

**The planned “Risk-Sharing Finance
Facility” (RSFF) in the 7th EU Framework
Programme: A First Appraisal**

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1 Task definition

The European Commission proposes to introduce a new financial instrument for the 7th Framework Programme for Research and Technological Development (FP7). Working together with the European Investment Bank (EIB), the Commission plans to establish a so-called “Risk-Sharing Finance Facility” (RSFF). The aim of RSFF is to improve the financing of large research projects and RTD (research and technological development) infrastructures, by creating the option for firms to receive finance in the form of EIB loans. The facility will make use of the set of EIB’s financial instruments already in use within the framework of the “Structured Finance Facility” (SFF). Financial resources from FP7 along with EIB’s own resources will serve to provision financial risk of EIB loans issued under the RSFF. According to current discussions, the amount of FP7 funds to be allocated for the RSFF will be of the order of 1 Billion Euro for the period 2007-2013. This money will be used to make loans totalling 3 to 6 Billion € available for RTD projects. Loans can be granted for projects that the Commission assesses as eligible for funding within FP7. Additionally, the RSFF is to be made available to other RTD projects with a “European dimension”.

The introduction of a publicly-funded loan facility should also be seen against the background of Basel II. The fact that banks now pay more careful attention to individual risks when granting loans has, on the whole, worsened loan financing conditions for small and medium-sized companies (SMEs) involved in research, since they are faced with higher risk premiums and thus higher interest. A supply of publicly-funded debt finance, with a lower risk premium than that of commercial banks, could help combat this problem.

The RSFF will break new ground in research policy. Until now, government R&D loans have primarily been used to promote innovative activity in individual companies, in cases where this activity is close to the market and a large part of the loan is used to finance investment that would also act as security for the loan. Such investment involves the purchase of new machinery, equipment or other real capital associated with the introduction of new products or processes. An example from Germany of such financing is the loan variant of the ERP Innovation Programme, transacted by the KfW bank group. It is rare for public banks to offer debt finance to promote pure RTD projects in individual companies. An example of this is the programme entitled “*l’aide au project d’innovation*”, offered by ANVAR in France. The programme can be used to fund RTD projects, under certain conditions. The RTD activities must be part of a wider innovation project. Additionally, the product launch and the exploitation plan must have been planned for the entire project, and this plan positively assessed.¹

The FP, on the other hand, envisages that RTD be promoted within the framework of international consortia. A high level of risk is normally associated with research projects, and

¹ See de Laat et al. (2001) for an evaluation of the programme.

there are large gaps (at least in terms of the time required) between the research and its eventual practical application. Furthermore, the organisational structure involved in carrying out such projects is often complex, involving numerous different firms and research institutions. For these reasons, it has always been assumed that debt is not an effective way of financing FP projects. Consequently, FP funding has, until now, been exclusively in the form of grants. However, the Commission and the EIB see potential in offering loans to fund FP projects and other projects with a European dimension.

It is against this background that the Federal Ministry of Education and Research (Bundesministerium für Bildung und Forschung - BMBF) has commissioned a short analysis from the Centre for European Economic Research (ZEW) to answer the following questions:

- (1) How does the potential economic utility of the planned RSFF rate, particularly compared with the promotion of RTD projects in FP7 through grants?
- (2) What is the potential of the planned RSFF in terms of making it easier for firms to gain access to the funds available under FP7?
- (3) To what extent can the RSFF cover SMEs' financing needs for RTD projects and how is the planned involvement of private banks as loan agents for SMEs to be assessed?

Finding answers to these questions is made more difficult by the fact that the final form the RSFF will take is yet to be decided. Furthermore, various RSFF parameters that are of considerable importance for the assessment can only be fixed in the course of using the instrument. This is virtually unavoidable in the case of such innovative instruments, for which no past data is available. The limited availability of information thus permits only qualitative statements to be made in response to the above questions, based primarily on conceptual analyses, interviews with experts, literature reviews, and previous experience with debt finance instruments for RTD.

