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Raising EU R&D Intensity

Improving the Effectiveness of Public Support Mechanisms for Private Sector Research and Development

RISK CAPITAL MEASURES

Report to the European Commission by an Independent Expert Group

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The European Council in Barcelona set an overall EU R&D investment target of 3% of GDP by the year 2010, with industry asked to contribute two thirds of this figure. To approach these levels, however, dramatic improvements are needed in the effectiveness of policies used to stimulate private sector R&D.

The specific aim of this report is to offer suggestions and guidance on improving the effectiveness of public support for risk capital investment in research. Starting from the link between R&D activity and risk capital, the report considers the range of policy instruments available to tackle the risk capital funding gaps.

After reviewing the use and potential of financing instruments and the role of framework conditions, the report then presents a series of recommendations for the consideration of policy makers across the EU.

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Improving the Effectiveness of Public Support Mechanisms for Private Sector Research and Development : **Risk Capital Measures**

Report to the European Commission
by an Independent Expert Group

Directorate-General for Research
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RESEARCH

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Directorate-General for Research

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FOREWORD

The EU is currently lagging behind both the USA and Japan in terms of expenditure on R&D as a proportion of GDP, primarily due to slow relative growth in business R&D expenditure. The European Council set an overall target of 3% of GDP by the year 2010, with industry asked to contribute two thirds of this objective. To approach these levels, dramatic improvements are needed in the effectiveness of policies used to stimulate private sector R&D.

In order to review how progress could be made towards this goal, the Commission services set up four expert groups to explore and enhance the potential of different financial and fiscal policy instruments. These different expert groups investigated respectively: direct measures, fiscal measures, risk capital measures and loan and equity guarantee instruments. An overarching Expert Group, the policy mix group, was also charged with reviewing the relationships between the mechanisms dealt with by the four groups and considering how these measures might be combined most appropriately to stimulate private sector R&D.

The specific aim of this report is to offer suggestions and guidance on improving the effectiveness of public support for risk capital investment in research. Starting from the link between R&D activity and risk capital, the report considers the range of policy instruments available to tackle the risk capital funding gaps. After reviewing the use and potential of financing instruments and the role of framework conditions, the report then presents a series of recommendations for policymakers across the EU.

I should like to thank all the experts who took part in the production of this timely report, particularly the Chairman of the expert group, Rory Earley. Their work contributed significantly to the Commission's own thinking and to the preparation of the Communication from the Commission: 'Investing in Research: An Action Plan for Europe'. It contains much of value to all those concerned with the formulation and delivery of effective policy mixes. As such I trust that it will stimulate the process of mutual learning needed to realise not only the 3% target for R&D, but also the target set at Lisbon of becoming the most competitive and dynamic knowledge-based economy in the world.

This report, as well as the reports of the other Expert Groups, is available on the Commission Web site http://europa.eu.int/comm/research/era/3pct.

Philippe Busquin
European Commissioner for Research

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EXECUTIVE SUMMARY

1. R&D spending is an indispensable constituent element of the knowledge economy. Although R&D accounts for a small proportion of total economic activity, it is the driver of new processes and products. These innovations can in the long run improve economic welfare many times greater than the initial investment in R&D. In view of the deficit in R&D spending in Europe versus the US and Japan, the Barcelona European Council in March 2002 set a target for R&D spending in the European Union of 3% of GDP by 2010, two thirds of this to come from the private sector (the "3 percent goal"). The author of this report, the Expert Group on Risk Capital, was charged with identifying to what extent and how public support measures can contribute more widely and more effectively to stimulate the contribution of risk capital (including seed and venture capital) to investment in research and thus to the 3% goal.

2. Risk capital is linked to R&D spending through the external financing constraint faced by many smaller firms undertaking innovation related activities. Much R&D work is paid for through finance supplied in the form of equity investments or certain types of loans. Longer term reinvestment of profits into further R&D by more established R&D intensive firms is typically built on this foundation. Private sector R&D investment levels, including projects by large firms triggered by smaller firms solving knowledge bottlenecks, are thus critically dependent on a well-functioning risk capital market. Public policy measures are typically applied where this market falters and market failures need to be addressed**. Policy measures can be targeted at improving framework conditions or at specific financing instruments.**

3. 'Risk Capital' is used rather than 'Venture Capital' because externally financed R&D spending occurs in a wider range of circumstances than the very small number of exceptionally high-growth and high-risk opportunities which venture capitalists finance, typically with pure equity. Risk capital covers specialised loans and hybrid debt-equity products ('mezzanine') as well as equity finance. 'Private Risk Capital' restricts the scope to investment in companies whose shares are not traded on public equity markets.

4. Providers of risk capital are formal venture capital funds as well as informal investors, corporate investors and also specialist mezzanine lenders. Managers of formal venture funds regard their financial investors, rather than the R&D intensive high-growth companies into which they themselves invest, as their customers. These financial investors are predominantly institutions, e.g. pension funds and banks, which expect very high risk-weighted returns from this particular part of their overall investment portfolio. High-growth companies supply these investment opportunities to the risk capital industry, and, of course, use the capital.

5. Venture capital provided to high-growth companies in the first phases of their life cycle is associated with the highest R&D intensity of activity. Consecutive financing stages and investment rounds are conventionally distinguished as seed, start-up and (other) early-stage. Broadly speaking the R&D intensity, and particularly the research component, will diminish as successive phases are completed. Spin-off companies from universities and research institutes set up to commercialise new intellectual property are a significant and important sub-category of R&D intensive start-ups, though only some are high-growth oriented and therefore appropriate for venture capital.

6. The current depressed financial environment, including the public securities markets where flotations (IPOs) - a vital exit route allowing venture capitalists to complete their investment cycle - have virtually ceased, as well as the continuing fall-out from the dot-com boom have resulted in a sharp reduction in the numbers of new companies being created and backed by risk capital investment. Investment at seed and start-up stage by formal venture capital funds has fallen sharply in 2002 to €1.2 billion (first three quarters) from €4.2 billion in 2001. Fund raising by venture capital managers trying to raise new technology funds has been hard hit. This downturn underscores the need to review the role of public policy support.

7. Public policy action is likely to be more cost-effective and less distorting if it is targeted at behaviour at the beginning of the risk capital investment cycle. Beyond rebuilding investor confidence, through macro-economic measures, public policy action to stimulate public equity markets is not considered appropriate. The limitations of the risk capital market particularly affect investment at seed and start-up stages, and demand as well as supply constraints apply here. However, given that it is the private sector that drives the risk capital market, any public sector intervention creates a real danger of distortion unless it is market oriented. All our recommendations are thus subject to the general caveat that **public support should**, **as far as possible, be non-distorting, time-limited, non-bureaucratic and subject to robust, external, and independent evaluation**.

8. The group was asked to estimate the impact that an improvement in the effectiveness of public policy measures for risk capital could have on R&D spending as a whole. This can only be done by using crude assumptions, and with a wide range of results. **The maximum impact was put at between €2 and €5 billion** per year of additional R&D spending**, after a lag of several years** and only if commensurate investment management expertise is also available.

9. Framework conditions for the private risk capital market include **tax and regulatory environment for funding by institutional investors**. The group focusses its recommendations on the need to increase the availability across Europe of **tax transparency for risk capital funds,** on **maintaining the regulatory flexibility for banks to invest in venture funds,** and **on enabling the financing channel of Direct Public Offerings to qualified private investors.**

10. A key framework condition for externally financed R&D investment is a **favourable intellectual property rights (IPR) regime**. The group's identified five priority issues within this area**.** These cover **(1) clarification of the ownership of academic IP, (2) provision of funding within R&D projects for the proper protection of IP, (3) allowing exclusive industrial licences for IP in EU funded grants and programmes, (4) introduction of standard revenue and royalty sharing schemes for IP developed in academic institutions, and (5) reintroduction of a minimum six months grace period before filing.**

11. Other framework conditions cover the **relations between and within research and high-tech business activities and communities**. The group recommendations focused on **(1) the need to increase the interpenetration of business and technical education courses for advanced students (2) the need for employment contracts for researchers in publicly funded institutes to be made flexible to allow their reasonable participation in spin-out companies (3) the need for better networking between University Technology Transfer Officers (TTOs) and between TTOs, incubator managers and early-stage fund managers.**

12. The final framework condition for private risk capital identified by the group as being both important and capable of amelioration by public policy measures was the **state of demand from potential users of risk capital**. **The application of further public resource should be considered to raise awareness and understanding among SMEs and start-ups of the appropriateness and availability of this type of financing.**

13. The rest of the attention of the expert group was devoted to how public policy measures to support specific financing mechanisms within, and adjacent to, the risk capital market could be improved to assist research-oriented investment. The group placed strong emphasis on **how, through cost-effective financing mechanisms, the flow of new projects attractive to investors could be increased in quantity and quality.** Such financing, while vital to the functioning of the risk capital market, is not itself risk capital. Indeed bridge mechanisms of various kinds supporting technology-incubator/pre-seed activity require some sustained public resource input as they are not profit generating.

KEY RECOMMENDATION: **the Commission should use its resources to call for and fund proposals for new trans-European, appropriate scale, and co-ordinated initiatives in bridge-mechanisms financing the conversion of research projects into business proposals attractive to investors.**

14. The group identified **a specific financing gap in Europe for small-scale seed and early-stage investments**, arising from market indivisibilities. This gap is associated with an insufficiency in Europe of adequately financed and commercially managed smaller early-stage funds. We recommend three public policy measures**:**

(1) experimental leverage programmes using public resources, at national and transnational levels, for seed funds

(2) EIF to consider relaxing its investment participation limits on seed and/or early-stage funds

(3) accelerating research into the counter-intuitive phenomenon of some very large US venture funds undertaking some seed-level investments.

15. Another specific financing gap the group identified is **institutional investor reluctance to finance technology venture funds**. In part this is a performance information gap, inherent in the essentially private nature of the risk capital industry, though the quality and quantity of this information in Europe could be improved even within this constraint. Another aspect of it is institutional perception and management of risk. The group recognised that this gap is severe in the current market downturn,

KEY RECOMMENDATION EIF should:

(1) take the lead in committing to investing in new funds being raised by existing teams with a good recent track record who are finding it difficult to maintain institutional interest and

(2) enable fund raising teams to offer their investors flexible downside protection arrangements by providing commercially priced capital guarantee facilities.

16. The final specific financing gap in the European risk capital market that the group recognised was **business angel funding which is undeveloped in comparison to the USA** where it plays a crucial role in seed and start-up investment, particularly in smaller size deals. The group makes three recommendations for public policy measures in this area covering: **the further spread of national level fiscal incentives or co-investment programmes for angels, the inclusion of**

angel syndicates alongside formal venture funds as potentially eligible for national/European tax and regulatory advantages and for leverage schemes, and national promotion campaigns for business angel activity.

1 INTRODUCTION

1.1 Background and Terms of Reference

This is the final report of the expert group set up by DG research of the European Commission to examine how the effectiveness of public support measures to encourage risk capital investment in innovation-oriented research could be improved.

The immediate background of this report is the Lisbon European Council, which set the objective of making Europe the most dynamic knowledge-based economy in the world. R&D spending is an indispensable constituent element of the knowledge economy. Although R&D accounts for a small proportion of total economic activity, it is the driver of new processes and products. These innovations can in the long run improve economic welfare many times greater than the initial investment in R&D. It is therefore a matter of great concern that the US and Japan spend a considerably greater proportion of GDP on R&D than Europe (2.6% and 2.9% versus 1.9%, respectively). Furthermore, the gap has increased in the last half decade, and lack of private sector investment accounts for almost all of this gap. In view of this situation the Barcelona European Council in March 2002 set a target for R&D spending in the European Union of 3% of GDP by 2010, two thirds of this to come from the private sector.

As part of the process for formulating recommendations and guidelines for reaching the 3 percent goal, a set of expert groups were constituted to look at the potential impact of different financing instruments on achieving this goal, including Risk Capital, Loan and Equity Guarantees, Fiscal Measures and Direct Measures. Furthermore, a "policy mix" group was formed to "examine in detail how the overall effectiveness of the policy mix of instruments can be improved."

