers in the governance of public investment in the hybrid VC funds”.

In addition to the above characteristics, the ‘leaders’ have over the longer period provided sustained levels of publicly backed investments and many of the more recent measures in advanced countries have a strong regional element (with, however, as noted above poor returns, see the UK case)

**Follower** countries are adopting novel or more sophisticated approaches but still lagging in terms of performance. In this category are countries like Estonia which formed a fund operating as pari passu investment vehicle with business angels and private venture capital or Austria and Slovenia that provide a guarantee to venture capital funds/banks that are investing in/providing a loan to technology oriented SMEs. These funds tend to have shorter history than those of the ‘leaders’ and their performance varies. Overall these funds also tend to be smaller in size than those in Germany or the UK and do not provide support throughout the business development cycle of the investee firm.

**Case 6: Estonian Development Fund**

The Arengufond (the Estonian Development Fund, EDF) is a publicly funded hybrid (early-stage) venture capital organisation (licensed and under the control of the Estonian Financial Supervision Authority) combining within the same walls an investment team and an economic and technology foresight team.

Founded in 2007 by an Act of the Estonian Parliament (Riiigikogu), EDF is a unique model among the countries of Central and Eastern Europe that joined the EU in 2004. Similar organisations to the EDF are found in more advanced Nordic (e.g. SITRA in Finland) and Western European countries (e.g. NESTA in the UK).

On the investment side, the EDF is a professionally managed co-investment fund (with an international expert committee), always syndicating its investments on similar terms with private investors. Some business angle syndicates that started technology investments together with the EDF now invest also on their own, forming future professional VC companies, e.g. http://www.wnb.ee/. Today, three and a half years after its first investments, the EDF has the biggest portfolio of seed and start-up investments (15) in Estonian growth companies (see http://www.arengufond.ee/eng/VC/portfolio/). The EDF also runs many local and international VC/start-up awareness and networking events, like its VentureLABs.

Half of the EDF investments have scientific origins, however most of them are built up by entrepreneurial teams, not by scientists (e.g. new wind turbine developer GoliathWind, see http://www.goliath.ee/ or the
developer of virtual fitting room technology Fits.me, see http://fits.me/). The EDF is running its own international business incubator SeedBooster. Its aim is to find and develop international potential of the far-reaching business projects and mature them for venture investments, including for the EDF’s own pipeline. Successful SeedBooster graduates include GrabCad (global internet environment for CAD-engineers, see http://grabcad.com/) and Sportlyzer (pocket trainer/ smart training planning engine that generates self-adjustable training plans, see http://www.sportlyzer.com/).

**Moderate support** countries are mostly Central and Eastern European countries, two Baltic states and two southern European countries. This group of countries is characterised by the creation of public VC funds using external public finances such as PHARE (pre-accession period) or ERDF (post-accession period). Funding in some of these schemes was reduced or even cancelled altogether. Some of these countries have established funds of funds (Latvia, Slovakia and Greece) but only the Greek one is co-financed by the private sector. Other have established fully state owned funds (usually via national banks) and additional support initiatives such as the Hungarian Start Equity Guarantee Fund.

**Catching up** in terms of public support for VC markets are mainly small EU countries like Cyprus and Malta, but also the Czech Republic in which laws and regulatory measures do not permit Czech pension funds and insurances to invest into venture capital funds. This is the reason why the Czech Republic was in last place in the EVCA’s 2008 assessment tax and legal environment. The VC market in these countries is inadequately developed and most of the funds specialise on the later firm development stages associated with lower-risk. Indeed, there is no state support for VC in the Czech Republic. This includes state guaranties, tax credits or co-investing. During 2010 discussions on whether a share of the Operational Programme Entrepreneurship and Innovations should be dedicated to the support of VC firms took place. However, the Ministry of Industry and Trade deemed the implementation of such initiative as too lengthy and to pose economic and legislative difficulties. Implementation of the JEREMIE initiative in the Czech Republic will, at best, occur in 2014 (Toman and Kousalova, 2011).

Figure 7 Level of sophistication’ of venture capital/Yollies policies

<table>
<thead>
<tr>
<th>Category</th>
<th>Countries</th>
<th>Comment with reference to policies within the category</th>
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<tbody>
<tr>
<td><strong>Leaders</strong></td>
<td>Belgium, Denmark, Finland, France, Germany, Ireland, Sweden, the Netherlands, the United Kingdom, Israel</td>
<td>Policies include funds with regional aspect such as SRIW or GIMV in Belgium, public-private partnerships, co-investment funds for business angels. In Denmark the Innovationsmiljøer incubators with Vækstfonden invest up to 60% of seed capital. In Finland and Ireland there are several funds focusing on different stages of firm development, including regional VC investment activities whilst in France there is one large Fund covering these activities (CDC Enterprises). In the Netherlands complex support system is available from idea creation to market analysis/prototype development, while commercialisation is to be funded by a private investor. In the UK there is a portfolio of 10 funds ranging from business Angel Co-Investment Fund to Equity funds and in addition to that are regional funds such as the Scottish co-investment fund. The Israel Yozma programme is regarded as successful and several European countries attempted to replicate it.</td>
</tr>
<tr>
<td><strong>Followers</strong>²⁴</td>
<td>Austria, Estonia, Italy, Luxembourgh, Slovenia, Spain, Australia, Canada</td>
<td>Policies in these countries include more specific support for VC markets. For example in a form of direct warranty to venture capital funds that are being invested in technology oriented SMEs (the FGG in Austria guarantees 50% of the invested capital) or as a pari passu investment vehicle (in Estonia) with business angels and private venture funds.</td>
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²⁴ Countries adopting novel or more sophisticated approaches but still lagging in terms of performance.
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<tr>
<th>Category</th>
<th>Countries</th>
<th>Comment with reference to policies within the category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate support</td>
<td>Greece, Hungary, Latvia, Lithuania, Poland, Portugal, Slovakia</td>
<td>These countries in majority of cases used the ERDF (and previously Phare) to co-fund their funds. Latvia, Slovakia and Greece have all established funds of funds but only the Greek one is co-financed by the private sector. Hungary established a fully state owned fund (CELIN), an equity guarantee fund and more recently a programme for co-financing VC funds (covered by JEREMIE funds). Lithuania, Poland and Portugal have also established ERDF co-funded VC funds, one of which is also co-funded by private sector (FINICIA in Portugal).</td>
</tr>
<tr>
<td>Catching up</td>
<td>Cyprus, Czech Republic, Malta, Romania, Bulgaria</td>
<td>Countries in this category have either no specific public support in the form of VC programmes for Yollies (Czech Republic, Romania) or very little support (Bulgaria has a Bulgarian Business Angels network that matches capital seeking entrepreneurs with informal investors).</td>
</tr>
</tbody>
</table>

5.2 Research intensive universities and venture capital

The study team was asked to consider the question of what is the relationship between investments in young innovation firms and universities and large research hubs. A widely accepted ‘stylised fact’ is that research and technology ‘hotspots’ generally built around one or more leading universities are a main source of ‘Yollies’: such idealised examples include Silicon Valley or route 128 in Massachusetts, or Cambridge in the UK (see, for instance, SQW, 2011), Lyon in France, etc. However, even in these well-known and often cited examples, all is not perfect in terms of the links between young innovative firms and venture capital (see Cambridge example below). However, recent academic research has highlighted that most of the high impact firms in these areas are spun out of firms rather than universities, and that many of the university spin outs perform poorly. The small number of successful academic spin outs need to be seen in the context of the large amount of public support driving their creation.

Case 7: Does the Cambridge phenomenon extend to equity funding of young innovative firms?

The Cambridge phenomenon, or high-tech cluster, has been long promoted as one of the European powerhouses in research-intensive economic development. Between 1991 and 2008, high-tech employment in the two core districts of Cambridgeshire has grown more quickly than the economy as a whole. Based on the findings of a recent consultation, there is evidence of range of business models for start-ups requiring different levels and types of funding ranging from software/new media to biotech firms. The increasing number of ‘serial entrepreneurs’ was taken as evidence of the cluster ‘maturing’.

Although more or less formally constituted networks in the region are reportedly strong, they tend to be focused more on technical problem solving than enterprise development, per se. Networks are also important in terms of early-stage financing with Cambridge University Entrepreneurs cited as an example of a mechanism for linking would be entrepreneurs to potential investors; while Cambridge Angels is given as a ‘dining club’, with financing propositions presented before dinner and discussed during it before decisions were made. However, these locally strong networks are not matched in terms of venture capital investments in excess of £0.5m. According to the report, the prevailing view is that Cambridge is good for small-scale activity (a maximum of five years before exit and total early stage investment of around £500k).

The role of the University of Cambridge is also not clear cut with most regarding it as most important for generating skilled science based graduates and as a globally recognised brand. The links between the University and young innovative firms were seen as sometimes sub-optimal (e.g. it was suggested under-used lab space could be made available to start-ups).

Source: SQW (2011)

25 Countries which are creating VC funds using ERDF, but without a sophisticated coherent policy framework.
26 No or low support or early days.
The focus here is not the origin or developments of technology-driven clusters but rather to analyse the conditions within which equity capital funding instruments can successfully link to (research) universities or major research driven clusters. The evidence suggests that a critical mass of research funding (highlighted above in terms of the absolute and relative intensity of research investments in the US and the EU) is a factor in the potential to create start-up. For the 59 US universities with a research budget in excess of $200m, the data suggests that, on average, it takes $93m of academic research expenditures to generate a single spin-off. Moreover, as the scale of research expenditure increases so the research dollar (and presumably euro) required to create a spin-off decreases. The ‘mega research universities’ (e.g. Caltech, Harvard, MIT, Stanford) with research expenditures greater than $500m are more start-up ‘productive’ (one start up per $59m of research expenditure) and have a lower cost per technology license ($6.37m versus $10m per license for all 59 universities). As with all averages there are exceptions to the rule, for instance, the University of Kentucky (research expenditures of $248m) outperforms Harvard in cost per start-up ($17.7m).

Nevertheless, on average, it takes $8.7m of government investment in research to create a ‘transformative piece of technology’ (blending the data for start-ups and licenses). Hence, getting the right balance between a focus on ‘spin-offs’ (generally requiring a much more intense ‘hands-on’ effort) and licensing technology in University technology transfer offices (TTOs) may be a key to maximising academic returns from research commercialisation. Finally, even in the best case (the >$500m research universities), the average number of spin-offs per year is only 7.3 and 5.4 on average for the top 59 research universities in the USA.

Although similar data is not available for the EU27, evidence from a UK spin-out database suggests that on average for 150 UK higher educational institutes, less than one spin-out was created per year from 2000-2010. However, the average is higher (3.4 per year) for a more ‘select’ group of 12 universities which account for 412 out of 820 spin-offs over the last decade. Indeed, the best performers (Imperial College, Edinburgh and Cambridge) achieve a spin-out rate close to the US average of 5 per year.