To answer the questions posed by the BMBF, we take the approach of assessing the proposed instrument (RSFF) as a research policy tool. To do this, we first examine the economic reasons justifying the intervention and the expected effect of the availability of a debt financing instrument on companies' willingness to invest in RTD. We then go on to discuss the EIB's choice of target group, in terms of the reasons given for establishing the RSFF and the specificities of how the instrument functions. In a separate section, we look at the relationship between the RSFF and the FP, especially as regards the application procedure and the timeframe for both activities. Finally, we briefly examine the role of the RSFF as an exemplary financial instrument, from which commercial banks can learn valuable lessons about the provision of debt for RTD projects.

This appraisal draws mainly on the following sources relating to the possible form of the RSFF:

- The Commission and EIB: *FP7 "Risk-Sharing Finance Facility" to Leverage EIB Loan Investment in Large European RTD Projects and Infrastructures*. Discussion document

prepared by the Commission services (DG RTD and ECFIN) and the European Investment Bank. 2nd Draft, 28th July 2005.

- An interview with Commission and EIB representatives conducted on the 30th of August in Brussels
- Commission proposals of the 21st September 2005 for a council decision on „*Specific Programmes implementing the Seventh Framework Programme (2007-2013) of the European Community for research, technological development and demonstration activities*“.
- Presentation slides from the RTD DG, from a presentation made of the commission’s proposal for an RSFF, on 6th April 2005.
- EIB slides from the presentation „*Enhancing Financing to RDI (Research & Development & Innovation) through Co-financing & Leveraging & Risk-Sharing*“, made on 17th May 2005.
- The EIB list of past and present projects financed through the SFF within the framework of the „*Innovation 2010 Initiative (i2i)*“ (July 2005 version).
- The Commission and EIB: *FP7 “Risk-Sharing Finance Facility” to Leverage EIB Investment in Large European RTD Projects and Infrastructures*. Discussion document prepared by the Commission services (DG RTD and ECFIN) and the EIB. 1st Draft, 29th April 2005.

In the following, all references to page numbers relate to the 2nd draft of the Commission and EIB discussion document of the 28th July 2005.

2 A brief characterisation of the planned RSFF

The Commission and EIB discussion paper of 28th July 2005 introduces the main features of the planned RSFF. The following section summarises these features and elaborates on the central elements of the RSFF.

The **primary aim** of the RSFF is to clearly expand the range of RTD activities promoted through FP7, and thereby also increase private investment in RTD. This “expansion” should work as follows: funds from FP7 will be made available for the RSFF and used – along with the EIB’s own funds – to provision financial risk (i.e. failure of lenders to fully repay the loan). Since only a small fraction of all loans are expected to fail, many times the original sum is used as a deposit to be made available in the form of loans. The magnitude of this “leverage effect” depends on the probability of default and how this probability is distributed over time, as well as on the terms and conditions of the loan (credit term, amount of repayments and payment schedule, grace period, interest rate). The Commission and EIB assume a leverage effect of 3 to 6; i.e. with 1 billion Euro of FP7 funding made available for the RSFF, loans totalling between 3 and 6 billion Euro can be granted for RTD purposes. The resources provided by FP7 therefore constitute a fund, which is only brought into use when a loan is in (partial) default. A further difference between the RSFF and grant funding is the RSFF’s “revolving” nature. That is to say, the

majority of borrowed funds are paid back (with interest) by the borrowers. These funds are then available to grant new loans in later periods.

A **further aim** of the RSFF is to generate a demonstration effect, educating the private bank sector (or indeed, dependent on how a national banking system is organised, also state-owned banks and promotional banks). It is intended that the RSFF show that financing RTD projects by means of loans is both economically viable and practicable. In particular, it should demonstrate that it is possible to grant loans without collateral (“soft loans” or “collateral free loans”). It is hoped that the EIB’s example will have the effect of familiarising commercial banks with financing RTD in firms, opening the private loan market for such firms. Another effect of the RSFF should be to create a critical mass of RTD financing know-how by bringing together experts from the two areas of research policy and finance.