The expert group on Support Measures for Risk Capital was charged with identifying

"…to what extent and how public support measures can contribute more widely and more effectively to stimulate risk capital (including seed and venture capital) investment in research, taking into account differences in national conditions across Member States. Based on an analysis of market failures and experiences in different countries, the study should identify good practices and, where appropriate, make recommendations regarding the design and implementation of public support measures to encourage the supply and use of risk capital to finance research activities."

1.2 Plan of Report

The group met three times on 31 st July, 24th September and 21st November 2002. In addition to its own internal expertise, it was able to draw on the knowledge of a number of outside experts, on the results of a special survey of risk capitalists conducted by EVCA, attached to this report as Appendix A, and on the supporting study of the rapporteur.

The report is intended to summarise the group's conclusions and recommendations with respect to the terms of reference above. The next section presents an expository section on R&D, risk capital and public policy. This begins by outlining the basic link between R&D and risk capital, continues with a short description of risk capital markets, and goes on to assess the importance of risk capital for private sector R&D spending as a whole. This is followed by a review of the

current environment for risk capital, an outline of how public policy interacts with the risk capital market, and an estimate of the possible maximum impact of public support measures for risk capital on R&D spending in Europe. The third section considers public support in detail in the light of international past experience and emerging good practice. First it discusses the role of framework conditions, and then analyses specific financing support measures. The final section presents detailed conclusions and recommendations. Separate appendices cover the report of the EVCA panel survey specially undertaken for this study, case study material and data backing up two specific points made in the text.

2 RISK CAPITAL, R&D, AND PUBLIC POLICY

2.1 The Link between R&D Activity and Risk capital

Many of the R&D and innovation-related activities conducted by firms, especially smaller firms, are financed from external sources via equity investments or certain types of loans. Private sector R&D investment levels are thus critically linked to the well-being of the risk capital markets which provide this finance, and public policy instruments in this sphere are typically applied when these markets falter and some form of support is needed to rectify market failure. When successfully applied, these policies can therefore catalyse the flow of risk capital for R&D and innovation-related activities and lead to an overall increase in R&D investment levels, both directly via the use of this finance for R&D projects, and indirectly via the longer term reinvestment of profits into R&D activities, and via the triggering of additional R&D spending by larger firms using the new knowledge created. Before discussing the type of policies and policy instruments that can be used, however, a short description of the risk capital markets concerned and the actors involved in them is helpful.

2.2 A Short Description of Risk Capital Markets

The term 'Risk Capital' is used rather than 'Venture Capital' because the latter usually refers to the provision of equity for young unquoted companies with high growth potential and high commercial uncertainty, whereas the broader term 'Risk Capital' captures the use of all iinstruments (as well as equity finance, hybrid equity/loan and high-risk loan arrangements known as 'Mezzanine' finance products). The term 'Private Risk Capital' is further used to refer only to investment in companies whose shares are not traded on public equity markets.

Private Risk Capital is a broad heading incorporating a range of categories of instruments. There is often confusion on precise definitions of these categories and some intermingling and overlapping of terminology, even amongst industry experts. The table below seeks to clarify the usage of various terms for the purposes of this section of the report:

HEADING	SUB-HEADING	DEFINITION
Private Risk Capital	Seed Capital	Finance provided at the earliest stage, to research, assess and develop an initial concept.
	Start-Up Capital	Finance provided to a company for product development, initial marketing and the commencement of commercial sales
	(Other) Early-Stage Capital	Finance to an existing company with some revenues but in need of greater investment for e.g. manufacturing and sales development.
	Expansion Capital	Finance for the expansion of an established, usually profitable, company
	Management Buy-Out (MBO)	Finance provided to enable an existing management team to buy a company, or division of a company from its present owners. Usually profitable, well-established businesses.
	Management Buy-In (MBI)	As with an MBO but with new management brought in, often to turn a company around.
	Mezzanine	Finance used, mainly in larger deals in profitable companies, which combines a small amount of equity with loans secured, where possible, on the company's assets. Often used as expansion capital.
Venture Capital		Provision of equity for generally young, unquoted companies with high growth potential and high commercial uncertainty – ranges from seed to late-stage investment with key feature being "hands-on" involvement by the finance provider. Describes the higher risk element of the Private Risk Capital industry, normally excluding MBO/MBIs and mezzanine.

The introduction of the concept of "technology investment" generates further confusion of definitions. It should not be considered as a separate category but as a major focus of venture capital investment. For venture capital funds to generate the returns they need, they will generally be investing in businesses which are developing and introducing new technologies or innovative uses of existing technologies.

The main actors involved in the Private Risk Capital sphere are as follows:

- The 'providers' of Private Risk Capital to companies are formal venture capital and buy-out funds as well as informal investors (i.e. business angels) acting individually or in syndicates, corporate investors and also specialist lenders using mezzanine products;
- The 'customers' of the professional managers of formal Private Risk Capital funds are their financial investors, which expect very high risk-weighted returns from this particular, and small, part of their overall investment portfolio. These investors are

predominantly institutions, e.g. pension funds, insurance companies and banks (particularly in continental Europe), but also include private individuals and companies;
- The 'suppliers' to the Risk Capital 'industry' are the growing companies who provide the investment opportunities for the professional fund managers, and, of course, use the capital.

The venture capital element of the industry supports R&D because R&D intensive companies are deemed likely to grow rapidly and generate both the high returns the industry needs to compensate for failed investments and appropriate returns for investors. The main concern of the venture capital sector, therefore, is with the growth of firms as a whole rather than with the activity of R&D *per se* or, even more pertinently, absolute levels of R&D investment. Venture capital is used by firms to finance R&D, amongst many other activities, and R&D investment levels can be raised via this route, but the main purpose of the investment is to generate growth, and it is this growth that eventually allows successful companies to reinvest in future R&D activities.

2.3 Importance of Risk Capital for Private Sector R&D Spending

Although the impact of Private Risk Capital on private sector R&D spending is indirect, it is nevertheless of critical importance for certain categories of business. Most obviously, certain R&D intensive, independent small firms working on innovative technologies in sectors such as biosciences, ICT, healthcare, nanotechnology and new materials would not exist without risk capital financing. Indirectly, if and when such firms succeed in solving technical bottlenecks, their activities can trigger complementary R&D spending on applications by other actors, including large corporations.

Large national and international corporations are unlikely to need Private Risk Capital for funding R&D, as they have retained earnings and access to public equity markets. Indeed, through direct investment in promising, R&D intensive SMEs and indirect corporate venturing (investing in venture capital funds), many large corporations are supplying funds to the private risk capital market.

The main users of Risk Capital for R&D are therefore young, innovation-oriented SMEs with high growth potential subject to internal financing constraints. These represent only a tiny proportion of the general population of SMEs, and only a very small percentage even of technology-oriented SMEs. To meet the requirements of risk capital investors, such SMEs need to demonstrate strong potential for rapid growth and the capacities and capabilities necessary to achieve and sustain that growth. The type of risk capital used by these companies is best described under the heading "venture capital".

Venture capital provided to companies in the first phases of their life cycle is associated with the highest R&D intensity of activity. Consecutive financing stages and investment rounds are conventionally distinguished as seed, start-up and (other) early-stage. Broadly speaking the R&D intensity, and particularly the research component, will diminish as successive phases are completed.

Spin-off companies from universities and research institutes set up to commercialise new intellectual property are a significant and important sub-category of R&D intensive start-ups. While some will have ambitious business plans relying on venture capital to develop, launch and distribute new products and services to international markets within a tight time scale, others will be oriented more to contract R&D and may be companies with modest growth

targets appropriate for scientists leaving full-time academic positions. Companies in the latter group are less likely to need venture capital, though a few may grow to become important venture capital candidates some years after establishment.

2.4 The Current Environment for Private Risk Capital

Maintaining the flow of Private Risk Capital to research intensive SMEs may be important for the companies concerned and for R&D investment levels generally, but many factors affect the level and intensity of this flow. The Venture Capital sector of the industry, for example, has to compete for investors' funds with the leveraged buy-out sector of the industry. Many investors prefer to channel their funds into Management Buy-Outs (MBOs) and Management Buy-Ins (MBIs), both of which can generate returns for investors via the use of sophisticated financial leverage techniques and often do not need to generate the level of growth in individual investee companies needed by venture investors. Investors in MBOs and MBIs are therefore less likely to seek out investments that are dependent on generating growth from the research, development and marketing of new products and processes.

The flow of private Risk Capital is also greatly affected by the general financial environment and the fate of public equity markets. This is particularly true at the current time, when investment levels are at a low ebb. In December 2002, the European Private Equity and Venture Capital Association newsletter reported that

> "In 2002, a large proportion of the companies funded by venture capitalists were existing portfolio companies, recapitalisations of existing businesses, or corporate divestitures. Very few new companies have been created in the last 12 months. Early stage deal flow has plummeted by anything up to 50% in the first eight months of 2002, compared to the same period in 2001."

The volume of investment recorded at the seed and start-up stage has in fact fallen from €6.7 billion in 2000, to €4.2 billion in 2001 and to €1.2 billion for the first three quarters of 2002.

Funds raised for investment also appear to have declined dramatically. According to EVCA data, a total of €10.9 billion was raised in the first 3 quarters of 2002, against a total of €38.2 billion for the whole of 2001 (and much of what has been raised will have been raised for buy-out activity).

One significant reason for the reduction in funds raised is the impact of declining public equity market values on institutional investors. Those institutions which do invest in private risk capital often allocate a fixed proportion of their funds to this asset class. As their funds overall have declined in value (because of declining stock markets) the maximum proportionate allocations to risk capital are quickly reached, and even breached. In extreme cases, some institutions have been forced to sell (at a discount) their risk capital holdings to secondary investors and funds in order to balance their portfolios. Others have stopped making new commitments to this asset class. Those that have been forced to sell at a discount have suffered sub-optimal returns (because of the selling discounts) which make future investment in risk capital less attractive in comparison to other asset classes.

Public equity markets affect more than just the industry's ability to fundraise however. Stock market valuations of public companies are frequently used as valuation benchmarks for risk capital investments. Lower public market valuations depress the returns that risk capital

investors can expect to make from the sale of their investments (to other investment firms, trade buyers, management teams etc'). The virtual closure of public market flotations as an exit route for European high-tech venture capitalists is also a significant current problem: From a total of 249 companies floated in 2000, the flow was reduced to 47 in 2001, and 20 in the first three quarters of 2002. According to information from Credit Suisse First Boston (CSFB), only one new technology sector public offering above €30 million took place in 2002, compared to five in 2001.

Particular problems are also currently being experienced by venture capital firms seeking to raise new funds for future investment programmes. Many (but not all) of these funds lost large amounts of investors' money by investing unwisely in the "dot.com bubble". Even those funds that did manage their exposure to dot.com investments, and hence protected investors' returns, have become tarred by the very pervasive negative attitude that currently exists towards "technology investing". Some of these fund managers, which have extensive positive track records for venture capital investing, may not be able to survive this current downturn as they will be unable to attract new institutional investment.

2.5 The Role of Public Policy

Even though the behaviour of the public equity markets has a significant effect on the risk capital industry, public policy action to stimulate these markets (beyond creating the macroeconomic stability and growth that will lead to a return of investor confidence) is not considered appropriate. Public policy action is likely to be more cost-effective and less distorting if it is targeted at behaviour earlier in the risk capital investment cycle. Whether venture capital markets are well established or undeveloped, support measures will have most impact at the earliest stages of investment, as this is the point at which the private market is most constrained.

The desire to implement public policies designed to increase venture capital flows and raise R&D investment levels should be tempered with caution, however. Since it is the private sector that largely drives the risk capital market, any public sector intervention creates a real danger of market distortion unless the intervention in question is sensitive and market-oriented. All recommendations for public support measures thus have to be prefaced with the general caveat that **public support should, as far as possible, be non-distorting, time-limited, non-bureaucratic and subject to robust, external, and independent evaluation**. Wherever possible, new interventions should also co-ordinate with existing regional, national and transnational risk capital measures to provide a coherent set of measures across the EU.