Of course, the merits of measuring success by counting number of spin-offs created is in itself open to debate as a metric (see Minshall & Wickstead, 2005 for a critique of narrowly defined metrics that may have encouraged universities to create too many unsustainable spin-offs in the early years of the last decade). Hence, the extent which the spin-offs created actually survive and grow, requiring follow-on rounds of funding, is arguably more important. In this context, while the recent NESTA thin markets report did not look specifically at UK spin out firms it did include a control variable on firms that had ‘spin out’ as a status (Nightingale, 2009). This was an atypical sample of firms that received VC funding, and is therefore likely to be positively biased. Even so, the performance of the ‘spin out’ firms was consistently statistically significantly negative.

In terms of models for managing university-VC relations, there are a range of methods applied by universities to manage the technology transfer process from internal TTOs (more or less to the creation of separate legal entities often in the form of privately

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29 Imperial College London formed 59 spinouts between 2000-10, followed by Oxford (55), Edinburgh (49), Cambridge (44), Warwick (36), Strathclyde (35), Newcastle (28), Bristol (28), Sheffield (28), Queen’s University Belfast and Leeds (both with 25).
companies (wholly or partly owned by the university). In parallel to these efforts to develop increasingly sophisticated methods to manage and exploit the IP they hold, major universities (and, similarly, large public or not-for-profit research centres) have sought to develop relations with venture capitalists to create and grow spin-offs in which they, generally, retain an equity stake. Again various possible models are available from funds raised by a University with public or private co-investors (business angel groups, public funds, etc.) to strategic partnerships with private venture funds. A 2005 report (SQW, 2005) argued that ‘first option to fund’ arrangements (i.e., a fund is given the right to consider possible deals before other investors) with the financial partner typically making a significant up-front payment, seemed to work well.

In the UK, a report on university spin-offs (BVCA, 2005) analysed the state of play in the (at that time) 36 leading research universities (based on a survey and interviews with technology transfer offices (TTO), venture capitalists and spin-offs. Many of the findings serve to confirm the ‘smart-money’ conclusions raised above. The report also underlined how in the early 2000s, a change to a tax ruling by the UK tax authorities led to a sharp drop in academics creating spin-offs underlining how sensitive entrepreneurial behaviour can be to financial incentives. In general, the report argues that university spin-offs receive about half the early stage VC funding of other technology investments, as they are generally considered too immature. Specific issues related to the relationship between equity finance and research universities/hubs included:

- The need for university spin-off founders to receive practical help from the critical validation phase onwards from experienced entrepreneurs;
- The need to simplify and speed up the process of securing access to IP rights;
- The need to tailor university spin-offs to meet the criteria for success from the venture capital perspective ranging from understanding the customer base (not just the technology) to early consideration of exit opportunities.

Similarly, in the US, a 2009 report from the University of Southern California (Holly, 2009) entitled “Venture Capital-University Interface: Best Practices to Make Maximum Impact” covered five key areas: understanding investor motivations, supporting entrepreneurs, streamlining bureaucracy, improving access and visibility, and fostering a culture of innovation on campus. The study was based on 94 in-depth interviews among a geographically and commercially diverse sample of venture capitalists and aimed to provide an insight into the current model for academic spinouts and which elements of that process help or hinder the efforts of venture capitalists to develop those ideas into thriving businesses. The USC report provides a number of pointers to managing the relationship between ‘academia’ and venture capitalists, including:

- ‘Know your venture capitalists’, the report underlines that universities still need to do more to understand the types of spin-offs (not just technology but strong management with market understanding) and the investment time lines and expectations of the investors.
- Support and educate entrepreneurs: VCs underlined the need for inventors to understand their role in the start-up and to be prepared to follow the their technology from lab to start-up. They also need to appreciate that they are unlikely to be the CEO!
- Foster a culture of innovation and offer university resources to spin-offs – i.e. continued access to cutting edge laboratories.
- Streamline the bureaucracy: TTOs should screen and package the technology, make the introduction and then ‘step back’. This also implies the need to strike the right balance between a defensive protection of the universities IP and developing a standardised, transparent deal process.
Recent evidence from the US suggests, partly in response to the downturn in the overall VC investment levels and rates of return over the last decade, that venture capitalists do view universities as potentially strategic partners in investment in high-growth young innovative firms. However, the basic conditions for venture funding remain firmly in place. In particular, university based funds run three risks:

- The deal flow is very small in a typical university, thus reducing management’s ability to be selective. As pointed out previously, even in the best universities the number of spin-offs invested in per year is around five. In smaller universities the number of possible deals may not exceed that number and it would be unlikely a fund manager would accept to invest in them all.

- The funds are likely to be too undercapitalised (as it is unlikely that a single university could attract sufficient funds given the likely deal flow) to generate a good return if any of the companies falter in future financing rounds. For instance, recent cases in the US include a $20m fund launched by New York University (which invested itself only $3m and seeking to raise the rest from tax-deductible donor contributions).

- Fund management are likely not to be professional investors (given the size and hence likely returns of the fund) and may not be skilled in using market insight to identify potential successes.

The arguments that a critical mass of research is important to generate a sufficient deal flow and that universities generally ‘miss-out’ on or unable to raise follow-on funding for their spin-offs is the driver behind a recently launched US co-investment fund developed on an inter-university basis Osage University Partner Funds).

Case 8: Osage University Partners Fund

In early 2011, Osage University Partners raised a $100 million co-investment fund in partnership with a group of ‘top-tier’ universities, including the California Institute of Technology, Columbia University, Duke University, University of California at Berkeley, University of Florida, University of Michigan, University of Pennsylvania, and Yale University.

The fund has proved attractive by providing universities with a unique co-investment feature, allowing the universities to get more skin in their start-ups by participating in later funding rounds. These rounds are often passed on by TTOs because they don’t have the money to participate, and the result is a dilution of their ownership stakes.

The fund aims to make eight syndicated investments each year that could start out around $1 million or $2 million and rise to $3 million to $5 million over time. By managing the co-investment rights universities pick up from spin-offs, Osage and its higher education partners will gain a contractual right to participate in funding rounds of the most promising new companies. The universities can use their returns to reinvest back into more research and commercialisation work.

Universities participating in the fund, as either full partners or associates (an additional 20 or so schools and universities), also report benefits from access to a broader community of investors by leveraging the knowledge of the experienced, investors running the fund.

While Osage has a broad list of technologies it plans to back, the venture group has already backed several life science firms and plans to make a special effort in therapeutics, an area in which universities often prove to be a breeding ground for new developers.


This model may be an option for a group a EU universities (from a larger Member State or from a cross-border ‘macro-region’ like the Baltic Sea region).

This is not to say that below the minimum capitalisation level required for a viable VC fund that there is not a role for smaller ‘proof-of-concept’ mechanisms (often a mix of grant/business mentor schemes linked to business angel networks or early-stage hybrid funds). Such measures have proved successful in a number of EU regions and

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30 http://www.ecommercetimes.com/story/70479.html
31 http://www.nyu.edu/about/university-initiatives/entrepreneurship/innovation-venture-fund.html
have recently been promoted in the US as a means of helping university spin-offs to cross the ‘valley of death’. However, the nature of a proof of concept initiative and the likely returns are significantly different from those of an early-stage fund. Hence, when two universities proudly proclaim to have launched together a £2m venture capital fund, there must be a suspicion that they are misleading their stakeholders.

Finally, the evidence on university licensing and spin-off policies does suggest that significant investment by a university in protecting a broad pool of IP with a view to licensing or spin-off may not always be the most cost-effective route. The USC report (USC Stevens, 2009) noted that venture capitalists are of the opinion that the vast majority of technologies coming out of universities are not appropriate as stand-alone businesses, rather they are, at best, licensing deals. Hence, a university should seek to develop a TTO or a commercialisation subsidiary that filter out ideas that will never work as venture-backed spin-offs.

Even when a technology is suitable for spinning-out, the cost-benefit ratio between long-negotiations over IPR, valuations, etc. for universities and final returns may be low. This has led to some novel options such as Carnegie Mellon University’s “Five percent, Go in Peace” approach based on a streamlined, common template for faculty based start-ups that limit university equity to 5 percent, capped at a $2million dilution event. The template also establishes clear royalty guidelines with a three-year delay in payments. In line with the USC study findings, faculty members can incubate companies in the university for short periods and take up posts in management.

The licensing route, apparently more ‘cost-effective’ per research euro/dollar, may not always be optimal given that “five percent of IP produces about 95 per cent of revenue”. This has led some European universities to develop models that provide ‘easy-access’ to IP. One advantage of such an approach may be to allow University TTO to focus on the IP with most value limited resources for the university (either in terms of licensing or spin-offs).

Case 9: Easy-access IP

Glasgow University has developed a policy of easy access innovation for IP generated within the university based on the principle that five per cent of their IP produces about 95 per cent of the revenue, and that it is relatively simple to determine what IP is likely to have this value. Glasgow’s approach is to freely license the remaining IP generated by the university to businesses who want to develop / use this technology with a standard one page exclusive licence for a term of three years.

Industry response had been positive following the original announcement of the initiative. In the first half of 2011, three licences have been granted and six were being negotiated. Glasgow University has partnered with University of Bristol and Kings College London to further this scheme. The partnership was established in March 2011 following a funding award of £80,000 from the UK Intellectual Property Office. The partners intend to use some of the funds awarded to them to set up an industry/university discussion in autumn 2011 to gather further support for the project.

The approach has already been transferred internationally with the University of Copenhagen (Denmark) adopting a similar policy[32].

This approach has received both plaudits and ‘brickbats’. Those in favour note that the University is fulfilling a mission to promote economic development by giving a simplified access to available technology. The process (based on a one-page agreement) may also be less time consuming for the University than managing a licensing process for technologies that are unlikely to ever generate much revenue.

Critics argue that the University still has to put some sort of filter in place to decide whether the IP has any commercial prospects and whether any of the funding that has supported the development of the IP came with conditions that would restrict the future use of the IP. Moreover, the Glasgow licence does not impose any financial obligations, but it is not a free licence. In fact, it has been argued that the Easy Access licence is more like an option agreement that allows the recipient to evaluate the IP (for free) over a period of three years. Hence, the Easy Access model may risk actually restricting the technology transfer process.

Source: [http://www.gla.ac.uk/businessandindustry/easyaccessip](http://www.gla.ac.uk/businessandindustry/easyaccessip)

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In general, Europe differs from the US in having a more privatised approach to university research. In the US, Universities are often legally required to diffuse technology for commercialisation, and focus on encouraging innovation in their local environments, with public authorities accepting that this will mean that TTOs will be loss-making institutions that create public goods (Dosi et al, 2006). The returns to TTOs are highly skewed and for most universities they make a considerable loss. In Europe TTOs are sometimes set up as profit centres. This is unrealistic for most and can lead to a problematic relationship with VCs and entrepreneurs. Academics rarely have the skill sets needed to start up and grow a high impact firm, and suffer from lack of understanding of market requirements. TTOs also suffer from lack of specialisation, and may need to cover the full range of technologies and markets that universities might produce useful research for. This means that they are often poorly integrated into commercial networks. A potential solution to this problem might be to specialise technology transfer in Europe by technologies or markets, rather than by universities. Rather than having a TTO office in a university covering all markets, instead have specialised TTOs for biotechnology, photonics, chemistry, etc.