RSFF Funds are to be made available for two types of planned RTD activity (p. 9):

- **large RTD projects**, i.e. research that requires large volumes of financing and is conducted by a community of researchers from different organisations (firms, higher education institutions, research centres etc.) working together;
- **RTD Infrastructure**, i.e. investment in buildings, equipment and other tangible and intangible assets that are used to carry out or support RTD. These may be owned and managed publicly, privately, or in a public-private partnership (PPP);

A third type put forward in the discussion document is that of all projects that are eligible for funding under FP7, in particular RTD activities in SMEs. These will now be eligible for RSFF financing.

Applications for RSFF loans will be accepted from the following two sources (p. 11ff):

- From RTD projects that have already successfully applied for funding under FP7;
- From RTD projects not funded in FP7 that demonstrate a “European dimension”. This could mean that they are carried out by a multinational consortium or that they make a significant contribution to the European research agenda in certain economic and technological areas. Concrete examples of this named in the draft include Joint European Technology Initiatives (JETIs) not funded by FP7, large collaborative research projects (including Eureka projects), projects financed under the i2i programme (including new research infrastructure), FP6 follow-up projects and Quick Start projects.

RTD projects seeking finance through the RSFF must first demonstrate their eligibility in terms of their content. FP7 projects are automatically assumed to be eligible as long as they have been positively evaluated and can, theoretically at least, receive a FP7 grant. A panel will be set up to test the eligibility of non-FP7 projects. RSFF financing is also dependent on the criterion of **creditworthiness**. This is assessed by the EIB through a “bankability assessment”, a techno-economic risk analysis of the project. The RSFF is intended for projects in the EIB risk

categories D-, E+ and E-. Previously, the highest risk category for which a loan from the SFF could be granted was D-. The EIB's "traditional" loans (excluding the SFF) normally make even more stringent demands on the borrower's creditworthiness.

RSFF loans can be used to provide up to 50% of the funding for a project. In principle, RSFF loans are available to firms, research institutions and higher education establishments, as well as to organisations established on a PPP basis. Either individual project partners or a single legal entity can act as the **borrower**. For loans totalling 12.5M € per project or more, the EIB itself will take on the role of lender. For projects requiring lower volumes of funding, it is envisaged that commercial banks will be brought in as intermediaries. They will grant the individual loans and in turn receive a global loan from the EIB under RSFF.

No information is yet available as to the actual conditions of EIB loans under RSFF. In any case, these will depend considerably on the individual projects financed. In general, RSFF loans include some degree of **subsidies**, to the extent that the interest rate charged by the EIB is lower than that which a private commercial bank would have to charge on such risky loans. However, the extent of the subsidy cannot be quantified, since there is no market for "RTD loans" and therefore no market interest rate. It is a fair assumption that the size of the subsidy associated with the EIB loan will be very small as a percentage of the total cost of the RTD project. Thus it is considerably lower than in the case of a grant, which can reach up to 50% of the total cost.

Financing for the RSFF is to be derived from two FP7 budgetary lines, "Cooperation" and "Infrastructure" (p. 16). The FP7 funds for the RSFF should be used to complement the EIB's own funds. This would enable the EIB to increase the extent of EIB loans used to finance RTD, compared to the current volume. Furthermore, the EIB would find itself in a position of being able to finance projects that, owing to their risky nature, were previously beyond the scope of what it could finance. The implementation of the RSFF is to be entrusted to the EIB, which has the benefits of experience and suitable management structures at its disposal.