The public sector can influence the workings of the risk capital market by intervening, where constraints or gaps exist, in the operation of the industry; to adjust the risk/return ratios of individual investments or portfolios of investments, to address the demand constraints and by its influence on the framework conditions governing market activity.

Differences in regulation and taxation of investment across the EU create barriers to efficient growth of investment in private risk capital and cross-border development of fund management teams. Uncertainties in the ownership of, and ability to protect intellectual property rights (which, at the earliest stages, is often the only asset being invested in) can also increase complexity, and therefore relative cost of early-stage investment. These and other framework conditions, together with recommendations for action, are discussed in greater detail later in this report.

Constraints are recognised on the market supply of early-stage venture capital investment, particularly at seed and start-up stages. Most stem from the combination of high risk and high relative costs in relation to the investment size. Others relate to the unusual combination of business and technical skills, as well as experience, required by consistently successful early-stage venture managers. Yet another issue is insufficient networking, co-operation and co-investment among early-stage funds of different sizes and in different localities. Investor attitudes to venture or technology investing are also an important consideration.

There are also constraints acting on the demand for venture capital, arising from a lack of understanding of the needs of risk capital investors and from the often inadequate management and other key business resources within firms necessary to maximise the commercial benefits of the innovation itself. Supply and demand constraints, together with a discussion of "bridge mechanisms" to bridge the gap between supply and demand for spin-outs from universities and research institutions, are discussed in greater detail, with specific recommendations for action, in Section 3.3. Case studies of bridge mechanisms are the subject of a separate Appendix B.

2.6 Potential Impact of Risk Capital Public Policy on R&D Spending

Understanding the potential impact of risk capital support measures on R&D investment levels is complicated in the first instance by the fact that the relationship between the functioning of the risk capital market and R&D spending is itself complex. SMEs as a group contribute a relatively small proportion of business R&D spending in the EU as whole, and in the USA (under 20 percent). Overall R&D intensities can be substantially higher among technology-based SMEs than among technology-driven large firms. More important, though not well understood, are the leverage and perhaps catalytic effects of SME innovation activity within the whole innovation process. A key function of risk capital, besides relieving specific innovation bottlenecks, may be to enable the establishment of new SMEs that are permanently more R&D intensive in their business culture than the bulk of SMEs, even than the class of leading technology users. Some of these SMEs will grow to be large enterprises while maintaining high R&D intensity. Small technology-based firms are also important in the competitiveness of large firms that adopt a "buy" rather than a build "strategy".

In the US, the SME share of business R&D nearly doubled during the 1990s. If this is any guide, there will have to be a similar increase in the SME share in the EU if European business R&D spending is to reach the overall 3% GDP target by 2010. The annual growth rate of SME R&D spend would therefore need to be even higher than the 7% p.a. overall growth rate needed to reach the 3% target. Moreover, much of this growth would need to come from some of the smaller SMEs. Again the US experience may be some guide to potential, for it was the smaller firms, specifically those with less than 100 employees, that achieved by far the greatest increase in R&D spend during the 1990s, reaching a spend of $16 billion annually or 10% of total business R&D by 2000. This in turn emphasises the need for the adequate provision of formal and informal venture capital.

Some measure of the **maximum** potential impact of risk capital support measures can be made by considering the effect on R&D spending were the intensity of seed and start-up stage formal venture investment to increase to allow the overall European average to match the **current** level achieved by the leading countries (at 0.1% of GDP, this comfortably exceeds that of the US). Were this increase achieved, European investment levels in seed and start-up stages would double to around € 8 billion annually.

The additional SME R&D which would be generated by an increase of £4 billion in seed and start-up capital is not known and is difficult to estimate. We might assume however that a very high proportion (say 90%) of seed capital is utilised for R&D but that a much smaller proportion (say 25%) of start-up capital is dedicated to R&D. Given that seed capital accounts for around 12.5% of the total amount of seed and early-stage capital invested, this might suggest a crude multiplier of around 0.33 for R&D stimulated by increased seed and early-stage venture capital provision. €4bn additional funding might therefore directly facilitate an additional €1.33bn of SME R&D[1].

In addition to this direct effect, there could be considerable secondary effects within the sector, not least a significant additional mobilisation of business angel investment funding seed and start-up projects which are R&D intensive. The amount of additional investment that might be stimulated is not known but our current best guess is a total of around €2-5 billion of additional R&D spend deriving from total new investment of €6-15bn[2]. The contribution to closing the R&D gap of approximately €100 billion per year might therefore be significant[3]. There were some suggestions that there might be a higher potential contribution, but the current state of research does not allow these to be substantiated or quantified.

Any increase in R&D spend resulting from increased venture capital provision assumes that the additional capital put in will be managed by skilled professionals and will be at least reasonably smart money, and therefore productive. Rapid increases in capital disbursements can cause the quality of investment decision-making and support to drop sharply. Poor investment decisions will lead to poor returns and hence an inability to sustain private investment in venture capital. The potential increase in R&D spending from greater availability of venture capital is therefore large, but it will not be achieved unless commensurate investment management expertise is also available.

[1] **N.B.** All estimates assume that viable demand exists for such new investment. Viable demand comprises businesses which have genuine potential to grow and deliver returns to investors.

[2] Research in the UK (Mason and Harrison) has suggested that angels can invest up to 3 times as much as the formal venture capital industry in early stage investments.

[3] Research is currently underway (by EVCA) in Europe on the economic impact of venture capital. Interesting findings from the US on the impact of venture capital on innovation can be found in "Assessing the Contribution of Venture Capital to Innovation" by Kortum and Lerner, RAND Journal of economics, vol. 31, No: 4, pp 674-692. Amongst their findings was that $1 of venture capital produced 3 times more innovation that $1 of traditional capital.

3 RISK CAPITAL SUPPORT MEASURES

3.1 Framework Conditions

Risk capital funding systems are sensitive to their immediate tax and regulatory environments. Where these are complex and dynamic, barriers are created which add to the costs of creating and operating risk capital vehicles (funds). Many institutional investors are highly sensitive to costs and complexity and will divert their investments to other asset classes (public equities, fixed-interest bonds, property etc') if the costs and complexity of investing in risk capital funds are seen as disproportionate to these other asset classes.

Much work has already been done in the EU on addressing the environment for financial services and risk capital. Specifically, the Financial Services Action Plan (FSAP) and the Risk Capital Action Plan (RCAP) have been created and are being implemented by Member States. Progress however, particularly on RCAP, has been perceived to be slow and Member States could do well to revisit their implementation timetables and accelerate these in order to help address the current problems facing the private risk capital market.

A key requirement is for risk capital investment vehicles to be tax transparent. Returns from risk capital investments are diminished when they are taxed at the fund level and again on distribution to investors. There is a strong case for a standardised European fund vehicle to be developed which allows returns to flow through the fund to investors without double taxation. Such a model exists in the USA, the UK and other Member States and has recently been introduced in Belgium. Its adoption across all Member States would obviate the need for complex offshore vehicles to be established to overcome National tax rules.

Recommendation: The Commission should promulgate to Member States the principles of tax transparency, in line with EVCA proposals, for risk capital funds. Recent legislative change in Belgium is a useful example.

Investment by banks is an important source of finance for European venture funds. The new Basel Capital Accord, currently being negotiated, proposes risk weightings for banks allocating capital for these investments of 150%, or even 200% for start-up investments, against the current requirement of 100%. Such a change is likely to dramatically reduce the allocations that banks can make to risk capital investment, exacerbating the current problems faced by the industry and endangering its future development.

Recommendation: The Commission should support EVCA in its argument to the Basle Committee against the change in the financial regulation for venture capital investment made by banks. Some progress is apparently being made in this area with a recent report from the Netherlands that a proposal that co-investment by banks in venture investments should attract no more than a 100% capital weighting has been well received.

State-aid and competition rules should not unduly restrict risk capital support measures. The use of the Market Economy Investor Principle (MEIP), as a test for whether public sector investment constitutes a state-aid has now been established, and should act to improve the cost-effectiveness of interventions, and to avoid outlawing those which cannot prove their effects will always fall within R&D intensity limits.

An important issue for current consideration is the need for sensitive application by DG Competition of State Aid rules for risk capital interventions. The current risk capital market is volatile and arguably in greater need of sensitive support than it has been at other times. Strict application of bureaucratic rules could risk preventing the introduction of necessary short-term measures.

Tax regime for investment in unquoted companies

The main issue is tax reliefs designed to encourage investment by taxpaying individuals in target companies. Two main kinds of relief are: (1) making investment amounts deductible from taxable income, and (2) exempting capital profits re-invested in target companies from capital gains tax. The first achieves an alteration in the risk-return profile as public-sector guarantee schemes do for formal venture capitalists. The effective maximum loss to the individual is reduced by the tax saved. Investment flows can be targeted at innovation rich SMEs defined by various parameters, either through professional intermediaries or bilaterally.

Investor-protection legislation

The European Prospectus Directive is perceived to run the risk of eliminating the very limited scope for high-net worth individuals to be treated as a separate class of the "public" when shares in unquoted SMEs are offered for sale. Provision for a legal category of qualified or sophisticated investors who, on the grounds of wealth and/or experience, can opt out of general investor protection provisions is very useful. Such people in the USA invest in thousands of companies that annually raise modest amounts of equity through direct public offerings, under SEC exemptions. Evidence from the United States suggests that a future order of magnitude in Europe for this capital raising route across all sectors could be as much as 10,000 companies raising €10 billion annually.

Recommendation: In transposing the Prospectus Directive**,** exemptions, which would enable Direct Public Offerings to experienced and/or risk-aware investors, should be considered by Member States and implemented in a manner which maintains the necessary protection for vulnerable investors.

Regulatory quantitative ceilings on investment by institutional investors (pension funds and insurance companies) across Europe in unquoted equities including venture funds, and in companies quoted on emerging-growth stock markets (secondary markets) continue to be gradually replaced by more flexible "prudent-man" rules. There is little evidence that such ceilings have constrained risk capital investment in practice, but the move to pro-active risk return portfolio management (as in asset-liability modelling) needs to be maintained despite adverse equity market performance.

Without a favourable intellectual property rights regime, other support measures for early-stage risk capital are unlikely to achieve their potential in increasing R&D spend, and innovation activity.

Recommendation: The Commission and Member States should work towards improvements on these five priority IPR issues:

- Clarification of the ownership of IP developed by academics while at a university or research institute, with a strong preference for decisions to be in the hands of a single institutional controller.
- Adequate funding for the cost of protecting IP through patenting, legal costs and for professional IP asset management.

- The option for exclusive industry licences to be granted for IPR protected products and technologies to be built into EU grants and programmes, and the duty of grant recipients to nominate a single body (e.g. a technology transfer organisation) to have the rights to commercial exploitation
- Introduction of standard revenue and royalty sharing schemes between the academic institution, the scientific institute/department and the inventors, preferably with a high degree of convergence across Europe
- Re-introduction of a minimum six months grace period while maintaining the European first-to-file regime

A second set of framework conditions govern the relationship between the academic and research communities and those of high-growth businesses. In this area, there is scope for public policy measures to make substantial improvements.

Interpenetration of business and technical education courses

The shortage of suitably qualified and experienced early-stage venture investors is a serious constraint, though affecting only a small number of job positions. A much wider problem is the lack of entrepreneurial and business empathy, as well as business and management skills, among people with advanced technical training. This contributes to the difficulty venture managers frequently quote of building cohesive management teams for new technology-based firms. The inclusion of entrepreneurship modules, including familiarity with venture capital and high technology start-ups, within advanced technical and scientific education, as well as the inclusion of technology-understanding modules in business school curricula would help to solve these problems.

Recommendation: The Commission, building on Gate2Growth, should encourage universities to educate all their students about entrepreneurship and the opportunities in "high-technology start-ups". Business schools should be incentivised to encourage their Executive MBA graduates to join R&D intensive spin-outs and start-ups, raising the profile of such activity through funded awards and competitions across the EU. The UK Science Enterprise Challenge is a possible example here.