5.3 Young innovation companies policies and the grand challenges

Europe is seeing to develop responses to grand challenges such as global warming, energy security, water and food supply, ageing societies, public health, pandemics and security that no country can solve on its own. The Europe 2020 Strategy and the Innovation Union flagship initiative call for all key EU and MS stakeholders (public services, research communities, business, civil society) to respond together by developing pro-active strategies. While grand challenges outlined in the Europe 2020 strategy largely affect the physical and life sciences, tackling existing and newly emerging social challenges such as a proper understanding of the economic downturn, migration flows, integration capacity of societies and future modes of living and mobility also require a sound scientific basis.

EU level financial instruments have a crucial role to play in successfully addressing these challenges. These instruments include FP7 (and Horizon 2020 in the future), RSFF, Joint Programming Initiatives (JPIs), Joint Technology Initiatives, European Innovation Partnerships, European Technology Platforms (ETPs), the European Research Council, COST, and EUREKA. From the interviews undertaken it is understood that the scope and scale of the RSFF will be extended and that a second RSFF window, a policy-driven window, will address the grand challenges and other policy areas of importance (e.g. DG EAC – media). It is expected that there will be no pre-defined allocations per challenge and particular financial support to the challenges will be through the JPIs, ETPs and EUREKA.

The potential role of equity based instruments in supporting the creation and growth of Yollies able to help address the challenges are examined by two illustrative cases, namely: cleantech and social innovation.

5.3.1 Cleantech

Cleantech, referring to technologies that make the consumption of critical resources more efficient or replace finite resources with renewable alternatives, extends across many different industries including: materials (bio and nano), water and waste water, wind, solar and tidal power, air and environment, biofuels and biomaterials, smart grid, energy efficiency, energy storage and transportation (www.cleantech.com).

In response to urgent environmental challenges such as climate change, rising energy costs, increasing environmental regulation, and Europe 2020 and national commitments for the transition to low carbon economies, the expectation is that investments by governments and the private sector in cleantech will increase, furthering the development and commercialisation of new environmental technologies. As an example, the level of patenting in solar, wind and marine technology has increased threefold between 1997-99 and 2006-09 (Cullen, 2009). With research pointing to small businesses driving innovations in the early stages of
emerging industries such as cleantech (Klepper, 1996), VC funding is undoubtedly an important player in driving cleantech innovation.

Indeed, there has been a notable increase in interest in cleantech investments over the past five years (Jones, 2011). Given the emerging nature of cleantech with a focus on the development of new technologies, 65% of all currently active private equity managers are VC-focused firms. Despite fundraising problems, there are currently 223 private equity vehicles worldwide that include cleantech investments as part of their industry focus (including 80 dedicated cleantech vehicles), seeking to raise an aggregate $80bn in capital (ibid). As of March 2011, the estimated amounts available to private equity funds focusing solely on cleantech was $11.4bn, of which cleantech venture funds had $7.1bn available for investment. This indicates a substantial amount of capital ready to be used in the sector.

In 2010, cleantech attracted $7.8bn of VC globally, an increase of 28% compared to 2009 (but not as much as the $8.8bn in 2008), albeit with a decline in the second half of 2010 (Kuo, 2011). This decline, while smaller than in other areas of VC activity, reflects the global economic downturn and doubt on risky capital-intensive investments that take time to bear fruit. These VC risk averse conclusions are backed by UK results from Parris and Demirel (2010) pointing to VC funds avoiding big risks with funding the most radical and risky cleantech innovations, instead focusing on funding investments with less than two year payback periods. Baker (2010) notes priority for incremental energy efficiency innovation over cutting edge biofuels or advanced solar technologies. Only a minority of VC investment in cleantech in the UK has targeted (radical) technology innovators, indicating potential market failure.

Case 10: Israel Cleantech Venture Capital Fund

Israel Cleantech Ventures is an example of a successful sectorally focused VC fund targeting early stage companies. Established in 2006, Israel Cleantech Ventures, raising $75m for its first fund in 2007, is the leading cleantech venture capital fund in the country focused on energy, water and agricultural/green technologies as well as ancillary cleantech sectors. Recognising the relative scarcity of energy, water and land resources in comparison with many other countries and Israel's global recognition as a centre of technology innovation, investments are principally in Israeli based and Israeli related early-stage companies with evolutionary and disruptive technologies. (Israel is now ranked fourth in cleantech investments in the recently published 2011 Global Green Economy Index). Typically, the fund acquires and maintains significant ownership positions in portfolio companies throughout their life cycles, often leading the initial round and taking part in follow-on funding.

To date, more than 13 investments have been made in energy, water and energy efficiency and greentech. Some of the investments are attracting additional international investment like Emefcy Ltd., raising about $10m from investors including General Electric, NRG Energy Inc. and ConocoPhillips, for developing a process that reduces the amount of energy required to treat sewage and generates electricity.

Main lessons learned:
• Early stage VC investment in cleantech technologies with long development times does pay off.
• Have a clear strategy, responding to national priorities (wide government support to solve the identified problems and robust cleantech-related research in Israel's public universities and research institutions).
• Along with funding, need a VC fund management team that combines significant experience in building technology companies with deep industry understanding gained through management positions at Israel's pioneering cleantech companies.
• Develop an extensive network in local and international cleantech and investment communities, helping to identify the emerging companies and the critical tools for those companies to develop and succeed.

Source: Cleantech Magazine (2010), Israel Cleantech Ventures (2011), Israel21c Newsletter (2011)

As a consequence of VC funding not always fully supporting technology development, thus possibly restricting the development of the most radical and urgently needed cleantech innovations, public funding will be important in supporting emerging cleantech innovation, particularly in those areas where clean technologies are struggling for traction (e.g. electricity generation). Understanding which innovations and sectors VC investors target will help to identify areas of market failure (and conversely identify the areas where public funding is not/less required).
5.3.2 Funding for social innovation ventures

Social innovation is a relatively new term (but old concept), not well understood by many, often confused with social enterprise and associated with a social field. It is about innovations that are both social in their ends and in their means. Social innovations are new ideas (products, services and models) that simultaneously meet social needs (more effectively than alternatives) and create new social relationships or collaborations (EC, 2010b).

Increasingly, companies seek to share responsibility with governments for tackling issues such as health or the environment (Ellis, 2010). With the financial crisis and societal trust in businesses at a low, firms are focusing more on socially responsible investing (SRI) that contributes to addressing social innovations/grand challenges. SRI increased by 5,000% in less than 20 years (in 1984 SRI was a $40 billion market, by 2003 it had developed into a $2.16 trillion industry) (Ellis, 2010). In 2007, institutional investors that filed or co-filed resolutions on social or environmental issues controlled $739 billion in assets. Furthermore, the number of signatories to the investor-led and UN-backed initiative “Principles for Responsible Investment (PRI)” more than doubled to 381 as a response to the crisis, and has further increased to 560 investors managing a total of $18 trillion in assets, including private equity firms (Ellis, 2010).

Equally, in Europe and the USA, the social economy sector (including cooperatives, mutual societies, non-profit associations, foundations and social enterprises) is fast growing and gaining in importance (European Commission, 2011c; Defourney and Nyssens, 2008; Austrian Institute for SME Research, 2007). Social entrepreneurship and social enterprises now play an important role in closing the gap between social products and services and more demands and needs. Social enterprises, by the very nature of their non-share incorporation, have limited financing options beyond non-sustainable grants and expensive loans at the start-up stage. Hence, new forms of ‘investment-like’ capital pools and investor tax credits and innovative share-based social enterprise incorporation models are needed. Social economy enterprises in Europe represent two million enterprises (i.e. 10% of all European businesses) and employ over 11 million employees (or 6% of the EU’s working population).

Social innovation related financing instruments include: (i) a social RSFF (or RSFF with a social window); (ii) a social venture capital fund; (iii) the contribution of the social economy sector; (iv) corporate social responsibility and socially responsible investing; (v) social impact bonds; and (vi) community bonds.

A social impact bond is a public-private outcomes-based contract in which the relevant public sector entity agrees to pay a private sector investor a dividend only if improvements in social services for a defined population(s) are achieved (Social Finance, 2010; McGarry, 2011; Meyer and Kirby, 2011). In the UK, the government is asking philanthropists, businesses and charities to invest up to £40m into SIBs, to be spent on providing intensive help for families blighted by crime, addiction and poor education. In Ireland the public are being asked to identify the social issues and/or interventions that have the most potential for social impact bonds. Examples could include re-offenders, the homeless, children with ADHD or diabetics. An example of community bonds - loans from regular investors that offer both a social and financial return on investment – is the purchase of $6.5 m building in Canada (Social Enterprise Council of Canada, 2011).

While financial instruments for social innovation are mostly not comparable to debt and equity finance infrastructure for Yollies detailed throughout this report, VC does play an increasingly important role. There are a number of social venture capital funds (for example, Acumen Fund, Big Issue Investment, Calvert Investments, Central Fund, City Light Capital, Clean Technology Venture Capital, First Light, Good Capital, Gray Ghost Ventures, Investors’ Circle, Root Capital, Shared Interest, TBL Capital, Triodos Bank, Underdog Ventures) that provide market-based solutions but also evaluate a business on its social and environmental performance. While they may have originally
been established with a non-profit, socially-oriented focus, they are now increasingly focused on due diligence, supporting management, the exit strategy, financial return on investment and social return on investment. Unlike high-tech focused venture capitalists, social venture capitalists, while deploying similar risk and project management models, will limit interest to those social ventures where the rate of return is also measured in socially positive results.

Case 11: Calvert investments - a socially orientated investment fund

Calvert Investments, with more than $12bn in assets, is a US based leader in sustainable and responsible investing for over 25 years, believing that responsible management of environmental, social and governance factors contributes to sound financial performance and long-term shareholder value.

Established in 1976, Calvert now offers investors a wide range of portfolio strategies following the launch of its first Social Investment Fund in 1982. Three distinct approaches are employed: (i) signature strategies comprising two distinct research frameworks - a thorough review of financial performance and assessment of environmental, social and governance performance; (ii) solution strategies - a thematic/sector approach to solving some of the most serious global environmental and sustainability challenges such as energy (2007 Calvert Global Alternative Energy Fund) and water (2008 Calvert Global Water Fund); and (iii) SAGE (Sustainability Achieved through Greater Engagement) strategies - an enhanced strategic engagement approach to advance environmental, social and governance performance in companies that may not meet certain standards today, but have the potential to improve.

Success is measured by financial returns and criteria set out for each of the Signature, Solution and SAGE Funds. Criteria, for example, for the Signature Funds include: governance and ethics, workplace, environment, product safety and impact, international operations and human rights, indigenous peoples’ rights, and community relations.