The motivation for the Commission and EIB to set up a credit-based finance programme for RTD projects lies in an apparent failure of the private debt market to provide loans for RTD projects (cf. p. 5ff). According to the Commission and EIB, the causes of this are asymmetric information and a lack of securities on the part of the borrower. They state that these factors lead private lenders either to abandon the idea of financing RTD completely, or to charge prohibitively high risk premiums. This market failure particularly affects potential borrowers who can offer no past statistical information as to their economic and technological performance.

At the same time, according to the Commission and EIB, there is a **strong (latent) demand** for debt financing for RTD projects. Related to this, they identify three groups of potential RTD borrowers (p. 6):

- medium-sized private companies who demonstrate large potential for growth but who are neither rated by one of the large rating agencies nor stock-exchange listed;

- medium-sized to large technology companies that, owing to (temporary) economic difficulties, are currently not assessed as creditworthy;
- *Special Purpose Vehicles (SPVs)*. These serve as legal entities for larger companies (for example in the case of RTD joint ventures) and/or for public bodies, with the purpose of carrying out combined research activities.

The RSFF is intended to close these “gaps” in the private debt market by making (additional) funds available to essentially creditworthy borrowers who engage in research in new technologies, for clearly-defined RTD projects. This will thus compensate for the scarcity or excessive cost of debt funding provided on the private credit market.

3 Assessment of the RSFF as a research policy instrument

This section discusses the usefulness and expected effectiveness of the RSFF, as assessed by the authors on the basis of the information available. The focus is placed upon four points:

- Economic justification of the instrument, i.e. the relationship between the market failure identified and the form of the instrument;
- The target group, i.e. the choice of potential benefactors of the RSFF;
- The relationship between the RSFF and FP7, i.e. the extent to which the RSFF “fits in” as a new financial instrument within FP7;
- The impact of the demonstration effect on other banks, i.e. the extent to which the RSFF can lead the way for commercial banks to commit to financing RTD projects.

3.1 Economic Rationale

The Commission and EIB cite a **market failure on the part of the private debt market** with respect to the financing of RTD projects as the grounds for the introduction of the RSFF as a financial instrument for FP7. Three reasons are given for this market failure. Firstly, such projects typically have a high probability of failure, which means a **very high interest rate**. Secondly, such projects involve relatively little investment in tangible assets, meaning that the **project lacks a source of collateral**. Finally, it is difficult for third parties to estimate how feasible the project is and how it could subsequently affect company performance, or whether they are at risk of **Moral Hazard** (i.e. **information asymmetries** exist). At the same time, the Commission and EIB work on the basis of the assumption that a large number of firms would apply for such loans to finance RTD plans. In relation to this, the following should be noted:

- (1) The main economic justification for government intervention in private RTD activities is the existence of **positive externalities**.² RTD projects create knowledge spillovers, so that third

² Cf. e.g. Audretsch et al. (2002) for an economic justification of research policy.

parties benefit from a firm's RTD activities and are able to reap part of the reward of the research. Because of this, firms' willingness to invest in RTD decreases and the volume of RTD activities in the economy as a whole is below the level which would deliver the maximum benefit to society. **Public grants for RTD activities** should compensate for their positive externalities. They shift the cost function for the company carrying out the RTD downwards. It is then possible for the company to allocate more resources to the project and/or to pursue projects with higher expected revenue, which can often be associated with riskier activities. A formal description of this is given in Appendix 1. If the subsidies are replaced by a loan (without an artificially low interest rate), the cost function shifts back up. This is because a loan of this sort, in contrast to a grant, does not have the property of subsidising the company.