Flexibility in public-sector researcher employment contracts

Academics need to be able to become partially involved in spin-out companies, as advisers, consultants, part-time employees, and shareholders without having to give up basic employment rights or benefits within their research laboratory. Conflicts of interest should be dealt with within professional and ethical codes where arrangements including adjustments to employment contracts are transparent. Obviously there are limits to this process, and some academics will cross-over to be employed by the spin-out, but here it is important that there is flexibility to maintain links with their university or research institute, for example as visiting lecturers or as doctoral candidate supervisors.

Recommendation: Member States should build on initiatives such as that taken in France to make employment contracts for researchers in publicly funded institutes flexible to allow their reasonable participation in spin-out companies.

Networking among the European early-stage investor community

There is evidence that co-investment by funds of different sizes and from different locations within overall early-stage investment activity is much less frequent in Europe than in the USA. Theoretical and practical arguments support co-investment as a way to increase the efficiency

and reduce the risks of this stage of investing. Cross-border investment in Europe is hindered by the lack of a single European legal structure for venture capital funds, and by the differing tax regimes for investors, including the availability of resident and non-resident forms of tax-exempt fund.

In addition, there is a strong perception that the less formal (i.e. networking) links between seed and early-stage funds across Europe are not as good as they could be. Seed fund managers are also considered to be less well trained in fund management skills than their colleagues in more formal early-stage funds and the links between venture fund managers and University Technology Transfer Offices (TTOs) are considered to be under-developed.

Recommendation: The Commission should support networking and training activities by organisations such as EVCA to enable greater networking, interchange and understanding between University Technology Transfer Officers, incubator managers, seed fund managers and early-stage fund managers.

Recommendation: The Commission and Member States should consider providing resources to support the diffusion of good practice from larger, more experienced TTOs to newer ones, complementing and building on existing initiatives.

The problem of availability of risk capital for commercialisation of R&D is not just one of supply, it is also one of demand. SMEs and potential start-ups need more education and advice on the availability and appropriateness of external risk capital.

Recommendation: The Commission and Member States should consider making public resources available to improve awareness within channels of communication to and from SMEs on the appropriate application of risk capital. Any such activity should complement and build on that already underway and funded under the Sixth Framework Programme or other sources.

3.2 Typology of Specific Financing Measures

The strength and depth of the connections between early-stage risk capital and R&D spending, as described earlier, makes a prima facie case for public support measures which can improve the supply of risk capital and the effective demand for it from R&D intensive SMEs (as long as these measures are not distortive of developing markets). A wide range of public support measures has been targeted at relieving both supply and demand constraints in the risk capital markets. A number of "bridge" mechanisms have also been introduced to improve the links and flows between the supply and demand sides of the risk capital industry.

Public support measures addressing supply constraints include:

- public investment in venture funds instead of private investors (substitution)
- public investment alongside private investors (co-investment, to increase the funds available)
- overhead subsidies to private investment companies (to address the disproportionate costs of making very small early stage venture investments)
- refinancing or leverage of private investment on favourable terms (again to increase funds available)

- loss underwriting or sharing by the public sector for private-sector investors (can be public investors taking the first share of any losses, or guarantees to compensate for losses – covered in the next section of this chapter)
- special provision within capital gains and/or income tax rules to incentivise individual (informal/business angel) investors in early-stage companies.

The impact of public sector substitution or loss-sharing schemes has been most often seen in regions where venture capital activity has been largely undeveloped, and a first cohort of fund managers and investors has had to be encouraged to enter the activity and gain experience. Once venture activity has become established and there is a wider range of opportunities for investors across all stages of investment, this particular approach runs an increasing risk of distorting the developing market and needs to develop into more sophisticated models. Such variants include schemes which take a share in upside gains to recover some of the losses or potential losses they finance or underwrite.

Risk Capital Support Measures: Classification and Geographical Application

Measure	European Level schemes	Member State Schemes
Public investment in venture funds instead of private investors (100% or majority funding)		Mainly historic:1970s, 1980s at regional level in France, Belgium, Netherlands, Portugal, Spain. 1990s in Sweden and Finland
Public investment in venture funds (or in fund of funds) alongside private investors (minority: co-investment to increase funds available)	EIB/EIF equity programmes, includes investments in funds of funds	France: National Venture Capital Promotion Fund, UK: High Technology Fund, (fund of funds level) Finland: regional venture capital fund network France: seed capital funds support programme Greece: Fund for Development of the New Economy Ireland: seed and venture capital measure Netherlands: participation companies for NTBFs Norway: seed capital funds UK: regional venture capital funds
Overhead subsidies to private investment companies	I-TEC, CREA	
Refinancing or leverage on favourable terms of private investment in high-tech companies		Germany: BTU scheme tbg and KfW variants **Note**: The US Small Business Investment Company programmes act to provide leverage to funds but do not necessarily focus on high-tech.
Loss-underwriting or sharing by public sector for private sector investors		Austria, Belgium, Denmark, France Germany, Italy, Netherlands (dealt with more fully in next section of this chapter)

Special provision within capital gains and/or income tax rules to incentivise individual (informal/business angel) investors in early-stage companies		UK Netherlands France
Creation of regional incubator structures		Belgium, Denmark, Finland, France, Greece Ireland, Italy, Netherlands, UK

Risk capital support measures are attractive to public policy makers because large leverage effects can be achieved on the public resources injected. Leverage will normally be higher than that of direct measures or fiscal deduction schemes for R&D spending. An example is where public investment is made in an early-stage fund, or in a fund investing in early-stage funds, with minimum subordination to the private investment attracted alongside it. In fact the eventual cost to the public purse may be zero, or even negative, if the fund is successful and the subordination is not called into action to improve the returns of the private investors.

These support measures for risk capital are mainly implemented at national level, though there are some regional and European level interventions (see good practice later in this section). Of particular importance is the activity of the European Investment Fund (EIF). The EIF manages the MultiAnnual Programme (MAP) 2000-2005. Through this facility, the EIF invests in many early-stage funds, using both its own resources and as agent for Commission programmes. These funds in turn may have regional, national or international scopes of operation. In particular EIF manages the ETF Start-Up scheme and provides grants to support the employment by fund management firms of new seed investment managers. The importance of the EIF in supporting venture capital activity across the EU should not be under-estimated. Its remit to operate in a commercial manner also helps to ensure minimisation of market distortion.

Organisations such as technology transfer offices and incubators that "bridge" or intermediate between research institutes/universities and the commercial and financial sectors form one important setting for risk capital support measures. True "incubators" will provide physical space, business support, education and advice, networking, continuing access to research facilities and access to professional legal and accountancy support as well as seed finance for the creation and initial structuring of new corporate entities. These organisations can act as "bridge mechanisms" that increase the quantity and quality of deal flow for early-stage, formal venture investors by converting more research projects into potentially viable business proposals. Public support measures for these bridge or incubator mechanisms appear crucial as private commercial returns are unlikely ever to be earned from such activity.

3.3 Specific Market Gaps and Measures

There is evidence to support the existence of several specific gaps affecting the risk capital market: the bridge/incubator gap; the small seed/early-stage investment gap; and the institutional reluctance to finance technology venture funds. There are also specific angel financing gaps by comparison with US practice. Alongside these specific gaps is the more general notion that there is under-investment by the private sector in early-stage venture capital because of the combination of high risk, high cost and small size of deals. In each case,

experience in Europe and elsewhere proves that various public sector support measures can have some useful impact.

bridging/incubator mechanisms are relatively new in Europe. Good practice is only beginning to emerge from the wide variety of institutional and organisational formats, many experimental. A basic rule is to have a clear focus on the objective: to increase the quantity and quality of the research-based deal flow available to commercial seed and/or start-up investors, in a systematic, scaleable, long-term and cost-effective manner.

One of the longest running, largest and well-established bridge programmes is the locally dispersed technology incubator programme of Israel. It has well-defined parameters and rules for support and finance at both programme and project level. Its performance record in terms of the number of new R&D-intensive companies attracting investment and generated cost-effectively appears good, though there has been no independent formal evaluation. After a review in 2001, the basic framework has been retained, but with more flexibility in deal structures, and more emphasis on private-sector participation.

Within Europe, Finland's network of co-operating public-sector institutions including SITRA, TEKES, FINNVERA and Spinno, which have more than ten years experience supporting technology transfer and spin-offs is a reference point, though not enough is known about the Finnish system's overall cost effectiveness. R&D granting institutes in several countries have recently (1999-2001) set aside resources for internal units supporting start-ups with services and loans, joining the national FUTOUR programme established by the government in 1997 in Germany.

Another new approach (1999) is the UK University Challenge scheme, supported partly by a large Scientific Foundation. This uses very small (under €5 million typically) seed investment funds, professionally managed, but with soft financial targets, attached to 15 universities, as a bridging mechanism. The focus of these funds is however more on making the financial investment than providing the necessary support and nurturing.

Fresh approaches include the German BTU Frühphasen programme administered by tbg. This is an ambitious and flexible scheme, introduced in 2001 using a network of entrepreneurial coaches, and a phased grant system.

Other fresh approaches worth considering include mixed private-public sector funded large-scale pan-European technology transfer accelerators (TTAs) for broad technology themes. These would act as virtual incubators, divided into technology segments. Output, in the form of intellectual property rights, with clear ownership structures and well-defended scope, would be sold to VCs and other acquirers. TTA concentration and learning economies within sectors would deepen technology expertise among venture capitalists and make technology transfer more commercial.

Key Recommendation

The provision of technology-incubator/pre-seed activity converting more research projects to investment-ready business proposals needs to be enhanced across the EU. Such activity is not profit-generating and requires some sustained public resource input to its funding mix.

The Commission should use its resources to call for and fund proposals for new trans-European, co-ordinated incubator/pre-seed fund activity. Criteria for proposals should include a need for experienced, properly remunerated private management who understand both technology transfer and investment processes. Proposals should be consistent with activity already existing at national and transnational levels and should be of sufficient scale to ensure cost-effectiveness (i.e. regional or more concentrated level). Proposals could be geographically or technology-sector based.

Appendix B provides more detail on a number of case studies of bridging mechanisms using a range of approaches in different contexts.

The small seed/early-stage investment gap

Europe has too few seed funds of an appropriate scale to operate effectively. In many Member States, seed funds for investing in R&D intensive start-ups are too small to be viable. By contrast, institutionally backed early-stage funds tend to be too large to be able to address this segment as part of their mainstream business.

Academic research and European experience has demonstrated that there is a minimum viable size for formal venture capital funds. This size is determined both by the number of investments needing to be made by the fund to achieve an effective but manageable portfolio and the need for sufficient fees to be generated by the fund to pay for the creation and ongoing management of that portfolio. Some institutions can only invest in larger funds as the administrative costs to them of making many smaller allocations to small funds (say <€15m) is considered disproportionately high (although fund-of-funds activity can address this issue). See Appendix A where the optimum size for seed/early-stage funds was put at €50 to €150 million. It is also proven that larger venture capital funds make larger investments. There is therefore a problem sourcing smaller amounts of investment for seed, start-up and other very early-stage investment as all pressures on formal funds are to become larger.

One approach to this problem could be through enhancing the activities of private investors by increasing the scale of their activity. In the USA, the Small Business Investment Company (SBIC) programme provides long-term leverage of 2 or 3 times the amount raised (minimum $5 million) by groups of private investors (who arrange their activities in a fund). This effectively triples or quadruples the capital available for investment by the funds, but still leaves them in a size range below institutionally backed funds. Median investment size made by leveraged SBICs was only $250,000 in the year 2000, compared with $14.7 million for US venture funds.[5]

[5] See Innovative Instruments for Raising Equity for SMEs in Europe, Final Report of the Study by Bannock Consulting for DG Enterprise, 2001.

The average cost of capital for debt-leveraged funds is much lower than for pure equity funds, allowing a higher return for their equity investors for any given portfolio return, but only when the portfolio return exceeds a certain threshold. For SBICs the threshold is typically around 15 percent per annum, allowing the leverage to be serviced and satisfactory profits to be made. If, however, the portfolio return falls below around 10 percent per annum, equity investors make partial or complete losses. There is evidence that SBICs allow investors a wide range of portfolio choices and mixes, including both very high-risk small seed stage investments and moderate risk investments in established technology companies. Fund-managers are often also investors, so their returns are enhanced by the manager's profit share. There are currently some 260 leveraged SBICs operating in the US, and they account for about 30 percent of formal venture deals by number, though less than 5 percent by value.