Main lessons:
- Responsible corporate conduct and solid investment returns go hand in hand over time;
- Need for a proactive, disciplined investment process integrating environmental, social and governance research, allowing to identify often overlooked market opportunities;
- Requires specialised management team(s), with sectoral expertise and long years of experience;
- Offer a wide range of tailored investment solutions.

Source: [www.calvert.com](http://www.calvert.com).

Ventures capitalists are generally unwilling to invest in social enterprises partly due to a lack of knowledge and know-how on social enterprise business models, but essentially since they were perceived to provide lower rates of return than those expected from high tech start-ups. However, evidence from the past decade suggests that social enterprises may have equally good or bad survival rates and do not provide significantly lower returns than those expected from high tech start-ups (Patil, 2011).

Despite existing social innovation financing instruments, numerous good ideas and projects addressing the modern societal challenges in Europe are expected to go un-funded or under-funded, remain small and not sustainable without innovative solutions being found to address the funding issue (Social Innovation Europe, 2011; European Commission, 2010b).

5.4 EU level initiatives

Aside from the legislative measures in favour of venture capital, there are two main risk financing initiatives at EU level: the European Investment Fund instruments and the Risk Sharing Finance Facility (RSFF).

5.4.1 European Investment Fund risk financing for Yollies

One of the six objectives of the Entrepreneurship and Innovation Programme (EIP) pillar of CIP is to facilitate access to finance for start-ups and growth of SMEs and encourage investment in innovation activities. This objective is primarily served by one measure that includes two instruments: (i) the High Growth and Innovative SME Facility (GIF); and (ii) the SME Guarantee Facility (SMEG). The EIP budget allocation for 2007-11 amounts to €798.2 m or 53.6% of the total allocation (€1.489.4 bn).

The two financial instruments are not directly granted to SMEs; rather the EIF on behalf of the EC services places the funds in selected financial intermediaries such as
venture capital funds and business angels in the case of GIF, and guarantee institutions and banks in the case of SMEG.

The objective of GIF is to improve access to finance for the start-up and growth of SMEs. GIF 1 and GIF 2 focus on innovation and also high growth in the case of GIF 2.

A 2011 evaluation of EIP (Centre for Strategy and Evaluation Services, 2011) found that GIF and SMEG are building momentum and have a large leveraging effect, meeting a clear need for finance and stimulating cross-border activities. Often they were viewed as the only option for the financial support offered. Around two thirds of GIF beneficiaries and half of SMEG beneficiaries stated that they would not have established the business or invested without the financial support provided. Almost half of GIF and 60% of SMEG beneficiaries stated that the support is sufficient.

On the other hand, the evaluation reports a perception that a mechanism for following cross-cutting objectives or for communicating implications for the programme of strategic developments (e.g. Europe 2020 Strategy and relevant Flagship initiatives) and other EU actions (e.g. Structural Funds, FP7) at EU level is missing.

Synergy between GIF and national instruments was found to be limited with instruments similar to SMEG existing at national level. GIF1 includes the option of co-investments with business angel networks. To date this has not occurred due to the incompatibility between the structured GIF framework and the flexible approach of business angels. The take-up of the guarantee scheme for equity and quasi-equity investment has been very low. The stakeholder perception is that procedures for intermediaries participating or looking to participate are complicated.

Intermediaries in some countries do not participate due to the existence of national schemes and/or EU instruments such as Structural Funds. At end 2010, the number of GIF beneficiaries was 143 of the 1,200 anticipated over the whole period. Given the average investment per fund, it’s difficult to envisage the foreseen level being achieved. Recommendations include focusing more on innovation, high growth and internationalisation and taking a more proactive approach in promoting the instruments in countries not sufficiently covered.

Although early to assess final outcomes, the evaluation states that both GIF and SMEG are on target to achieve expected outcomes.

Separate from the EC allocating funds to the EIF on a trust basis to manage various joint initiatives such as the RSFF, GIF and SMEG (under CIP), the EIB also supports innovative companies through commitments to and management of equity funds. (GIF represents only about 10% of the funds managed by EIF). EIF total net commitments to private equity funds amounted to €5.4bn at end 2010. Focusing on early and later stage VC cumulative commitments at end 2010 amounted to €3bn, estimated to leverage €10.7bn, with an average leverage multiplier of 3-4x.

With investments in over 300 funds, the EIF is a leading player in VC in Europe. Within the VC portfolio, the focus is on cutting edge technology (55% in ICT and life sciences). EIF joint investment facilities with public and private entities through investments in specific Fund-of Funds are summarised in Appendix E.2.

5.4.2 Risk Sharing Finance Facility

With private investment and capital market finance in research and innovation below required levels to meet the Lisbon Agenda (and Europe 2020 Strategy) goals due, in part, to perceived high risk and uncertainty, further intensified by the financial crisis, the EC (through FP7 funding) and the EIB jointly established the Risk Sharing Finance Facility (RSFF) in June 2007 to improve access to loan finance.

The specific objectives of the RSFF - a demand driven (“first come, first served”) debt-based facility - are to encourage private investment in RTDI by financing innovative companies of any size and ownership, supporting the implementation of joint European projects (Joint Technology Initiatives, Eureka) and European Research
Infrastructures. Focusing on five core sectors at the outset (energy, ICT, life sciences, RDI infrastructure and the automotive industry) target groups include mid-sized and large companies, SMEs, research institutes, special purpose companies and promoters of research infrastructures.

An EIB evaluation of the facility for the period June 2007 to end 2009 (EIB Operations Evaluation, 2010) found that 62 operations were approved, 45 signed and 24 disbursed by end 2009. More than half of the total project approvals (€6.3bn) were for three countries (Germany, Spain and Sweden) and more than 60% of the project portfolio was in two sectors (engineering/industry – 37% and life sciences – 25%). Average loan size increased from €51m in 2007 to €87.5m in 2008 and €129.5m in 2009. The majority (73%) of all RSFF loan approvals were made to large companies, 5% to mid-size companies and only 2% to SMEs. Research institutes and universities only started to gain importance in 2009. The RSFF loan share increased from 43% in 2007 to 91% in 2009.

The total FP7 and EIB contribution between 2007-09 was €1.162bn (FP7 €390m and EIB €772m), leveraging a multiple of 6.3 in EIB loans and guarantees, and €16.2bn in additional investments in RDI (compared to the overall €229bn in public and private expenditure on R&D in 2007 for the same countries as the RSFF core portfolio).

Overall the facility was assessed to have performed well. European cooperation effects as well as technological, financial and economic spill-over effects were noted. Demand for the facility was high with approvals outstripping initial targets. From the various promoters interviewed, it was found that the RSFF loan was a cost effective instrument for opening up the private loan market, facilitating other intermediary involvement. Aspects of the facility noted for review include: with large companies dominating the portfolio, how to expand the involvement of SMEs, research infrastructure and university financing; the involvement of countries with no or lower participation to date; enlargement of sectoral participation to those sectors with high RTDI intensity (e.g. key enabling technologies, strategic energy technologies, knowledge intensive services) and/or sectors not considered to date; and the need to streamline procedures. With the likelihood that the EU contribution will not be fully utilised before 2013 the issue of revolving funds also needs to be addressed.

5.4.3 Future plans for EU instruments

Interviews undertaken for this study (see also Europe INNOVA and Technopolis Group, 2011) suggest that there is added value from action on access to finance at the EU level. On the one hand, the latest ECB survey on SME access to finance (ECB, 2011) shows that access to finance is the second most pressing faced by euro area SMEs (after finding customers). There is general agreement that new measures are needed and existing EU level measures be further developed/tailored for Yollies. As per the GIF evaluation, a key issue to address is the lack of drawdown by early stage investors from financial instruments such as GIF1. Staff experienced in early-stage investment are required in all relevant agencies (including at ERDF level). Additionally, new realities for early stage investment such as market fragmentation, the too many small VC funds operating with no critical mass and the increased number of business angels (and business angel networks) need to be more recognised.

The Inno-Partnering Forum (IPF, 2011) proposes joining forces with national programmes to establish an EU Invest initiative33. EU Invest is envisaged to operate outside of national regulatory regimes, the fund to be at least 10 times bigger than current national schemes, fund management to be outsourced to best available private investors and complementary support measures to be ensured.

33 It is proposed that Eureka’s Techno Lending Fund and an equity fund should be part of this initiative.
The European Venture Fund Investors Network (EVFIN, 2011) note that the various national and EU level initiatives focus on large, existing VC funds rather than on new and smaller funds although these smaller funds may be more active in the upstream stages. From discussions with EIF it seems to want to work more with new, emerging funds, helping them also on strategy/ideas, not only with finance. It is looking for niche, specialised fund managers with new approaches (e.g. Open Ocean fund in Finland [http://www.openoceancapital.com]).

On the other hand, lack of funds is not viewed as the key problem (Inno-Partnering Forum, 2011). Rather, it is the structural barriers in Europe that need to be solved (EBAN, 2011, 2010; ERAB, 2010); problems are arising from a fragmented market with varying national regulations and too few VCs of sufficient quality. The European Commission aims to take account of the financing needs of new companies in the initial start-up and growth phases and to adopt new rules by 2012 for VC funds to operate and invest freely throughout the EU. However, it is expected that harmonising tax rules will be a long and difficult process and take time.

EBAN proposes leveraging business angels interventions by topping up their investment with co-financing from the public sector by establishing a dedicated pan-European fund. In response, the EC/EIF under the RSFF will launch a pilot co-investment scheme with business angels in late 2011/early 2012. Other business angel related proposals include: (i) encourage networking between the BANs and VC funds at EU level through allocated funding under the Enterprise Europe Network and Europe INNOVA; (ii) capacity building programmes for BANs; and (iii) more fiscal incentives be introduced to allow high net worth individuals to diversify their portfolio into Yollies across Europe, not only in their home countries.

The “Horizon 2020” initiative (that will replace FP7 and the CIP) includes the intention to increase debt and equity financing for innovative SMEs, through a new RSFF sub-window, with the EC taking 95% of the risk. The SME focused RSFF component will also have an SBIR component supporting commercialisation through: (i) debt or equity financing (addressing the “valley of death” syndrome); and (ii) pre-competitive public procurement and public procurement.

Moreover, there is discussion on the possibility for EU funds to be fully exempt from the State Aid framework and to allow regions to use Structural Funds for YIC financing purposes and, with EC prior approval, also be allowed to allocate funds to activities outside their territories if it’s clearly in their interests. While EU legislation allows for the opening up of different EU funding instruments, enabling MS collaboration by pooling together resources for early stage investments (e.g. Articles 33 and 60 of the new Draft General Regulation for the implementation of ERDF, ESF and the Cohesion Fund 2014-2020), it is rare in practice. Opening up of Structural Funds would require closer coordination between the relevant EC services and new working methods.