- (2) **Low-interest loans** such as the RSFF raise private RTD expenditure by the amount of the subsidy (which is low). Whether or not the optimal level of expenditure is reached in this way depends on the extent of knowledge spillovers. These differ from one project to another and their extent cannot be forecast (at least at the project planning stage). Empirical studies suggest that private R&D activities entail spillovers that amount in average rather to a two-digit than a one-digit percentage rate in terms of the volume of money privately spent on R&D.³ Therefore subsidised interest would, in most cases, be an insufficient incentive for private firms to increase their RTD expenditure. The advantage of debt financing is that there is very little possibility of crowding out. This is not so for grant financing. Since grants cover up to 50% of project costs, at least a partial substitution of private sources by public money cannot be ruled out. It is extremely difficult for a programme to put together an offer of both grants and low-interest loans in such a way that there is an incentive for applicants to seek finance for projects both loans rather than by grants alone. Thus the Commission and EIB's proposal that RSFF loans only be offered instead of grants is particularly pertinent.
- (3) Nonetheless, it is important to note that when a firm takes out a loan, this has negative effects on the financial terms of any future loans it may wish to take out, because of the burden of interest. A deterioration of this sort could only be compensated for by the EIB offering interest-free loans, something which is not planned for under the RSFF. However, the Commission and EIB's argument in favour of the RSFF is not based on the existence of externalities and their compensation by a public financing instrument, but rather on the **complete lack of sources of finance** for RTD. Because of this lack, firms are not even in the position to attain the (socially sub-optimal) level of RTD activity necessary to maximise their individual gains (x^* in Fig. 1, Appendix 1), given the existence of spillovers. The lack of available finance results from the fact that firms do not have sufficient funds of their own and that private lenders will only offer credit facilities that are too small for firms to fund a project of size x^* , if at all. A market failure of this sort on the debt market affects first and foremost **small and young firms**. This is firstly because they have not yet been in a position of being

³ Cf. Hall's (1995) overview and Hall (2003) and Hall und van Reenen (2000).

able to accumulate sufficient capital stock to act as security for a loan. Secondly, the problem of information asymmetries with respect to technological and market potential applies particularly strongly to these companies, as their company history is too short to serve as a source of information to help lenders assess projects and/or estimate possible moral hazard problems. Furthermore, RTD projects tend to occupy to high a proportion of small firms' total activities (because of economies of scope and fixed costs of RTD projects among other factors). The risk exposure of the company thus changes more dramatically when RTD activity is expanded than would be the case for a large firm. This, in turn, negatively affects the company's access to debt finance.

If the justification for the RSFF's existence lay in the failure of the debt market, it would be appropriate to introduce an **instrument with a broad impact**, capable of improving the conditions under which finance is made available for the majority of small or young technology companies. However, such wide-ranging promotion of individual firms is the primary responsibility of individual governments and not of the Commission. Moreover, an instrument of this sort would fit much better conceptually into the Commission's new Competitiveness and Innovation Programme (CIP) rather than into the FP. Indeed, the CIP attaches much value to improving financing conditions for small and/or young RTD-intensive companies. This means that the economic justification of this promotional instrument with a view to its actual target group and its ranking compared to other possible approaches are yet to be achieved. In doing so, we believe it is essential to emphasise the role of the RSFF as an instrument for specific target-groups, and as a complement to existing financing programmes.

- (4) A subsidization of R&D projects through the RSFF would be advisable if two conditions were satisfied. Firstly, credit financing has to be directly related to market failure in the technology market. Secondly, an intervention on the credit market is simpler and more precise than one on the technology market in order to compensate for market failure in the technology market. This means that the RSFF should rely more heavily on the argument that RTD activities have very high positive externalities than has been the case up to now. This applies particularly to very large and risky research plans in the field of the development of new technologies. In such cases, the level of uncertainty associated with the technologies and the possible market potential are initially incalculable. But if a project is successfully carried through, it opens the door to a great amount of related innovation (also in other markets), for which the risks and costs are much lower.⁴ Private investors are sometimes prepared to take on a certain amount of the risk of such projects. An example of this is when large firms set up independent companies in which they hold limited liability interests, in order to carry out joint ventures to develop new technologies. Another example would be young, very research-intensive high-tech companies. However, the amount of private financing for such projects is often still less than the amount required to reach the optimal project size. Therefore joint financing by the government is appropriate. In this case equity financing (for example

⁴ Cf. Scotchmer (1996) and O'Donoghue (1998).

through mezzanine capital) would be more efficient than debt financing, because it offers much higher returns than debt financing if the venture is successful, in the form of a profit share proportional to the total invested. At the same time, should the venture prove unsuccessful, the losses are the same for both methods of investment (i.e. the loan is written off as bad debt or the investment minus any remaining assets is written off completely).