Public or private leverage to private investor funds, however, whilst attractive to increase the range and scale of their activities, increases the real risk borne by private investors in the equity of the funds, for any specific portfolio investment risk undertaken. This is because where the leverage is on commercial terms, as in the US SBIC programme, any losses from the investment portfolio will impact heavily and first on the private equity investors, as all the leverage will always need to be repaid with interest before the private investors can recover anything. This underlines the need for leveraged funds to include enough moderate risk investments to balance the overall portfolio unless their equity investors have exceptional appetite for risk. Another kind of danger applies if the leverage is soft (i.e. repayment can be forgiven in whole or in part if the fund underperforms). Here there is a real risk of distortion of investment decisions, with poorer quality projects being chosen for investment.

Public or private leverage to funds, whilst attractive to increase the scale of their activities, carries real risks for private investors in the equity of the funds. Where the leverage is on commercial terms, as in the US SBIC programme, any under-performance of the investment portfolio will impact most on the private equity investors, as the leverage will always need to be repaid before the private investors. Where the leverage is soft (i.e. repayment can be forgiven in whole or in part if the fund underperforms) there is a real risk of distortion of investment decisions.

Another fresh approach to small funds targets the seed stage, and brings research organisations closer to the commercial world. This is the French programme of state loans to leverage investments by public research agencies in national-sectoral and regional cross-sectoral seed funds, backed by co-investment in these funds by a specialist state-owned bank (CDC), *pari passu* alongside private investors. This mechanism enables funds to be raised big enough to afford professional management teams, while benefiting from the deal-flow and the expertise of the research agencies.

There is counter-intuitive evidence from the USA that very small seed investments are being made by $multi-billion venture capital funds in addition to those made by seed specialists. Some of these investments are syndicated with locally acting specialists. The impact on the seed investment market by the very large funds is a subject of research about to be commenced by UK academics.

Recommendations:

- Public resources could be made available experimentally to provide leverage to seed funds, both on a national and transnational basis. Variants of the US SBIC model could be adopted (as has been done in Flanders) and other measures of subsidised or commercial leverage could be introduced as has been done in France. The Commission should develop a role for evaluating and reporting on the effectiveness of various forms of leverage, possibly co-ordinating with EVCA.

- The EIF should consider ways it can increase its impact on the provision of finance for seed funds across the EU, both consistent with its own financial mandate, and when acting as managing agent for Commission resources. The former could include relaxing its 50% limit on total public-sector participation in funds in markets where private co-finance for seed funds is particularly difficult to source.

- The Commission could consider making resources available to accelerate research into the impact of very large venture funds on seed-level investments.

The institutional reluctance to finance technology venture funds

This is partly an information and perception gap. An important influence on institutional investor funding is historic performance data, partly based on interim valuations of unrealised investments, of venture capital funds. Compared to highly-regulated publicly-quoted asset classes venture fund data is inevitably scarce, opaque and difficult to analyse. This problem is worse in Europe than in the USA, where venture performance measurement activity and its analysis by institutions are more widespread and competitive. Generally, the perception in Europe is that early-stage and technology funds have done worse on the whole than other sections of private equity including buy-out funds. However, the dispersion of individual technology fund results between fund manager group, and by size and vintage year of fund is large, and superior returns can be had by superior selection. Benchmarks have been occasionally corrupted by the inclusion of funds that did not have commercial return targets. More information, and of better quality, used in decision-making should lead to better allocation of capital resources.

Understanding of the progress of early-stage investment in Europe would also be improved by better presentation of investment activity statistics (volume and value of investments made at different financing stages) based on existing data sets. “Seed” and “start-up” investments are already separately reported.

Recommendation: EVCA should consider separate reporting of the category of investments made at “other early-stage”, currently included within the “expansion” category.

Coupled with the current negative perceptions of institutions of technology investing (arising from the dot.com bubble burst explained in the introduction), there is a real problem of institutional investment for early-stage venture funds “drying up”. A lead needs to be given by the key European level institution maintaining its commitment.

Allowing institutions to manage their risks more flexibly when making investments in technology funds is another potentially fruitful avenue for public policy measures. The

Austrian state finance institution for venture capital, for example, has introduced a capital guarantee programme, with commercial premiums, to enable investors in venture funds to limit their potential losses and therefore overcome certain investment barriers.

Other national measures act to reduce institutional (or other investor) investor risks include tax incentives, or public/private funds-of-funds, such as the UK High Technology Fund, the French FPCR, or the Greek TANEO project.

Key recommendation

The EIF should play a role in providing the proper signals to the market. Given its resources, longer term horizon, expertise, market standing and mission, it should be able to act counter-cyclically while improving, not weakening, commercial confidence. The EIF should:

- take the lead in committing to investing in new funds being raised by existing teams with a good recent track record who are finding it difficult to maintain institutional interest because of the delays in achieving exits from their current funds

- enable venture capital fund raising teams, including those raising fund of funds, to put in place flexible downside protection arrangements, to attract a wider range of investors. In return for payment of a flat premium (plus a share of their upside if the premium is less than risk-priced). EIF could act as capital guarantor to such investors to allow them the option to adjust their risk reward parameters.

European weakness in business angel financing

Business angel finance is known to be a major source of early-stage venture capital but is poorly researched and little quantitative evidence exists as to its impact. Europe certainly lags behind the USA in this activity in the minds of all observers and commentators. The evidence is that business angels are particularly important for smaller size deals, which can often initially launch a new technology start-up. Angel gaps have multiple aspects and causes and, in Europe, are probably rooted in the current immaturity of the business angel market. In the USA the Direct Public Offering (DPO) is a well-established technique, using standard exemptions from SEC rules, allowing high net worth individuals to be approached collectively without the expense of a prospectus and IPO. This raises their profile considerably. Making this process widely and flexibly possible in Europe would be a solid contribution to improving angel finance flows (see recommendation in Section 3.1 Framework Conditions).

Recommendations:

- National measures such as fiscal incentives or co-investment programmes should be more widely introduced to liberate angel market mechanisms.

- Angel syndicates should be included alongside formal venture funds as potentially eligible for national/European tax and regulatory advantages, and for leverage schemes.

- Member States should undertake national publicity measures to highlight the potential of business angel activity (such as those which occurred in Germany). Encouragement

should be directed particularly at cashed-out technology entrepreneurs/key management team members to recycle themselves as angels, mentors, coaches, VCs, serial entrepreneurs etc.) National and/or regional government organisations, working with private sponsors, should fund conferences and angel networks, engaging media to raise the profile of angel investing.

- The Commission should consider making funding available to and through EBAN to publicise angel activity including success stories and role models.

4 CONCLUSIONS AND RECOMMENDATIONS

4.1 Guidelines for Future Use in Risk Capital Policy Making

The private-sector risk capital market is capable of supplying large amounts of capital, **given sufficient deal flow within its required risk-return parameters, and sufficient smart investment-management capacity**. Policy makers therefore need to bear these constraints in mind and adjust risk subsidies, with their inevitable negative signalling and distortion effects, in line with market development.

Whenever possible, allowing for the stage of development of the private investment market, risk subsidies should be minimised through competitive tendering processes among private sector contractors.

Support measures that focus on the environment within which the risk capital industry operates, such as relieving human capital constraints on early-stage, R&D intensive, risk-capital investment-management capacity, and on other framework conditions specifically affecting seed capital, such as the intellectual property regime, and employment contracts for researchers, may relieve bottlenecks, and thus have higher leverage than measures working directly on financing instruments. Where the latter involve subsidies, they need in any case to be subject to independent evaluations.

Supply measures alone will not improve the operation of risk capital markets without attention also being placed on demand side constraints, affecting SME awareness and understanding of the appropriate use of risk capital.

Policy makers and support instrument designers should recognise that sub-divisions within the risk capital area require distinct approaches.

"Incubator", "Bridge" or "Conversion Gap"

In this area, lessons from past experience and emerging good practice suggest that policy makers need to:

- Recognise an important gap in the technology transfer process, not restricted to specific regions or countries, between the completion of a grant-funded research project in a university or research institute, and the development of a high-growth business start-up proposal, based on this innovation, that should be capable of attracting outside risk capital investment on reasonable terms.

- Establish programmes that have secure financing and realistic expectations of costs and revenues, including adequate public or educational sector sponsorship. Their continuation should not depend on generating investment returns or private-sector fund-raising that can distort project selection and divert management time.

- Utilise private sector commercial management to select much less narrowly than would an early-stage investor from individual research projects with some definite commercial potential.

- Support projects and team with a very modest package of finance, mentoring, IP management, and services for a strictly limited time-scale with milestones and ruthlessly cull those that do not demonstrate commercial potential.

Small early-stage fund gap
With this gap, the importance elements of the future policy approach should be to:

- Encourage non-institutional sources of smart funding by piloting and evaluating leverage programmes, on commercial terms, for experienced investors – whilst recognising that these must be experimental until more is known of their actual and proportionate impact on early-stage investing.

- Recognise the negative as well as positive potential impact of leverage programmes.

- The role and expertise of the EIF should be recognised and drawn upon wherever possible.

Institutional reluctance to finance technology funds
- The production, use and understanding of better information on fund performance and manager track records needs to be encouraged.
- Measures offering downside protection to institutional investors in technology funds at market or near-market rates should be encouraged. Subsidy is unlikely to create a sustainable, long-term private investment capability.

Angel gaps
- Profile-raising and information can have a significant positive impact on angel markets.

- Support measures should focus on liberating market mechanisms to raise capital from a class of potential investors who pre-qualify objectively, through wealth and/or experience, as requiring less investor protection than the general public, and have an appetite for high-risk/high-return investment.

4.2 Recommendations

We recapitulate our full list of recommendations as follows, beginning with our two key recommendations:

KR 1: The provision of technology-incubator/pre-seed activity converting more research projects to investment-ready business proposals needs to be enhanced across the EU. Such activity is not profit-generating and requires some sustained public resource input to its funding mix.

The Commission should use its resources to call for and fund proposals for new trans-European, co-ordinated incubator/pre-seed fund activity. Criteria for proposals should include a need for experienced, properly-remunerated private management who understand both technology transfer and investment processes. Proposals should be consistent with activity already existing at national and transnational levels and should be of sufficient scale to ensure cost-effectiveness (i.e. regional or more concentrated level). Proposals could be geographically or technology-sector based.

KR 2: The EIF should play a role in providing the proper signals to the market. Given its resources, longer term horizon, expertise, market standing and mission, it should be able to act counter-cyclically while improving, not weakening, commercial confidence. The EIF should:

- take the lead in committing to investing in new funds being raised by existing teams with a good recent track record who are finding it difficult to maintain institutional interest because of the delays in achieving exits from their current funds

- enable venture capital fund raising teams, including those raising fund of funds, to put in place flexible downside protection arrangements, to attract a wider range of investors. In return for payment of a flat premium (plus a share of their upside if the premium is less than risk-priced). EIF could act as capital guarantor to such investors to allow them the option to adjust their risk reward parameters.

Our other specific recommendations fall into two groups: framework condition recommendations (FCR1 to 9) and those concerned with specific financing instruments (SFR1 to 8).

FCR1: The Commission should promulgate to Member States the principles of tax transparency, in line with EVCA proposals, for risk capital funds. Recent legislative change in Belgium is a useful example.

FCR2: The Commission should support EVCA in its argument to the Basle Committee against the change in the financial regulation for venture capital investment made by banks. Some progress is apparently being made in this area with a recent report from the Netherlands that a proposal that co-investment by banks in venture investments should attract no more than a 100% capital weighting has been well received.

FCR3: The Commission and Member States should work towards improvements on the five priority issues identified within the intellectual property rights regime (see section 3.2).

FCR4: Member States should build on initiatives such as that taken in France to make employment contracts for researchers in publicly funded institutes flexible to allow their reasonable participation in spin-out companies.

FCR5: In transposing the Prospectus Directive**,** exemptions, which would enable Direct Public Offerings to experienced and/or risk-aware investors, should be considered by Member States and implemented in a manner which maintains the necessary protection for vulnerable investors.