To tackle the need to increase networking between large corporations, VC fund managers and portfolio companies, the EIF expects to launch in early 2012 an open innovation platform around four investment themes: (i) digital society; (ii) health and life sciences; (iii) resource sustainability; and (iv) smart things. It is envisaged to have VC funds operating along the lines of the Paris-based Aster fund (www.aster.com).

Other proposals include: need for broader financing instruments to encompass the entire innovation cycle (from idea to marketing), more EU funding at the proof-of-concept stage, additional funding to be available for commercialisation activities where an innovation or idea has materialised from EU funding, building the network of national promotional institutions, acceptance of patents as collateral, improvement in the framework for state aid (e.g. increase the de minimis threshold, lowering private investor share), establish an EU instrument for R&D commercialisation, and development of an EU wide SBIR type scheme giving SMEs more time to focus on developing ideas that chasing funding and fire-fighting (KfW, 2011; NEFI, 2011; Inno Partnering Forum, 2011; Innovationsbron, 2011; Irish Government, 2011; Scottish Government, 2011; Technology Strategy Board, 2011; Tekes, 2011).
6. Future policy options

The study was asked to address two main questions in conclusion:

- Is the VC route the most appropriate for Europe, or what mix of financial methods is best for the European framework?
- What is the potential role of the EU policy level in supporting the development of the various funding models stimulating young innovative companies?

This final section consolidates the arguments and proposes a series of policy options that should generate the best mix of financial methods to support high impact firms.

Public policy should avoid excessive market entry

The review of the literature, data and interviews highlights a number of key points that inform this policy section. First amongst them is the strong evidence that the problem the EU faces is a problem of lack of growth amongst its firms and not a lack of start-ups. European public policy in relation to entrepreneurship needs to shift its focus from quantity to quality and enhance the performance of the small minority of firms that drive economic growth and job creation. Public policies that encourage excessive market entry of low quality firms can be damaging to the economy if they drive up factor prices for high quality firms, dilute entrepreneurial and managerial talent and create a ‘market for lemons’ for investors.

Venture investing is only one element of a strongly interconnected system

The second key finding is that venture investing is part of a strongly interconnected system, so that business angels and venture capital funds do not exist in isolation. This system is comprised of institutional and government investors; a flow of high quality, investment ready firms; skilled, specialised and large professional investor funds; exit markets that allow investors to realise high returns; and a network of professional advisors able to advise growing firms. This system has to work effectively for long periods of time in order to develop the necessary human capital for it to work. Moreover, it has to allow firms to move up the funding ‘escalator’ as they grow and access increasingly large amounts of money. As firms grow they need different kinds of funding, and young technology firms often need cash flow which is more appropriately funded through debt instruments. Credit (loan) guarantees generally work in a modest, but effective way (although guarantees over 80% reduces the risk to lenders too much and reduces their incentives to evaluate proposals diligently). Developing a viable VC and venture investing sector is a long term project that has taken over 50 years in the USA. Europe seems to be learning faster, in part because the US provided a model to follow, but policy makers should be thinking in terms of decades rather than years as this gives firms the time to innovate and produce meaningful results.

Public support needs to be ‘flexibly aligned’ to market and societal trends by setting ‘core parameters’ for support

The third key finding relates to general Policy Guidelines. These are Simplicity, Clarity, and aligning Incentives. The review of the various policy instruments that have been tried around the world suggests that policy should be designed with simplicity of administration, delivery, and wider understanding in mind. Attempts to integrate social policy with economic policy and use VC funds for social objectives have not worked. Instead, policy that has clear objectives that are well articulated to private sector and other intermediaries involved in delivery, and is strongly aligned with private sector intermediaries’ incentivised is most effective at achieving policy objectives. Schemes with a small number of core parameters (e.g. investment size, sector, age target, investment term) can be the most adaptable and flexible way of reacting to changing economic circumstance or policy shifts. Schemes must be able to
adapt quickly, with the minimum of bureaucracy, to respond to the rapidly changing environments that have characterised the 50-year history of venture capital.

Policy should seek to incentivise private venture funds...

The fourth key finding relates to policy learning. There is clear evidence of policy improving through time, and there is now considerable knowledge about which types of funds are likely to be most successful. For Business Angels the key initial issue is building up capability and addressing demand side ‘investment readiness’ problems, once these are addressed, policies can move onto support and then co-invest with the professional networks that emerge. Such policies can be effective and are often very cost effective. With VC, the review of evaluations highlighted the importance of building up human capacity during the early years of the industry, and continuing to support capacity building as experienced investors move out of early stage investing into later stage investing. As human capacity is built up successful policies tended to move towards strongly incentivising success. These incentives can involve penalising VC intermediaries who ‘misbehave’ and pursue short-term, high risk, investment strategies. The experience of the UK hybrid fund schemes suggests that the public sector can make significant indirect returns from its investment in supporting well incentivised private sector venture funds from the increased taxation and job creation that follows. Governments, unlike other investors, can appropriate the benefits of their investments indirectly, and therefore have more to gain from supporting world-leading clusters of technology, firms and investors.

...through long term investment in professionally managed schemes...

The fifth key finding relates to specific policy guidelines for supporting venture investment funds: this is to build well funded, long term, professionally managed schemes, that reward success rather than subsidise failure. It is vital to ensure schemes are large, as underfunded schemes guarantees failure. Good policy focuses on both direct and indirect effects (i.e. job creation from policies aimed at achieving commercial returns, and technology spillovers) and learns from experience over long periods and drops (improves) bad schemes.

...by scaling up and expanding horizons of hybrid funds...

The sixth key finding relates to the design of VC hybrid schemes. These should be large (i.e. >€50m), never regionally focused (as this constrains deal flow and the benefits of specialisation), and properly aligned with realistic commercial incentives. This later point means that funds should be allowed to make commercial decisions and should not be constrained in their ability to make follow-on investments and avoid dilution. Policy should ensure the escalation of smart capital, as both debt and equity funding, seamlessly grows with firms expanding funding requirements. As a consequence, low caps on the upper limit on VC type investments (i.e. below €3m) should be avoided.

Schemes should rely on co-funding from private sector investors to signal quality, and strongly incentivise success (ideally with the recognition that tax payer returns are likely to be larger through increased tax revenues from the additional jobs and economic activity that is generated). Protecting funds from poor quality investment decisions by subsidising failure should be strongly avoided. The experience of the USA and Israel highlights the need to continuously support success in areas of global competitive advantage.

...and by policy makers biting the bullet and shutting down ineffective instruments

Lastly, in such a dynamic environment it is important to evaluate policy and shut down or change ineffective policy instruments. There is evidence that there are a number of highly ineffective schemes for supporting SMEs operating in Europe that, if shut down, would free up enough funds to allow a significant shift towards a more effective venture investing system within Europe at no additional cost to the taxpayer.
Financing Young Innovative Companies

**General Policy Guidelines:** Simplicity, Clarity, Incentives

- Policy must be designed with **simplicity** (of administration, delivery, and wider understanding) in mind
- The rationale for schemes must be clearly articulated to private sector and other intermediaries involved in delivery
- Private sector intermediaries must be incentivised to do what the government needs to achieve their objectives

**Specific Policy Guidelines:** Build well-funded, long term, professionally managed schemes, focused on both direct and indirect effects and learn from success and failure over long periods

- Do not ignore indirect effects (economic, technology etc spill-overs and multipliers)
- Do not underfund schemes as this guarantees failure
- Design policy goals to achieve objectives over a 10 year period to allow firms to innovate and bring products to commercial markets stage
- Ensure management information systems are in place prior to issuing money and that all intermediaries are clear that they need to provide this information on a quarterly basis
- Learn from mistakes and drop (improve) bad schemes
- Be aware that data is very poor and be sceptical of much data on VC returns.
- Remember that a scheme with a small number of core parameters (e.g. investment size, sector, age target, investment term) can be the most adaptable and flexible way of reacting to changing economic circumstance or policy shifts. Allow such schemes to be adapted quickly with the minimum of bureaucracy.

**Specific Finance Policy:** a key aim should be to ensure that the level of smart capital, involving both debt and equity funding, seamlessly grows as firms grow and require more funding.

- Credit (loan) guarantees generally work in a modest, but effective way
- Do not offer guarantees over 80% as this reduces the risk to lenders too much and hence their incentives to evaluate proposals diligently
- Yollies need cash flow that is more appropriately funded through debt instruments
- Do not prevent firms from receiving follow-on or multiple rounds of funds from specific schemes
- Hybrid VC funds often outperform private VC and direct government VC. Incentive VCs to make more patient and less spectacular investments.
- Do not cap the upper limit on VC type investments at anything less than Euro 3m.
- Allow firms to access ‘bundles’ of debt and equity type investments so there is an appropriate balance of short and long term capital in the firm.
- Penalise VC intermediaries who ‘misbehave’ and pursue short-term, high risk, investment strategies.
- Allow for a modicum of ‘blurring’ at the edges in terms of not being too bureaucratic about supporting firms are the margins of eligibility.
- Do not ignore the mutually beneficial relationship between improving management capability, securing finance and final outcomes.
Appendix A Bibliography


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Appendix B Interview guide

B.1 Financial mechanisms for young innovative companies
1. Is there a funding gap, and if so where is it most intense (proof of concept, creation, early-stage, growth, etc.)?
2. What models do you think are most effective in supporting the creation of young innovative firms?
3. What is the role, if any, of the public sector in supporting venture funding of young innovative firms?
4. Aside from financial mechanisms what other specific action is required to support young innovative firms?

B.2 Comparative approaches and experience of funding young innovative firms
4. What are the main obstacles facing early stage funding in the EU?
5. What key problems do European VC funds face? How do these compare to the markets in the US, other OECD countries and China and India?
6. To what extent are public funding schemes for young innovative companies serving to improve the situation? What good (or bad) examples can you suggest?
7. Is there a lack of qualified human capital in the EU venture industry and how might it be improved, would an Israeli style model be effective?
8. How does the industry interact with other elements of the high growth firm funding system such as Angels and exit markets?
9. Is there a problem with a lack of a European NASDAQ and what might be done to improve it?