- (5) The need for public funding of RTD investment is high, since governments set up and maintain such RTD infrastructures as research centres and higher education establishments. These concentrate on carrying out fundamental research and maintaining the infrastructure and necessary expertise for science and technology (databases, testing methods and procedures etc.). Public investments of this kind should be financed by individual government's budgets. For infrastructures with a European dimension, however, it seems appropriate that part or all of the funding come from the EU budget. The decision as to how much is to be funded by debt rather than current revenue has less to do with research policy than with financial and budgetary considerations.
- (6) The primary assumption of the Commission and EIB is that there is a market failure on the supply side, in that banks do not offer debt financing for RTD projects (or at least not with affordable conditions). However, it is also possible that there is a market failure on the demand side, in other words companies hold back from making any demand for RTD loans. The reason behind this would be that if a RTD project fails, repayments on the loan would encumber and possibly even threaten other business activities. This could have negative effects on the firm's continuance. The greater the proportion of the entirety of a firm's activities is devoted to a high-risk project, the more relevant this becomes. Because of this, smaller companies tend to be the ones to always finance RTD projects from their own reserves or cashflow, in order to avoid potential negative consequences of unsuccessful RTD activities for normal business operations. A formal representation of this argument can be found in Appendix 2.

This presumed low demand for loans to finance RTD activities on the part of SMEs that carry out research, together with the nature of what is already on offer in terms of public loan programmes for SMEs on both the national and EU level, would be an argument for the RSFF to be focussed on medium to large companies. Several sections of the Commission and EIB's discussion document reflect this. It should then be made abundantly clear, however, that the RSFF is not a suitable instrument for promoting RTD in RTD-intensive SMEs.

We argue that the economic reasoning for the introduction of the instrument RSFF should refer more to the need for public funding for certain RTD activities and make less play of the debt market failure with regard to the financing of RTD projects. Doing so would better reflect the characteristics and aims of the RSFF and avoid false expectations on the part of the establishments that carry out RTD and of politicians. At the same time, it seems necessary to broach the issue of the relationship between the two forms of market failure mentioned above and

to explain the reasons why an intervention in the debt market is more effective than one in the technology market.

3.2 Target Groups

In the information available to date from the Commission and EIB about the RSFF, there appears to be a discrepancy between (a) the target group implied by the reasons given for the existence of the instrument, (b) the conditions potential borrowers must meet, as per the available information as to the design of the RSFF and (c) the concrete examples given of possible borrowers under the RSFF (cf. p. 9ff):

- (a) As mentioned above, the thesis of a market failure on the private debt market in the provision of debt finance to RTD projects primarily applies to small and young companies. This is because the information asymmetries between company and bank are the greatest in these cases and it is very common for the firms to lack the necessary securities. The Commission and EIB's typology of firms that are most acutely affected by the inability to satisfy their demand for loans for RTD projects (privately owned medium-sized companies that are growing but not rated or listed, medium to large companies experiencing temporary economic difficulties and SPVs with limited available capital, for which the parent companies bear only limited liability) only represents a small sub-group of the firms potentially affected by a lack of access to debt finance provision. The RSFF proposal suggests focussing on this group. However, on the sole basis of the market failure identified, this should by no means be a foregone conclusion.
- (b) In practice, the RSFF is actually intended to help finance **large RTD projects and RTD infrastructures** that have come into being as a result of FP7 or other European initiatives (Eureka, technology platforms, EIB i2i projects). What these projects have in common is that they mostly involve large consortia, usually including large companies, that they are dedicated to new technologies, the current stage of development of which means they are far from being market-ready, and that project costs are usually high, totalling several million Euro. The main obstacle preventing such projects from receiving finance seems not to be the debt market failure already mentioned, but rather the basic lack of private funds to finance investments that have very high positive externalities or have the properties of public goods. The latter applies particularly to RTD infrastructures that are oriented towards basic research or maintaining the science and technology infrastructure.
- (c) The examples given by the Commission and EIB of firms for which the RSFF would be suitable (p. 9-11) only partially fit into the target group described in (b). The first two examples (1 and 2, p. 9-10) highlight the fact that innovative companies that have a high potential for innovation and a positive market position are subject to financial restrictions on the private debt market. However, these financial restrictions do not apply to a specific RTD project, but to the firm as a whole. It would be necessary in each individual case to assess