FCR6: The Commission, building on Gate2Growth, should encourage universities to educate all their students about entrepreneurship and the opportunities in "high-technology start-ups". Business schools should be incentivised to encourage their Executive MBA graduates to join R&D intensive spin-outs and start-ups, raising the profile of such activity through funded awards and competitions across the EU. The UK Science Enterprise Challenge is a possible example here.

FCR7: The Commission should support networking and training activities by organisations such as EVCA to enable greater networking, interchange and understanding between University Technology Transfer Officers, incubator managers, seed fund managers and early stage fund managers.

FCR8: The Commission and member states should consider providing resources to support the diffusion of good practice from larger, more experienced TTOs to newer ones, complementing and building on existing initiatives.

FCR9: The Commission and Member States should consider making public resources available to improve awareness within channels of communication to and from SMEs on the appropriate application of risk capital. Any such activity should complement and build on that already underway and funded under the Sixth Framework Programme or other sources.

SFR1: Public resources could be made available experimentally to provide leverage to seed funds, both on a national and transnational basis. Variants of the US SBIC model could be adopted (as has been done in Flanders) and other measures of subsidised or commercial leverage could be introduced as has been done in France. The Commission should develop a role for evaluating and reporting on the effectiveness of various forms of leverage, possibly co-ordinating with EVCA.

SFR2: The EIF should consider ways it can increase its impact on the provision of finance for seed funds across the EU, both consistent with its own financial mandate, and when acting as managing agent for Commission resources. The former could include relaxing its 50% limit on total public-sector participation in funds in markets where private co-finance for seed funds is particularly difficult to source.

SFR3: The Commission could consider making resources available to accelerate research into the impact of very large venture funds on seed-level investments.

SFR4: EVCA should consider separate reporting of the category of investments made at "other early-stage", currently included within the "expansion" category.

SFR5: National measures such as fiscal incentives or co-investment programmes should be introduced to liberate angel market mechanisms.

SFR6: Angel syndicates should be included alongside VC funds as potentially eligible for national/European tax and regulatory advantages, and for leverage schemes.

SFR7: Member States should undertake national publicity measures to highlight the potential of business angel activity (such as occurred in Germany). Encouragement should be directed particularly at cashed-out technology entrepreneurs/key management team members to recycle themselves as angels, mentors, coaches, VCs, serial entrepreneurs etc.) National and/or regional government organisations, working with private sponsors, should fund conferences and angel networks, engaging media to raise the profile of angel investing.

SFR8: The Commission should consider making funding available to and through EBAN to publicise angel activity including success stories and role models.

APPENDIX A: EVCA SURVEY OF EARLY STAGE INVESTORS

EVCA Questionnaire In Relation to European Commission R&D Policy

Final Results

The results were obtained from 7 questionnaires. 1 respondent was located in Belgium, 1 in France, 2 in Germany, 1 in Italy, 1 in the Netherlands and 1 in the UK (See Annex for more information)

A - Attracting Money From Institutional Investors

Respondents quoted a broad range of institutional investors that show an interest in committing money to seed/start-up funds: insurance companies, pension funds, fund of funds and banks. While their interest is still limited (in terms of total amount or by the shares allocated to seed/start-up funds – N.B. of the total amount they earmark for the private equity asset class, institutional investors invest between 10-20% in seed/start-up funds and 80-90% in later stage funds), an increased interest from pension funds is noted.

The institutional investors that show an interest in committing money to seed/start-up funds are mainly located in Europe. Investors located in Asia and in the United States represent a minority share of the total amount committed.

The barriers to institutional investors increasing their commitments to seed/start-up funds revolve firstly around the current state of the stock markets, which play an important role for two reasons: the IPO window is closed and allocation ratios are lower (public/private) because write-downs on stock markets do not allow further commitment to the private equity asset class.

The second barrier quoted is the need for the seed/start-up fund managers to be able to show longer track records in order to attract money from such investors.

The third barrier is the risk-return profile of seed/start-up funds, which does not match the asset allocation strategies of some institutional investors.

A fourth barrier is the fact that in some jurisdictions certain types of institutional investor cannot invest in unquoted shares.

When asking how these barriers can be overcome, the positive impact of recovering stock markets is mentioned but this depends on a large range of factors. The private equity and venture capital industry has to show longer track record. While this can be achieved over time, a first step towards approaching institutional investors is to demonstrate a high degree of professionalism in managing funds. As regards the regulatory framework - institutional investors should be allowed to invest in unquoted shares.

The following questions were asked to those surveyed:

Question 1: Which institutional investors show an interest in committing money to seed/start-up funds? (e.g. pension funds, insurance companies, etc.)

Question 2: What is the geographic origin of the above-mentioned investors? (e.g. Europe, USA, etc.).

Question 3: What are the barriers to institutional investors increasing their commitments to seed/start-up funds?

Question 4: How can these barriers be overcome?

B - Managing Seed/Start-up Funds

When determining the optimal fund size for efficient management in seed and start-up companies, several figures are quoted, ranging from EUR50m to EUR150m. Such a wide range must be understood in the context of the following equations:

In order to reach the first equation, one must take into account:

- The total number of investment managers dedicated to the fund (NFM).
- The total number of investments that these investment managers can manage (NI).
- The total amount that can be invested in one investment (TI). This figure is the total amount invested in a company throughout the life of the fund. In other words, this is the initial investment plus follow-on rounds, taking into account the need to diversify the risk and the financial resources required to develop portfolio companies in their respective industry. The figures quoted ranged from EUR5m to EUR7.5m on average.

This leads us to the first equation:

(1) Size of fund = NFM x NI x TI

The second equation involves management fees (MF, expressed as an annual percentage of the fund size) which should equal the annual financial resources needed to operate with a team consisting of the investment managers plus other support staff.

(2) MF(Size fund)= annual resources needed to operate

As regards the positive and negative aspects of support schemes for venture capital investment, the following initial conclusions can be drawn:

Loss-sharing schemes are appreciated because they provide the opportunity to start a first-time fund. For follow-on funds, the impact seems to be less important. Two reasons are given: Firstly the performance of these funds' managers may be lower than without such support schemes. These schemes should not support poorly-performing fund managers and if they did, they would lead to market distortions. The second reason is that the administrative burdens related to such schemes make them less efficient for a follow-on fund.

Where loss-sharing schemes are implemented they are specific to each country, but when designing such mechanisms one should ensure that they do not lead to fiscal disadvantages for the investors in the fund.

Co-investment schemes are appreciated for their potential for pooling useful skills and the fact that reimbursement is not a requirement. On the down side, these programs are difficult to manage.

Soft leveraging/refinancing schemes are appreciated in the same way as loss-sharing programs and the ability to link these two mechanisms together can lead to an improved situation. Unfortunately, this mechanism also leads to an increase in financial gearing and therefore increases risk. This can cause serious problems should the venture-backed company eventually fail.

At this stage it should be noted that the counter-cyclical aspect of both loss-sharing and soft leveraging/refinancing schemes is not always clear because the financial constraints related to these programs can be tightened up when the financial environment deteriorates.

Overhead cost subsidies were not used by most respondents and even when these were obtained they were regarded as being of little use.

From a regulatory point of view, the multiplicity of tax systems in Europe makes seed/start-up investments more difficult. Moreover, uncertainty concerning tax rules (systems that change too often in a particular country) is also seen as a barrier.

The following questions were asked to those surveyed:

Question 5: What is the optimal fund size for efficient investment management in seed and start-up companies?

Question 6: What *positive and negative* lessons can be learnt from your experiences in the following support schemes for venture capital investment:

Loss sharing guarantees:

Co-investment:

Soft leverage/refinancing:

Overhead cost subsidies:

Question 7: In your opinion, what regulatory barriers make seed/start-up investment in Europe more difficult? (e.g. single European fund, tax anomalies, inflexible prospectus directives, public market listing rules, etc).

C- Deal Flow

Seed projects should produce IRRs above 50%, while start-up projects should return an IRR above 30%. However, IRR is not the only criterion used by venture capitalists to gauge potential investments. The ability to provide multiples (i.e. money returned/money invested) above 5-10 times the amount invested was also mentioned, both for seed and start-up deals. Having a sufficient stake (e.g. above 20% after the early-stage is completed) or to be the lead investor are also aspects that are taken into account by venture capitalists.

Throughout the due diligence process, including surveys of early users/clients, the need for a clear funding plan to exit or profitability was mentioned. Of course, exit opportunities, via IPO or trade sale, are essential.

Changes in the regulatory environment for intellectual property to improve the actual situation include the more efficient protection of software and easier extraction of intellectual property from universities.

Important changes to the regulatory environment governing the involvement of employed researchers at universities and start-up companies were also proposed by respondents. These were: The need for clear intellectual property rules and the need for a system to avoid not penalising researchers in their future academic career if they join start-up companies. This aspect is also connected to the fact that nowadays, in most European countries, researchers are rewarded for the number of publications they produce rather than for the number of spin-offs they generate. Employed researchers should also be allowed to have shareholdings in university spin-offs.

Some positive and negative lessons can be drawn from experiences in R&D project competition for grant funds. Respondents mention as positive experiences a stimulus to the R&D activity, the additional cash and the exposure provided by such programs. On the other hand, the resources devoted to such competitions can be too high and more importantly - science is one of the primary reasons for doing a deal but not the only one.

Respondents do not regard business angels as important sources of deals. Business angels are appreciated as “smart” co-investors who have business experience, good networks, time and money.

Suggestions for governments to cost-effectively improve R&D intensive deal flow for commercial seed-stage venture capitalists include the clear and efficient transfer of technology. Patent activity at universities and research institutions should also be encouraged. The focus on basic research should be kept at the university level but academics should be allowed to get involved in commercial activities. The idea of introducing a ratio of spin-offs for any research centre receiving government support was also suggested.

The following questions were asked to the surveyed people:

Question 8: What indicative range of IRRs do you look for in order to finance seed projects?

Question 9: What simple quantitative financial rules are there which seed projects have to meet? (e.g. minimum likely amount invested after early-stage rounds completed, minimum share holdings after early-stage rounds completed, multiples, projected exit values, etc.)

Question 10: What indicative range of IRRs do you look for in order to finance start-up projects?

Question 11: What other simple quantitative financial rules are there which start-up projects have to meet? (e.g. minimum likely amount invested after early-stage rounds completed, minimum share holdings after early-stage rounds completed, multiples, projected exit values, etc.)

Question 12: What are the most important changes needed in the intellectual property regulatory environment?

Question 13: What are the most important changes needed in the regulatory environment governing the involvement of employed researchers at universities/research institutes and start-up companies?

Question 14: What positive and negative lessons can be drawn from experiences gathered in relation to R&D project competitions for grant funds (as the basis for attracting investment)?

Question 15: What makes a business angel useful as a co-investor in a deal?

Question 16: What makes a business angel useful as a source of a deal (in the context of a follow-on round or exit of the business angel and sale to a venture capitalist)?

Question 17: What needs to be done by government to cost-effectively improve R&D-intensive deal flow for commercial seed-stage venture capitalists?

D - Exit

The need for a truly pan-European stock market for technology companies, such as the NASDAQ in the US is, not surprisingly, considered to be very important.

The following question was asked to the surveyed people:

Question 18: In future, what will the ideal structure be to allow favourable exits from investments made during the seed/start-up stage of companies?

E - Conclusion

The most important factors for improvement/implementation in order to increase venture capital funding of R&D projects in Europe are:

1- Increasing entrepreneurship, in particular to ease the spin-off process from universities.
2- The need for funds to have a long-term view, implying that institutional investors should be encouraged to invest in seed/start-up funds.
3- Although much criticized by some respondents who experienced such schemes, the availability of loss-sharing and soft refinancing schemes are seen by others as important areas for improvement.

The following question was asked to those surveyed:

Question 19: In your opinion, what is the most important factor that needs to be improved/implemented to increase Venture Capital funding of R&D projects in Europe?