B.3 Policy options
10. At what level is action most required: EU or national? And why?
11. How could risk be better allocated?
12. Would EU level initiatives such as a risk-sharing finance, a European SBIR, etc. assist in boosting the number of young innovative firms?
Appendix C  List of interviewees

Noam Bar-Gal, Office of the Chief Scientist, Israel
Will Cardwell, Aalto Entrepreneurship Centre
Edwin Chow, Planning Director, SPRING Singapore,
Anne Glover, Amadeus Capital Partners Limited
Nelson Gray (http://www.nelsongray.com)
Patric Gresko, European Investment Fund
Richard Horning, Sonnenschein Nath & Rosenthal LLP, Palo Alto, CA
Kevin Jonson, Index Venture
Ulrik Jørring, Senior Vice President, Vækstfonden
Jan Kutan, Fond fondov, s.r.o., Slovakia
Tan Kai Hoe, Deputy Chief Executive, SPRING Singapore,
Jean-David Malo, European Commission, DG Research.
Colin Mason, University of Strathclyde
Claire Munck, European Business Angels Network
Professor Gordon Murray - Exeter Business School
Killu Sanborn, Business Development Director, Oxford Financial Corporation, San
Diego, US
Mikko Suonenlahti, President Advisor of Veraventure (FI) and of DFJ Esprit (DFJ
Menlo Park CA European Affiliate)
Dan Vanderschans - Enterprise Directorate, DBIS
Carmen Yuen, General Manager of SPRING SEEDS Capital Pte Ltd
Appendix D: Statistical data on US venture capital investments by sector

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<td>792</td>
<td>952</td>
</tr>
<tr>
<td>Software</td>
<td>1,069</td>
<td>2,152</td>
<td>3,186</td>
<td>4,192</td>
<td>9,985</td>
<td>23,025</td>
<td>10,022</td>
<td>5,034</td>
<td>4,377</td>
<td>5,286</td>
<td>4,784</td>
<td>4,919</td>
<td>5,441</td>
<td>5,212</td>
<td>3,299</td>
<td>3,964</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>797</td>
<td>1,141</td>
<td>1,442</td>
<td>2,497</td>
<td>7,698</td>
<td>15,913</td>
<td>4,954</td>
<td>2,063</td>
<td>1,606</td>
<td>1,751</td>
<td>2,252</td>
<td>2,546</td>
<td>1,910</td>
<td>1,582</td>
<td>518</td>
<td>919</td>
</tr>
<tr>
<td>Grand Total</td>
<td>7,233</td>
<td>10,455</td>
<td>13,995</td>
<td>19,368</td>
<td>50,885</td>
<td>98,602</td>
<td>37,624</td>
<td>20,737</td>
<td>18,789</td>
<td>21,699</td>
<td>22,535</td>
<td>26,010</td>
<td>29,901</td>
<td>28,105</td>
<td>18,276</td>
<td>21,823</td>
</tr>
</tbody>
</table>

Appendix E: Public and hybrid funds and funds of funds in the EU and associated countries