Annex

Profile of respondents

Age	#
Less than 5 years	2
More than 5 years	5

Stage financing	
Early-stage	2
Early-stage and expansion	2
Generalist (early-stage, expansion and buyout)	3

Industry Preference	
IT	1
IT-Life Science	3
Generalist	3

Geographical preference	
European Approach	7

Country of location	
Belgium	1
France	1
Germany	2
Italy	1
The Netherlands	1
The United Kingdom	1

APPENDIX B: CASE STUDIES OF BRIDGING MECHANISMS

1) INRIA Spin-off Channel

INRIA, the French national institute for research and development into information and automation, has an active technology transfer programme, including a spin-out channel. INRIA is prepared to grant a 3 year exclusive licence on IP it automatically owns, with a buy-option at a pre-determined price, to allow researchers to try and develop spin-out companies. Companies exercising the buy-option pay 98 percent of the price in cash, through a royalty arrangement.

INRIA does not require equity, except for stock options, equivalent to 1 or 2 percent of the deal. The researchers can choose to take leave, while they are acting as shareholders in the start-up company. The flexibility of these employment arrangements has been enhanced by the new innovation policy act of 1999.

In addition, the researchers, as authors or inventors, receive 50% of the royalty amount paid to INRIA up to a moderate ceiling and 25% thereafter.

Through INRIA Transfert, a wholly owned subsidiary, spin-out companies can receive modest amounts of "love money" in the form of grants, reimbursable in the case of success, to cover consulting and market studies. The design of the spin-out channel thus recognised the inherent problem of the bridge requirement for support at the pre-seed stage.

A limitation of this arrangement was that INRIA's upside on successful spin-outs was limited. The cost of INRIA Transfert was not necessarily recovered and its scope of operations was limited.

The solution was to allow INRIA to participate indirectly in investment rounds of companies attracting seed and subsequent finance. Since 1999, the government has promoted a series of national sectoral and regional cross-sectoral seed funds, attracting a range of private-sector investors on the basis of cornerstone investments by the state-owned bank CDC. Inria Transfert has committed €11m of the total €80m raised for the national funds in the ICT sector, I-Source 1 and 2, C-Source and T-Source. Some of this stake has been loaned to Inria by CDC.

Given that INRIA's 2002 annual budget is €110 m, even a 10 fold eventual multiple on the seed fund stake would provide just one year's revenue, so the likely contribution to future revenue is modest, and cannot be regarded as a substitute for an element of mainstream public funding. In fact any gains have been ring-fenced for technology transfer activities though not necessarily for the spin-out channel.

2) Universities Challenge Seed Funds UK

A total of 15 University Challenge Seed Funds were established through competitive bidding in 1999. The competition was set up in 1999 in response to the 'equity gap' that exists in the UK for bringing university research discoveries to a point where their commercial usefulness can be demonstrated to a sufficient extent that successful approaches can be made to venture capitalists for financial support or to established companies to take licences in a product or process. The aim is described as enabling universities to gain access to seed funds.

£45 million of funding, augmented in autumn 2000 by a further £15 million, came from the State (£25 million) and two charitable trusts. The available funds were three times oversubscribed by bidders. 15 awards were made between £1 million and £4.5 million, covering 28 universities and 9 public sector research institutes. In several cases the award and the fund covered several institutions, for example the White Rose Fund covers the universities of Leeds, Sheffield and York. The largest fund is now the Sulis Seedcorn Fund covering the Universities of Bath, Bristol and Southampton with a combined award of £9 million. A minimum of 25 percent of the amount of the award had to be put up as a contribution to the fund by the university winners. Each of the 10 year funds had to appoint an experienced venture manager, normally a firm managing a much larger amount of capital on behalf of other clients. Fund managers can improve their networking among scientists and technologists, useful for early-stage investment generally, and some see opportunities for co-investment and/or follow-on funding.

The operation is a partnership between the technology transfer office of the universities, the board or steering group of the fund, normally including academics, VCs and industry experts and the fund manager. Funds do not have an exclusive right over university IP, nor do they have to invest in projects referred by the technology transfer office.

The key feature of this scheme is the attempt to combine the seed and pre-seed functions in one vehicle. Over half the so called "investments" are pathfinder in the size range £0- £25k (€0-€38k), while the maximum allowed in any one company is £250k. Some cross-subsidy between the functions was envisaged. "Significant investments in projects close to market would be seen an as enabler (providing an income stream to sustain the fund) not as an end in itself." Success was to be judged by the number and value of new commercial opportunities brought to the market place. The funds were "hopefully" to become self financing after their 10 year planned lifetime.

The meaning of self-financing was not precisely defined and varies from fund to fund. Broadly it means that returns, in the form of eventual capital gains and dividends from investments, would allow the funds to go on investing at a similar or greater rate in the future, with any additional capital resources being raised on a non-subsidised basis. The government is not looking for a financial return.

Fund sizes are small, ranging from under £2m to £9 million. Management resources, including overheads, associated with the funds, are also modest averaging £153k per fund. Given the large number of projects approved annually, averaging 10 per fund, it is clear that the degree of support offered per project cannot be large, even with some informal support arrangements being taken into account.

Larger, better resourced, commercially focussed funds dedicated to seed and other early-stage, without the restriction on the maximum investment, and therefore with the ability to follow on through at least some subsequent rounds, find it difficult to make commercial returns, or even avoid decapitalisation, without trying to do pre-seed activities in addition. This poses a question mark over the University Challenge scheme, unless expectations and evaluations are very well managed.

3) BTU-Frühphasen (Seed programme)

The TBG (Technologie Beteiligungsgesellschaft), technology investment company, the venture capital subsidiary of the state-owned Deutsche Ausgleichs Bank, launched the BTU-Frühphasen Programm in June 2001, supported by the Ministry of Economics, as an addition to the long established BTU-Programme. The latter has a refinancing channel (operated through KfW) and a co-financing channel, operated by tbg, supporting commercial investment by accredited lead investors in young, private technology-based companies.

In its target group and conditions, the Frühphasen programme fits well into the pre-seed category. The financial support available is a standard amount of €150,000 in the form of a grant, "Genussrechte", convertible to equity, for projects which pass the two-stage selection process operated by tbg. Projects are required to work with an experienced and entrepreneurial "business coach" who supports the founders as a mentor, and offers consulting services. Once the €150,000 has been allocated, the project has to be fully defined within 6 months.

The NTBFs can choose their mentor themselves from a decentralised network of accredited "business coaches", managed by tbg's eight regional offices. Coaches are not paid a retainer by tbg, but, depending how far "their" projects succeed through selection, receive fees on a standard scale, with a minimum of €1,000. Coaches' contracts are annual, though renewable, and their performance is reviewed regularly.

The Frühphasen Programme seems to have been offered partly in response to the deteriorating market conditions for VC exits on the Neuer Markt, a market which has since been closed by the German Authorities, but also in recognition of a more permanent pre-seed gap. Its aim is to fill in part of the equity gap, by helping companies become prepared for the requirements of early-stage venture capitalists.

The targeted companies are at most six months old or pre-foundation. The grant is designed to cover the costs of the initial creation of a new technology based firm. This typically covers establishing suitable organisational structures, drawing up a presentable business plan, developing products/procedures and securing necessary expertise.

Stage one selection is from a short profile (2 pages) of the identified business idea and its founders, prepared by the business coach. A tbg investment manager has to approve the formal requirements and the quality of the idea. Once accepted, the coach can do further investigation on the quality of the project. (If the profile is rejected, no fee is earned by the coach). One possible outcome of the further investigation is that the coach decides that the project should not be taken further. In this case, the coach can claim the minimum fee from tbg of €1,000. The other outcome is a second stage full application, together with the founders, for the €150,000 grant. To qualify for this application the company needs to be valued at €600,000 pre-grant.

If the full application is rejected by tbg, the coach can ask for a fee of €3,000. If it is accepted, the project moves to the next phase. Contracts for the management, the coach and the articles of association will be drawn up. The coach can be paid a fee in defined milestones up to €25,000. This can be reduced, by agreement, in exchange for a minority shareholding.

The programme is exempt under state aid rules through the de minimis exemption, but projects therefore have a low limit on any other public funds receivable.

Early indications show enthusiastic take up. By August 2002, there were 110 coaches, and 481 projects had been presented at stage one. Of these 165 (35%) were accepted for further investigation. From this set of projects 123 (75%) were entered in the second stage selection, and 43 of these succeeded in obtaining grants. The overall selection rate is thus around 9%, rather higher than standard commercial seed investors from their deal flow.

The projected annual budget for the programme is 100 projects allocated €15m, selected from 800 original profiles submitted to tbg by the coaches network, with 50% rejection at each stage. In the first two years, however, and given depressed market conditions, the deal flow is not expected to reach that level. Other costs, including coaching fees for aborted projects will be funded from an administrative budget, set initially at €0.5m.

4) European Technology Transfer Accelerator (TTA)

This is a proposal for a new mechanism, which was written up in 2001 as an internal working note within EIF, following discussions EIF had with technology transfer, venture capital and academic specialists, both European and American.

The drivers for it were two conclusions: first that the European VC community is insufficiently "deep" in its technology expertise particularly in emerging technologies, and second that European technology transfer mechanisms are insufficiently developed and commercial in their approach. A specific weakness noted is that there are no technology transfer operators with a pan-European or global reach.

The mechanism would target projects spanning at least two member states, and focus on emerging and advanced technologies in four or five sectoral groups. These could include health; nanotechnology, materials and physics applications; advanced IT around artificial intelligence applications, emerging energy transportation/mobility.

The TTA would find, develop and optimise European research ideas, from universities and institutes, and convert them into perfectly set-up, defensible, exploitable European Intellectual Property Rights, ready for sale (through auction processes to extract maximum value) to venture capitalists and others prepared to take the IPR to the next stage of commercial exploitation. The emphasis is on producing a "clean" property for sale. Thus, the division of economic rights would be clearly defined and aligned with the contributions of parties, defensive patents would have been filed, key management team members would be in place, and the IP for sale would be optimally structured.

TTAs would be sector specific, covering a defined range of technologies and independently managed. The TTAs would be structured as long-term (15-20 year) partnerships with team members' skills covering technology scouts, IPR management/legal, business/VC matters. They would have separate professional expert investment and advisory committees, with the decisions taken by the former on which investors in the TTA would not be represented.

The funding of the TTAs was envisaged as a mix of public and private funding. One possibility would be one third from the EIF acting under the European Commission mandate, one third from other public or public private partnership funding and the remaining third from the private sector, to include VC and strategic investors (large technology companies in that space).

The scale of the project was envisaged at €50-100m per TTA.

How would the flow of technology transfer be improved through the TTAs? Key underlying assumptions are that concentrating pre-seed expertise across Europe within technology areas would result in scale economies and efficiencies, as well as learning externalities, and more co-ordinated decision making. The financial targets for the TTAs have not been spelled out, but given the proposed sources of funding, it is clear that the objectives are primarily to increase the quantity and quality of deal flow, rather than to make high returns at this stage.

One counter argument is that the TTA mechanism as outlined has a flavour of planning and "picking winners" by a centralised decision maker. Decentralising technology investment decisions, and thus allowing for the elements of random discovery, personal chemistry, competition and rapid decision-making spread among large numbers of seed investors, may be a valuable part of the process of emerging technologies. However the TTAs themselves would presumably be a new competitive element with no special privileges, and not a source of market distortion.

5) Government Sponsored Incubator Network: Israel

The Israel incubator network dates from 1991, and is one component of a pro-active set of policies introduced to develop science based export industries. Up to the end of 1998, the government through the Office of the Chief Scientist (OCS) had invested $180 million in the programme. At that time 750 projects had received backing of which approximately 500 graduated and 200 were still in progress.

Over the years, their identity has been maintained as technological incubators, rather than drifting towards more general business incubators. 27 incubators have been in operation, with 4 closing since 1991, apparently through incompetence of management rather than conceptual failure. In the last two years, new bio-tech incubators have been established working on a slightly different model, with mixed private and public participation.

The aim of the programme is to help those with innovative ideas and technical experience, but limited commercial experience or none, to convert ideas into marketable propositions. The objective is not to compete with VC investors, but to develop initially sketchy ideas to the point where they are of interest to the private sector. In the early 1990s, the programme was of particular interest to Russian immigrant scientists and technologists.

The structure of the programme provides separate and clear government support for both programme level and project level financing.

At programme level the government provided a maximum of $184,000 annually per incubator for administration, infrastructure and operational expenses, but the lead partners had to provide or raise matching funds.

Partners had to include at least one public-sector body, or not-for-profit non-government organisation, and came from the following three categories:

- Universities and research technical institutes (Weizmann and Technion, plus Tel Aviv and Jerusalem College of High tech)
- local authorities and municipalities (could allow incubators to be exempt from local taxes)
- well established industrial organisations (local and/or technology companies).

Sixteen incubators out of the total of 24 had private sector partners in 2000.

Each incubator must be an independent entity to facilitate monitoring, have suitable R&D facilities, be able to manage at least 10 projects at any one time, and have an experienced incubator manager. Its board had to consist of unpaid volunteers from industry, commerce, research and the public sector.

At project level the maximum budget is $350,000 over 2 years. Up to $300,000 of this is available in two annual phases as a grant from OCS, for projects which met its selection and follow-on tests. 15% of the budget must be brought in by the entrepreneur from any and all private sources, including bank borrowing, angels, friends etc, and from the incubator itself. Preliminary selection by the incubator prior to approaching OCS is based on reviewing the concept, checking the patents, and scoping the market.

Once OCS has approved the grant, each project is registered as a limited company, with a standard division of equity ownership. 50% is allocated to the entrepreneur, while the incubator retains 20%. An additional 20% can be allocated later to external investors who must cover at least 15% of the company's budget, 10% is held in escrow for employees. From 2001, some flexibility has been introduced into these proportions.

Each project has a team of 3 to 5 people, including the entrepreneur and salaried staff, and is assigned an administrative manager from the incubator professional staff. Grant tranches are channeled through the administrative manager, against milestones. The approach is that:

"Every service is to be provided including those the entrepreneur thinks he/she does not need" The administrative manager's role includes team building, regulatory and accounting issues, help with documentation and protection of IP, and budgets and timetables. Assistance with the search for strategic and or financial partners is vital, as the project has to graduate within 2 years. The manager's role is part mentor, part discipline.

Key tasks for the two year period are reducing the remaining technology risk, developing the marketing platform, solving the IPR issues and creating management capability to attract key partners.

If projects fail to meet milestones, they can be closed down by the incubator at any time during the two years. Typically the turnover of projects per incubator is 3 to 5 per year.

There is a royalty clawback on successful projects developing new products at 3% of sales revenue, up to 100% repayment of the grant. The incubator has to pass this back to the OCS, but under certain circumstances OCS will allocate part of it back to the incubator for re-investment in the programme.

Although there has been no formal outside evaluation, an interim progress report by the Incubator Management Office under its director Rina Pridor was produced in 1999. One estimate suggests that less than 1% of projects would have been commercially interesting without incubator help, whereas in fact 52% have survived 2 or more years after incubation, and attract outside investment. The tables below are reproduced from the progress report.

Table 1. The Survival of Graduated Companies 1991 to 1998

Companies (number - %) *		
Total Incubator Graduates	**476 - 100%**	
Continuing entity	**239 - 50.2%**	**Received outside investment :78.7%** **----------** **Self generated funding: 21.3%**
Ceased functioning	**237 - 49.8%**	**During Incubation period: 19.4%** **----------** **Following Incubation period : 80.6%**

Source: Pridor 1999 interim progress report of Technological Incubator Project

Of the 239 companies that graduated from an incubator and continued their activities, 188 companies (79%) succeeded in attracting outside investments following their incubation period. The total amount invested in these companies amounted to $202 M that came mostly from Israeli sources (76%) and the rest from various overseas sources. It is important to note that most of these sources were venture capital companies.

Another important parameter is the ability of the incubators companies to become self sustained and to generate revenues from the sale of their own products. Table 2 presents the available data on this parameter and indicates that 50% of the companies were able to generate annual revenues of $ 100K and more.

Table 2: Commercialisation of Incubator Graduated Companies
Income Generated from Sales

Sales	**% of company number** **Number of companies: 110**
$50-100k	**50%**
$101-500K	**27%**
$501K-5M	**23%**

Source: Pridor 1999. Interim progress report of Technological Incubator Project

In August 2001, after a review, the government announced its intention of making the technology incubator programme as a whole less dependent on government funding. Its aim was to privatise 3 to 5 of the most successful turning them into profit making concerns. In addition two changes in the equity rules were introduced:

1) The entrepreneur's equity share will range from 30 to 70% instead of being fixed at 50%.
2) The state's investment of a maximum $300K through the grant will be able to buy more than 20% of the equity. Under the old rules a private investor could acquire 20% for only $50k and that is when the company is more valuable as it has had time in incubation.

The government also set up a new seed fund of $50m to invest alongside private investors in graduating incubator projects where these were in areas of national strategic importance.

One of the publicly sponsored incubators was specialised to the biotechnology sector, but the inflexibility of the model has been recognised as a limitation. Biotech projects typically need more than 2 years, and more than $350k budget. It also makes sense for the incubator to incorporate a shared laboratory infrastructure, and to have specialised management. Private sector biotech incubators have been started in Israel, and there is a new public sector initiative alongside this recognising the special needs of this sector and setting up 3 new incubators. The standard incubation period is 3 years and the grant amount can be as much as $1.8 million.

6) Government Sponsored Incubator Network: France

The aim of this new network is to support the creation of innovative enterprises based on results of public-sector research faciltities.

The project was launched in March 1999, jointly by the Ministries of Research, and of Finance, Economy and Industry, as part of a broad set of innovation initiatives under the Law on Innovation and Research. By December 2000, 31 incubators had been selected for support from those applying, spread over the whole country. Consortia applying incubator projects were led by institutions of higher education and research grouped on a regional level with regional organisations, including local government and regional councils. The first incubators began operations in January 2000.

All but 3 incubators were multi-sectoral. The exceptions were 2 focused on biotech and one on educational multi-media.

By October 2001, a preliminary survey of activity, showed that 440 projects had been taken on, from which 161 enterprises had been created, since the launch of the incubators, which had been established on average for 15 months, with a range from 7 to 22 months. Of these enterprises 101 were still in incubation and 60 had left their incubators.

The most active incubator, CREALYS in the Rhone-Alpes (Ouest) region, had taken on 54 projects over a period of 22 months, from which 21 firms had been created.

There were strong links with other innovation policy instruments: for example, among the incubator projects, nearly half included winners of the national competition for support in creation of innovative technology businesses.

The level of central government financial support for the 31 incubators allocated was modest at €24.6 million over a period of 3 years, or approximately €260,000 per incubator per year, and was designed to cover 50 percent of the incubators operational expenses covering both programme and project levels. The other 50 percent was to come from local authorities (regions, "départements") and other local partners. Aid in kind in the form of services, equipment use and other means was provided to project teams by research laboratories. The average government support was calculated at €28,203 per project.

Data on capital was available for 97 firms from the total of 161 created. Of these firms, more than 80% had initial capital of less than €76,400, of which half had a capital of less than €38,200. By May 2001, 25 of these firms had capital of more than €153,000, compared with only 5 at their creation. Internal sources, i.e. the entrepreneur, family and friends dominated the capital supply of most firms. But, by that date, 18 firms had attracted business angel finance, 6 seed capital and 11 venture capital, either singly or in combination.

7) Technology Pull Seed Capital: Arch Venture Partners USA

Arch is a specialist seed capital investment firm in the USA, and is included because of its unusual history and specialised mode of operation. This is sometimes described as "technology pull". There are no similar investment firms in Europe.

This is not in itself a bridge mechanism, since it is a purely commercial fund, now operating across the USA, but in selected high-tech research cluster areas. However, it began in Chicago as a locally-operating small venture fund, complementary to an early and very successful non-profit university technical development company encouraging and supporting commercialisation of research, which still continues to function.

The following is extracted and adapted from Arch Ventures website material.

ARCH Venture Partners is a spin-off from a technology commercialisation initiative originated by The University of Chicago. In 1986, ARCH Development Corporation was formed as a not-for-profit affiliate corporation dedicated to commercialising promising technology developed in research laboratories at Argonne National Laboratory and the university.

The organisation had the broad mandate to license promising technology and promote the formation of spin-off companies. The team pioneered a commercialisation strategy that was designed to benefit both the university and the scientists behind the research.

Within two years, they recognised the need to create a venture capital fund to support the formation of spin-off companies, as the Midwest did not support a strong early-stage venture capital community at the time.

In 1989, ARCH raised $9 million for its first fund, ARCH Venture Fund I, which provided seed capital to 12 companies. In late 1992, the team formed ARCH Venture Partners in a friendly separation agreement with The University of Chicago. ARCH Development Corporation remained within the university as its technology transfer arm. The University of Chicago became a special limited partner and investor in the new venture capital firm.

The team of ARCH partners share a decade of collaborative experiences in early-stage new enterprise formation. This cohesive structure has been an underpinning of the firm's continuing success.

In 1993, ARCH Venture Partners launched ARCH Venture Fund II and broadened its reach to embrace other leading research universities and national laboratories, which soon included Columbia University, Sandia National Laboratories, Los Alamos National Laboratory, and the University of Washington.

ARCH Venture Fund II was a $31 million fund that provided seed and early-stage capital for 22 new companies concentrated in the Midwest and south-west, with a developing presence in the north-west and eastern seaboard. This geographic expansion was deliberate, focusing on markets under-served by the venture capital community that were also close to major centres of research.

In 1996, ARCH launched ARCH Venture Fund III, a $107 million fund that invested in 25 new ventures specialising in advanced technology in information technology, life sciences, and physical sciences. With ARCH Venture Fund III, the partnership also expanded an interest in developing opportunities from corporate spin-offs and entrepreneurial ventures based on successful experiences during ARCH Venture Fund II. This decision leveraged the skills ARCH partners had developed in building new ventures from their earliest stages.

ARCH Venture Fund IV is a $175 million fund that continues ARCH's successful model of investing with 27 companies in information technology, life sciences, and physical sciences companies with an emphasis on Internet-based emerging technologies.

In 2000, ARCH launched ARCH Venture Fund V. The $380 million fund is the fifth to utilise the ARCH model of early-stage investing. ARCH remains among the top tier venture firms collaborating and investing in the national research community across multiple disciplines and venues, e.g. academic, corporate and national laboratories.

ARCH remains among the leading venture capital firms specialising in seed and early-stage investment. More than 90 new ventures have been funded by ARCH, many of them from the concept stage. Today many are public companies or have become part of other prominent organisations. ARCH has been the subject of much comment in business journals, including profiles in *Fortune Magazine* and *The Wall Street Journal*, as well as The Harvard Business School, which wrote a case study examining ARCH's model of technology commercialisation.

Arch’s investment principles declared in its publicity material include:

- Focus on seed and early-stage innovative opportunities. (including “ an idea described in a laboratory notebook”)
- Concentrate on breakthroughs and fundamental advances in information technology, life sciences, and physical sciences.
- Maintain an on-the-ground presence in geographic areas that are underserved by early-stage venture capital but contain great centres of basic research and an active community of technologists.
- Maintain special competence in building companies from products originating in academic and research laboratories, in particular by building relationships with key scientists. This includes combining science and technology from multiple laboratories sources to form a company.

Adhere to a particular investment model, initially conservative to reduce risk, leading syndications with familiar partners from early rounds all the way to liquidity, and using specialised non-equity capital (debt-equity hybrids) often available to early-stage companies.

European Commission

EUR 20717 — Raising EU R&D Intensity – Improving the Effectiveness of Public Support Mechanisms for Private Sector Research and Development: Risk Capital Measures

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SUMMARY

The European Council in Barcelona set an overall EU R&D investment target of 3% of GDP by the year 2010, with industry asked to contribute two thirds of this figure. To approach these levels, however, dramatic improvements are needed in the effectiveness of policies used to stimulate private sector R&D. The specific aim of this report is to offer suggestions and guidance on improving the effectiveness of public support for risk capital investment in research and innovation. Starting from the link between R&D activity and risk capital, the report considers the range of policy instruments available to tackle the risk capital funding gaps. After reviewing the use and potential of financing instruments and the role of framework conditions, the report then presents a series of recommendations for the consideration of policy makers across the EU.