E.1 Early-stage funding organisations in the EU and associated countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Main public or hybrid early stage or seed capital funds</th>
<th>Comment (EU co-financed, thematic focus, etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>• Finanzierungsgarantie-Gesellschaft</td>
<td>• Offers direct warranty to venture capital funds that are investing in technology oriented SMEs (the FGG guarantees 50% of the invested capital).</td>
</tr>
<tr>
<td>Belgium</td>
<td>• Business Angels Plus (BA+) scheme</td>
<td>• Matches the financing provided by a business angel investor and the entrepreneur.</td>
</tr>
<tr>
<td></td>
<td>• SRIW, GIMV, SRIB, LRM and Sowalfin</td>
<td>• SRIW for the Walloon region, GIMV for the Flanders region, as well as several regionalized players like SRIB for the Brussels region, LRM and Sowalfin for Flanders and Walloon region respectively.</td>
</tr>
<tr>
<td></td>
<td>• ARK-Angels Fund</td>
<td>• Public-private partnership, co-investment fund for Flemish Business Angels. Provides between 50 and 700 thousand Euro.</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>• Bulgarian Business Angels Network</td>
<td>• Matches capital seeking entrepreneurs with informal investors.</td>
</tr>
<tr>
<td>Cyprus</td>
<td>• Cyprus Development Bank</td>
<td>• Directed towards technological upgrading, financial restructuring, company flotation and overseas operations.</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>• None</td>
<td>• N/A.</td>
</tr>
<tr>
<td>Denmark</td>
<td>• Innovationsmiljø (incubators)</td>
<td>• Innovation Incubators may invest up to de minimis threshold per company and together with Vækstfonden invest 60% of the seed capital.</td>
</tr>
<tr>
<td></td>
<td>• Danish Investment Fund - Vækstfonden</td>
<td>• State investment fund that aims to create new growth companies by providing venture capital and competence. Since 1992 Vækstfonden has, in cooperation with private investors, co-financed growth with a total commitment of approx. DKK 10 billion. Vækstfonden invests equity or provides loans and guarantees in collaboration with private partners and Danish financial institutions. The companies, which Vækstfonden has co-financed since 2001 represent a total turnover of approx. DKK 27 billion and employ approx. 22,000 people all over the country.</td>
</tr>
<tr>
<td>Estonia</td>
<td>• Arengufond (Estonian Development Fund)</td>
<td>• No ERDF co-financing, operates as a pari passu investment vehicle with business angels and private venture funds.</td>
</tr>
<tr>
<td>Country</td>
<td>Main public or hybrid early stage or seed capital funds</td>
<td>Comment (EU co-financed, thematic focus, etc.)</td>
</tr>
<tr>
<td>---------</td>
<td>--------------------------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
</tbody>
</table>
| Finland | • SITRA  
• Finnish Industry Investments  
• Veraventure  
• Finvera  
• VIGO  | • Venture capital investments within its specific programmes  
• Only growth stage investments  
• Investments in the seed and start-up stages (80% of Finnish early-stage market (2009)  
• Finvera’s Venture Capital Investments serve as the hub for public early-stage venture capital investments. Finvera makes direct investments in early-stage innovative enterprises through its subsidiary Seed Fund Vera Ltd. Finvera also develops regional venture capital investment activities. In addition, the company manages a business angel network known under the name of InvestorExtra.  
• New business accelerator programme for fast growing young companies |
| France  | • CDC Enterprises  
– FCJE - Fonds de co-investissement pour les jeunes entreprises  | • Finances all types of activity at all stages: from start up through growth and subsequent transfers of ownership  
– The fund is fully invested in 46 companies |
| Germany | • High-tech Gründerfonds  
• ERP START-UP FUND  
• EXIST - Existengründungen aus der Wissenschaft  
• Seedfonds Bayern  | • Financed by the federal government sources, kfw and by a small number of large enterprises. Completely focuses on those stages where market failures have been identified (early stage). By 2011, the HTGF is expected to mobilise investments of €272m in total (about €240m by BMWi, about €32m by KfW and private funds) and reach at least 300 companies.  
• KfW Mittelstandsbank mobilises equity for young innovative companies with assistance from BMWi. In doing so, KfW enters into participations, which in most cases do not involve KfW assuming part of the management of the companies. The precondition is that at least one other investor (Lead Investor) also enters simultaneously into participation. The participation by KfW and the Lead Investor are subject to the same financial conditions ("pari passu").  
• Funding by the Federal government that supports students, graduates and scientists from universities and research institutions that wish to commercialise their business idea  
• Bayern Kapital joined forces with the LfA Foerderbank and thg-Technologie-Beteiligungs-Gesellschaft mbH (now KfW – a bank sponsored by the German government), to create Seedfonds Bayern for financing startups in the medical technology, environmental technology and information / communication / software sectors. |
| Greece  | • TANEÖ  | • Fund of Funds, Co-financed by the Structural funds (ERDF, ESF, etc.)  
Co-financed by the private sector |
<table>
<thead>
<tr>
<th>Country</th>
<th>Main public or hybrid early stage or seed capital funds</th>
<th>Comment (EU co-financed, thematic focus, etc.)</th>
</tr>
</thead>
</table>
| Hungary | • Corvinus First Innovation Venture Capital Fund (CELIN)  
• Start Equity Guarantee Fund  
• New Hungary Venture Capital Programme | • CELIN is part of the state-owned Hungarian Development Bank (MFB) Invest Group, and is managed by the Corvinus Venture Capital Management Ltd.  
• Offers equity guarantee for professional financial investors investing in Hungarian SMEs,  
• Intermediaries, i.e. venture capital fund management firms, may apply for the available amount, i.e. roughly EUR 140 million. The bulk (85%) of this amount is covered by the EU JEREMIE funds. The programme is managed by the Venture Finance Hungary Plc. The winners should raise at least 30% additional private funding - a challenge given the scarcity of available private capital due to the current economic crisis. |
| Ireland | • Enterprise Ireland Seed and Venture Capital Programme  
  - AIB Seed Capital Fund  
  - AIB Start-up Accelerator Fund  
  - Atlantic Bridge Venture Fund  
  - Atlantic Bridge Venture Fund II  
  - Bank of Ireland Early Stage Equity Fund,  
  - Bank of Ireland Kernel Capital Partners  
  - Bank of Ireland Start-up and Emerging Sectors Equity Fund  
  - Delta Equity Fund  
  - Fountain Healthcare Partners  
  - Seroba Kernel Lifesciences | • to 10 different funds ranging from seed funding to thematic venture capital, such as Serobia Kernel Lifesciences.  
  - Provides venture capital for companies at the seed and early stages of development across a range of sectors throughout the Republic of Ireland. The Fund has a total of €53 million under management with AIB committing €30 million and Enterprise Ireland €23 million.  
  - A fund managed by the ACT Team, investing funds from AIB and Enterprise Ireland. Investments in backing start up and early stage businesses and more established companies looking to use venture capital to build scale.  
  - Growth Equity Technology investments in the semiconductor, communications and software sectors.  
  - Continuation of ABVF  
  - Joint fund built with contributions from the Bank of Ireland, the University of Limerick Foundation, and government-backed Enterprise Ireland, invest in export-oriented high potential firms that operate in the technology, food and financial services sectors, in addition to supporting patent and patent pending projects within Irish universities, targeting investments between EUR 100K-500K.  
  - ICT, Telecoms, Healthcare, Life sciences,  
  - Managed by Delta Partners on behalf of Bank of Ireland, our €17m fund has been created to support Irish start-up or early stage businesses.  
  - Technology-based Businesses and MedTech and other Healthcare. Investment size ranges between €0.5 - €5m, primarily Ireland & the UK, but also with partners in other EU countries.  
  - the largest dedicated life science venture capital fund in Ireland  
<table>
<thead>
<tr>
<th>Country</th>
<th>Main public or hybrid early stage or seed capital funds</th>
<th>Comment (EU co-financed, thematic focus, etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy</td>
<td>- Incubators for Start-Ups</td>
<td>The measure is aimed to support the start up of innovative companies in high technological impact sectors.</td>
</tr>
<tr>
<td></td>
<td>- Support for the promotion and the development of new innovative enterprises</td>
<td>The measure is aimed to support the start up of innovative companies in high technological impact sectors. This is one of the national measures focusing on start-ups and promotion of business creation in high-tech fields that have become recently a more relevant priority for the governmental policy. The measure provides funds to selected intermediaries which invest in innovative companies that are planning innovative project at high-level technological impact.</td>
</tr>
<tr>
<td></td>
<td>- Guarantee Fund for SMEs-Special section on Digital Technologies</td>
<td>Fosters the adoption of ICT by SMEs. Its purpose is three-fold: To facilitate credit access to SMEs in the medium and long term in order to carry out complex projects in the digital innovation area; to reduce the overall costs of the guaranteed funding by reducing the risk level of the credit given by the banks; and to encourage the consortium of enterprises in order to create intercompany networks and to foster the integration of industries through the redefinition of operations of the Rotating Fund</td>
</tr>
<tr>
<td>Latvia</td>
<td>- Venture capital funding programme (managed by three private venture funds)</td>
<td>Since 2005, the programme has been co-financed by the ERDF</td>
</tr>
<tr>
<td></td>
<td>- Funds-of-funds within the Latvian Guarantee Agency</td>
<td>The Fund of Funds comprises of 1) ZGI fund managed by Zalās gaismas investīcijas LLČ, 2) Otrais Eko fonds managed by Eko Investors PLC, and 3) INVENTO managed by TechVentures Fondu Vadibus Kompanija LLČ. Maximum investment into one company is €487,830. Investments are made in start-up, early development, and expansion phases of SMEs registered in Latvia.</td>
</tr>
<tr>
<td>Lithuania</td>
<td>- Controlling fund established</td>
<td>Co-financed by the EU Structural Funds. Funds allocated during 2009-2010 for venture capital and business guarantees and loans of roughly €550m</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>- Ecostart - enterprise and innovation centre</td>
<td>Created by the Luxembourg government in order to diversify the range of support services on offer to innovative businesses in Luxembourg. The mission of Ecostart is twofold: - support promoters of innovative projects at the idea stage and to provide ongoing assistance up to the start-up phase; - provide temporary accommodation for domestic and foreign businesses at the development stage seeking a temporary foothold in Luxembourg.</td>
</tr>
<tr>
<td>Country</td>
<td>Main public or hybrid early stage or seed capital funds</td>
<td>Comment (EU co-financed, thematic focus, etc.)</td>
</tr>
<tr>
<td>---------</td>
<td>--------------------------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Malta</td>
<td>• Small Start-up ERDF Grant Scheme</td>
<td>• Grants to small enterprises created less than three years before application. The eligible sectors include manufacturing, Information and Communication Technology, Research and Development and Innovation, Waste Treatment and Environmental solutions and biotechnology. • Launched by Malta Enterprise to assist companies in accessing equity finance by supporting local businesses with the development of their business proposals and help them with their initial investor search.</td>
</tr>
<tr>
<td></td>
<td>• Equity Funding Programme</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• STW Valorisation Grant</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• TechnoPartner</td>
<td>• An integral programme that aims to improve the economic climate for technology-based start-ups by: giving technostarters access to capital, knowledge, experience and equipment; motivating knowledge institutes and investors to invest money and knowledge in pioneers; providing a platform where technostarters can ask questions, explore ideas and make comments</td>
</tr>
<tr>
<td></td>
<td>− Seed facility</td>
<td></td>
</tr>
<tr>
<td></td>
<td>− Knowledge Exploitation funding programme (SKE)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>− Certificate</td>
<td></td>
</tr>
<tr>
<td></td>
<td>− Business Angel Programme</td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td>• Venture Capital scheme</td>
<td>• The programme aims to promote commercialisation of knowledge within public scientific research institutes. Inspired by the American SBIR programme, researchers at public research institutes can apply for a grant to create a spin-off. The grant can be used for product-market analysis, for development of a prototype, for development of personal skills, for protection of intellectual property, etc. Commercialisation that follows should be funded by private investors</td>
</tr>
<tr>
<td>Poland</td>
<td>• Plans for 20 new venture capital funds during 2007-13 period</td>
<td>• ERDF co-financed under Measure 3.2 of the OP Innovative Economy</td>
</tr>
<tr>
<td></td>
<td>• Fund of Funds established (2005)</td>
<td>• ERDF co-financed</td>
</tr>
<tr>
<td>Portugal</td>
<td>• Fundo de Sindicac a o de Capital de Risco (FSCR)</td>
<td>• Co-financed by structural funds, aimed at providing further leverage and support to the development of venture capital activities in Portugal</td>
</tr>
<tr>
<td></td>
<td>• Credit Enhancement Securitization Fund (FGTC)</td>
<td>• Co-financed by the ERDF. Aimed at improving SMEs, financial structure and access to finance.</td>
</tr>
<tr>
<td></td>
<td>• FINICIA Programme</td>
<td>• Co-financed by the Structural funds and by the private sector, instrument combines equity and debt to support investments</td>
</tr>
<tr>
<td>Romania</td>
<td>• None</td>
<td>• N/A</td>
</tr>
<tr>
<td>Country</td>
<td>Main public or hybrid early stage or seed capital funds</td>
<td>Comment (EU co-financed, thematic focus, etc.)</td>
</tr>
<tr>
<td>---------</td>
<td>------------------------------------------------------</td>
<td>------------------------------------------------</td>
</tr>
</tbody>
</table>
| Slovakia | • Fond Fonov  
• Financial engineering tools for innovations | • Seven funds with different investment strategies all consist of public finances (PHARE and national budget)  
• Design of the measure is based on the JEREMIE |
| Slovenia | • Guarantees for subsidised bank credit to SMEs  
• The co-financing scheme is offered by Slovene Enterprise Fund  
• Financial Assistance to institutions supporting innovation activity | • Provides for a guarantee to the commercial bank when approving a loan to SMEs, and in the second phase it subsidizes the interest rate of that particular loan  
• Start-up companies, located within business or university incubators or technology parks for less than 12 months and have not yet entered the market. |
| Spain | • NEOTEC  
• FESpyme, previously known as Fond-ICO, FCR  
• Public Venture Capital to New Technology Based Firms (NTBF s) by ENISA participation  
• Centre d’Innovacio i desenvolupament Empresaria (Cataluna) | • Promotes cultural change in scientific environment towards an entrepreneurial approach, increases start-up funds to help NTBF’s (seed-capital), provides appropriate infrastructure and services to NTBFs (training, technical and legal assistance, information services)  
• Specialising in providing investment for start-ups with a technological or innovative content. €422nm equity investment and debt financing instrument, is to provide financing for enterprises’ expansion processes, including the acquisition of other companies, assets, but also innovation activities and internationalisation of the Spanish enterprises.  
• Equity loans  
• Co-financing ventures with international investors would help impart experience to public and private fund managers |
| Sweden | • ALMI Invest  
• Innovationbron  
• National Industrial Development Fund (Industrifonden) | • Co-funding from the ERDF  
• Innovationbron seed funding products are: soft loans, development grants, equity and management support for incubators |
| UK | • Capital for Enterprises Ltd (formerly Enterprise Capital Funds)  
• Scottish Enterprise-backed Funds such as Scottish Enterprise Proof of Concept Programme  
• UK Innovation Investment Fund UKIIF  
• Regional Venture Capital Funds (RVCFs) | • Wholly owned by UK Government through the Department for Business, Innovation and Skills. CfEL supports both existing programmes and actively seeks new opportunities that increase the provision of capital for early stage SMEs in the UK. Portfolio of 10 funds ranging from business Angel Co-Investment Fund to Equity funds.  
• Grants for development of already patented products, putting entrepreneurs in touch with experienced venture capitalists  
• The UKIIF is a substantial fund that replicates what the best US fund already do: making investments at all stages, with the kind of scale that can build companies with global reach.  
• Set up in each of the nine English regions run by private VC general partnerships |
<table>
<thead>
<tr>
<th>Country</th>
<th>Main public or hybrid early stage or seed capital funds</th>
<th>Comment (EU co-financed, thematic focus, etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• University Challenge Funds (UCFs)</td>
<td>• Co-funded by the government, the Wellcome Trust, the Gatsby Foundation and participating universities. They were intended to provide proof-of-technology and proof-of-market funding for the initial commercialisation of academic research.</td>
</tr>
<tr>
<td></td>
<td>• Early Growth Funds (EGFs);</td>
<td>• Provide small amounts of equity finance based on angel co-investment, employing a quasi-equity approach.</td>
</tr>
<tr>
<td></td>
<td>• Scottish Co-investment fund</td>
<td>• Co-financed by ERDF. It invests alongside approved investment partners, most of which are angel groups. Any business that the investment partner has invested in that meets the scheme’s eligibility rules can raise matching funds up to £1 million.</td>
</tr>
<tr>
<td></td>
<td>• Enterprise Investment Scheme</td>
<td>• EIS income tax relief has now been raised to be in line with Venture Capital Trusts, with the amount of upfront income tax relief increasing from 20% to 30%. And the amount of investment that can attract upfront tax relief will double in April 2012 from £500,000 to £1 million, limited to income tax liability if less than this. Investment can also be carried back and set against the previous year’s income tax liability instead if desired.</td>
</tr>
<tr>
<td></td>
<td>• Venture Capital Trust Scheme</td>
<td>• Designed to encourage individuals to invest indirectly in a range of small higher-risk trading companies whose shares and securities are not listed on a recognised stock exchange, by investing through Venture Capital Trusts</td>
</tr>
<tr>
<td></td>
<td>• UK High Technology Fund</td>
<td>• £125 million “fund of funds” which invested in a number of specialised technology VC funds such as Advent, Amadeus, MIT and Scottish Equity Partners</td>
</tr>
<tr>
<td></td>
<td>• Welsh Hybrid Funds</td>
<td></td>
</tr>
</tbody>
</table>

**Non-EU**

<table>
<thead>
<tr>
<th>Country</th>
<th>Main public or hybrid early stage or seed capital funds</th>
<th>Comment (EU co-financed, thematic focus, etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>• Industry Investment Fund</td>
<td>• Co-investment with private capital. Set up to assist the formation of 10 new early-stage venture capital funds. The minimum ratio of government to private funding is 1:1 so the new funds will have a minimum of $40 million in committed capital, and potentially significantly more.</td>
</tr>
<tr>
<td></td>
<td>• Venture Capital Limited Partnerships program (VCLP)</td>
<td>• The programme is designed to increase the amount of foreign investment in the Australian venture capital sector by providing certain foreign investors (eligible venture capital partners) in a VCLP with an exemption from capital gains tax on profits from eligible venture capital investments made by the VCLP.</td>
</tr>
<tr>
<td></td>
<td>• Early Stage Venture Capital Limited Partnerships (ESVCLP)</td>
<td>• Grants all investors in registered venture capital funds a tax-free entitlement to dividends or capital gains generated by those funds</td>
</tr>
<tr>
<td>Israel</td>
<td>• Israel’s Office of the Chief Scientist (OCS) Incubators</td>
<td>• 24 incubators designed to integrate newcomers with local talent and to foster early stage technology development through entrepreneurship. (Electronics / Communication 19%, Software 15%, Medical devices 23%, Biotechnology 19%,...</td>
</tr>
<tr>
<td>Country</td>
<td>Main public or hybrid early stage or seed capital funds</td>
<td>Comment (EU co-financed, thematic focus, etc.)</td>
</tr>
<tr>
<td>---------</td>
<td>--------------------------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
</tbody>
</table>
|         | • Yozma programme                                      | Agriculture and environment 11%, Other 13%)
|         | • Venture capital funds, initially managing $20 million each, capitalized with a combination of government funds (40 percent) and foreign investment (60 percent). In 2009, the Life Sciences Sector led the Israeli VC market with $272 million or 24% of total capital raised, followed by the Software Sector with $258 million or 25% and the Communications sector with $219 million or 20% of total capital raised. Internet firms continued to attract investor attention with 15% of capital raised in 2009 and 14% and 15% in 2008 and 2007 respectively. Within seed investments, software companies attracted the largest share – 41% – followed by life science companies with 20%.
| Canada  | • Labour Sponsored Venture Capital Corporation          | Fund managed by investment professionals and invested in small to mid-sized Canadian companies, the federal government offers investors in LSVCCs a 15% tax credit on a maximum investment amount of $5,000 per year.
|         | • Business Development Bank of Canada Venture Capital Fund | A major venture capital investor in Canada, active at every stage of the company’s development cycle, from seed through expansion, with a focus on technology-based businesses that have high growth potential and that are positioned to become dominant players in their markets. BDC Venture Capital invests in companies involved in the areas of Life Sciences, Information and Communication Technologies and Energy, Environment, Electronic and Materials.
|         | • Quebec Innovatech Venture Capital Fund                | Innovatech Quebec is a $125M early stage venture capital fund owned by the Government of Quebec. Innovatech invests in emerging technology-intensive companies in information technology and telecommunications, biotechnology, and advanced applied technologies. |

Source: authors’ compilation based on referenced materials and interview for this study

34 [http://www.incubators.org.il/program.htm](http://www.incubators.org.il/program.htm)
### E.2 European Investment Fund investments in country, multi-country or sector specific Funds-of-Funds

<table>
<thead>
<tr>
<th>Funds-of-Funds name</th>
<th>Overview</th>
<th>Commitments/Portfolio</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERP-EIF Dachfunds</td>
<td>• Launched in 2004</td>
<td>• €642 m committed in 20 funds matched by co-investments from EIF, EIB and EU resources and has helped to raise almost another €2bn from private investors</td>
</tr>
<tr>
<td><a href="http://www.eif.org/what_we_do/resources/erp/index.htm">http://www.eif.org/what_we_do/resources/erp/index.htm</a></td>
<td>• EIF manages the facility on behalf of the German Federal Ministry of Economics and Technology (BMWi) and the European Recovery Programme (ERP)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Co-investment (50/50) with BMWi</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Focus mainly on <strong>German based, high-tech early and development stage companies in all technology areas (ICT, Life Sciences, energy-related, emerging and converging technologies)</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Size – €1 bn</td>
<td></td>
</tr>
<tr>
<td>LfA-EIF</td>
<td>• Co-investment with Bavarian Ministry of Economics LfA Förderbank Bayern</td>
<td>• €26m committed in four funds</td>
</tr>
<tr>
<td><a href="http://www.eif.org/what_we_do/resources/LfA/index.htm">http://www.eif.org/what_we_do/resources/LfA/index.htm</a></td>
<td>• EIF manages the facility targeting all technology areas on behalf of the LfA Förderbank Bayern</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>Investments in VC funds to support technology-oriented early and development stage companies in the region of Bavaria.</strong> Funds are not restricted to invest solely in Bavarian companies, but one focus of the investment activity should be on investments in this region.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Size: €50m</td>
<td></td>
</tr>
<tr>
<td>NEOTEC – Spanish Technology Fund-of-Funds</td>
<td>• Partnership with CDTI - Centro para el Desarrollo Tecnológico Industrial, the tech transfer office of the Spanish Ministry of Innovation, EIF and several other private investors, mainly Spanish blue chip companies</td>
<td>• Closed in June 2006 with EIF commitment of €50m</td>
</tr>
<tr>
<td><a href="http://www.eif.org/what_we_do/resources/neotec/index.htm">http://www.eif.org/what_we_do/resources/neotec/index.htm</a></td>
<td>• focus on TMT, ICT, cleantech, biotech, lifesciences</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Size: €183m</td>
<td></td>
</tr>
<tr>
<td>Istanbul Venture Capital Initiative (IVCi)</td>
<td>• <strong>Established in 2007</strong></td>
<td>• As at 31 July 2011, five commitments signed amounting to €80 million.</td>
</tr>
<tr>
<td><a href="http://www.eif.org/what_we_do/resources/IVCi/index.htm">http://www.eif.org/what_we_do/resources/IVCi/index.htm</a></td>
<td>• Turkey’s first ever fund of funds and co-investment programme. Investors are: Small and Medium Industry Development Organisation of Turkey (KOSGEB), the Technology Development Foundation of Turkey (TTGV), the Development Bank of Turkey (TKB), Garanti Bank, National Bank of Greece Group (NBG) and EIF</td>
<td></td>
</tr>
<tr>
<td><a href="http://www.ivci.com.tr/">http://www.ivci.com.tr/</a></td>
<td>• Size: €163m</td>
<td>• Two further signatures totalling €32.5 million are envisaged during the second half of 2011 bringing the total portfolio to seven funds and €112.5 million</td>
</tr>
<tr>
<td>Portuguese Venture Capital Initiative</td>
<td>• established in 2007</td>
<td>• Two transactions totalling €30m</td>
</tr>
<tr>
<td><a href="http://www.eif.org/what_we_do/resources/PVCI/index.htm">http://www.eif.org/what_we_do/resources/PVCI/index.htm</a></td>
<td>• investors, along with EIF, are private financial institutions, public bodies and selected foundations</td>
<td></td>
</tr>
<tr>
<td>Funds-of-Funds name</td>
<td>Overview</td>
<td>Commitments/Portfolio</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| **Dahlia: Pan-European Fund-of-Funds**     | • joint initiative between Natixis Private Equity (Paris) and EIF  
  • EIF provided €75m and Natixis €225m on a 25%/75% basis, allowing for a trust close in mid 2006  
  • combines primary and secondary investments, building up on the respective strengths of EIF and Natixis  
  • Size: €300m                                                                                     | 60%+ has been committed                                                                 |
| **UKFTF – UK Technology Fund-of-Funds**    | • UK government and EIF with EIF as advisor  
  • Invests in funds targeting UK start-ups and growth businesses in the ICT, life sciences and advanced manufacturing sectors  
  • aim is to build a diversified portfolio of 12 to 20 funds  
  • Size: GBP 200m (first closing February 2010)                                                                                                 | five fund investments signed  
  • will continue to make new investments up until February 2014.   |
| [http://www.eif.org/what_we_do/resources/UK_FTF/index.htm](http://www.eif.org/what_we_do/resources/UK_FTF/index.htm) |                                                                                                                                                                                                          |                                                                                       |
| [http://www.eif.org/what_we_do/resources/UK_FTF/UK_FTF_Signed20Funds.htm](http://www.eif.org/what_we_do/resources/UK_FTF/UK_FTF_Signed20Funds.htm) |                                                                                                                                                                                                          |                                                                                       |
| **GAGF - Greater Anatolia Guarantee Facility** | • Facility with funding from Turkish government, EU (ERDF), EIB, EIF, and Akbank, Denizbank, Halkbank, Vakufbank, Yapı Kredi and Kredi Garanti Fonu (KGF) for SMEs and micro-enterprises in Turkey’s 43 least developed provinces  
  • managed by the EIF.  
  • comprises three main pillars: (i) €5m counter-guarantee agreement with KGF, aiming to reach around 1,500 micro-enterprises through financial intermediaries; (ii) direct guarantee of €250m provided to five partner financial intermediaries aiming to generate a new SME portfolio of €500 million in the target region; and (iii) €2m earmarked for capacity building and promotion of the Facility. The EIB is contributing EUR 250 million in loans.  
  • Size: €280m                                                                                     | As at 12 May 2011: total volume of ~ €80.7 million and total number of loans of 1875  |
| **Global Energy Efficiency and Renewable Energy Fund (GEEREF)** | • Fund-of-Funds for energy efficiency and renewable energy projects in developing countries and economies in transition  
  • sponsored by the EU, Germany and Norway and advised by EIF and EIB  
  • Size: target funding size of €200-250 million. As of September 2009, secured a total €108 million.                                                                 | Portfolio includes: €12.5m in the Renewable Energy Asia Fund; €10m in the Evolution One Fund; €12.5m in the Cleantech Latin American Fund; 1m to Barefoot Power; €500,000 to the German Canopius Foundation |

Sources: EIF (March 2011 figures) and individual facility websites
## Appendix F: Yollie policy ranking and EVCA benchmark

<table>
<thead>
<tr>
<th>Category</th>
<th>Country</th>
<th>Total composite score (Benchmarking European Tax and Legal Environments by EVCA)³⁶</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced Countries</td>
<td>France</td>
<td>1.23</td>
</tr>
<tr>
<td>Advanced Countries</td>
<td>Ireland</td>
<td>1.32</td>
</tr>
<tr>
<td>Advanced Countries</td>
<td>Belgium</td>
<td>1.33</td>
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<tr>
<td>Advanced Countries</td>
<td>The United Kingdom</td>
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<tr>
<td>Minimum Support Countries</td>
<td>Greece</td>
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<tr>
<td>Catching-up Countries</td>
<td>Spain</td>
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<tr>
<td>Advanced Countries</td>
<td>The Netherlands</td>
<td>1.63</td>
</tr>
<tr>
<td>Minimum Support Countries</td>
<td>Portugal</td>
<td>1.63</td>
</tr>
<tr>
<td>Catching-up Countries</td>
<td>Luxembourg</td>
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</tr>
<tr>
<td>Minimum Support Countries</td>
<td>Lithuania</td>
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<tr>
<td>n/a</td>
<td>Switzerland</td>
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<tr>
<td>Advanced Countries</td>
<td>Denmark</td>
<td>1.77</td>
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<td>Minimum Support Countries</td>
<td>Hungary</td>
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<td>Catching-up Countries</td>
<td>Austria</td>
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<td>Minimum Support Countries</td>
<td>Latvia</td>
<td>1.88</td>
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<tr>
<td>Advanced Countries</td>
<td>Finland</td>
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<tr>
<td>Minimum Support Countries</td>
<td>Poland</td>
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<tr>
<td>Catching-up Countries</td>
<td>Italy</td>
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<td>Catching-up Countries</td>
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<td>n/a</td>
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<td>Catching-up Countries</td>
<td>Estonia</td>
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<td>Advanced Countries</td>
<td>Germany</td>
<td>2.18</td>
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<tr>
<td>Laggards</td>
<td>Cyprus</td>
<td>2.24</td>
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<tr>
<td>Laggards</td>
<td>Romania</td>
<td>2.27</td>
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<tr>
<td>Catching-up Countries</td>
<td>Slovenia</td>
<td>2.3</td>
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<tr>
<td>Minimum Support Countries</td>
<td>Slovakia</td>
<td>2.33</td>
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<tr>
<td>Laggards</td>
<td>The Czech Republic</td>
<td>2.4</td>
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<tr>
<td>n/a</td>
<td>Europe</td>
<td>1.85</td>
</tr>
</tbody>
</table>

³⁶ Scoring ranges from 1 to 3, 1 being positive, 3 negative mark.