whether the fact that no loans are on offer for such companies actually leads to loss of welfare (and thus necessitates state intervention), or whether it in fact represents an efficient allocation of scarce credit resources. In any case, it is not clear how the demand for financing on the part of the two companies mentioned could be met by participation in an FP7 project or via other channels (Eureka, JETI etc.). In both of the examples given, the firms are looking for a source of financing for the continuation of their RTD activities in general. It seems infeasible to us for medium-sized or large firms to formulate the entirety of their RTD activities as FP7 projects and submit them for joint financing, particularly considering that almost every company, the bulk of RTD activity is rather applied and market-oriented. This limits the extent to which it is suited to being carried out within a cooperative framework. The third example, on the other hand, fits the requirements for projects under the planned RSFF very well.

We agree with the Commission and the EIB that the projects described in section (b) can be a meaningful target group for EIB loans. However, it appears to us that the **orientation towards SMEs** mentioned in the reasons given for the RSFF and to which a section of the discussion document is devoted (p. 13-15) **will not lead to the desired results**, for several reasons:

- In the case of FP7 projects as well as projects outside of the FP that are in the interest of the community and thus relevant for the RSFF, research in large consortia over a long period takes centre stage. In contrast to this, the vast majority of SMEs who carry out research need financing for **individual plans**, mostly with a much shorter time frame (typically between 1 and a maximum of 2 years).
- The administrative costs that result from the restructuring of an RTD project often necessary in the case of debt financing (cf. 3.3) would be particularly high for SMEs. This is because a FP7 project can constitute a significant part of a small company's business activities, so that the costs of conceiving the project make up a relevant proportion of the SME's total costs. In addition to this, costs accrue when the lending bank carries out a credit check on the SME and there are further monitoring costs.⁵
- Aside of this, it is reasonable to assume that taking part in a FP7 project would only be attractive to a SME if coupled to a grant or heavily subsidised interest rate, given the high costs incurred in preparing a proposal. We therefore assume that only a small number of SMEs would apply for debt financing of their RTD plans within FP7. Because of this it is important to verify with a critical eye whether or not setting up global loan facilities for commercial banks is an efficient way of providing SMEs with RSFF loans. To avoid unfair treatment of SMEs in individual member countries, **global credit agreements** would have to be set up in such a way as to **guarantee reaching SMEs throughout Europe**. The administrative costs of this would be high. There is no value in doing it if only a small

⁵ These checks could only be omitted if the SME already banks with the RSFF lender bank. For this to be possible, the EIB would need to agree a global loan agreement with all commercial banks in Europe whose clients include SMEs. This would be inefficient, because of the high costs involved.

number of applications come from SMEs. The same is true of a central administration of applications, through a “special SME desk” in the EIB or similar (see p. 15). This would bring high fixed costs, the payment of which does not seem justifiable if SMEs only make a small number of applications. The fact that additional transaction costs are incurred if loans are administered centrally (compared to administration through commercial banks) should also be taken into consideration. The source of these costs is the close interaction between the EIB and the individual SMEs required to assess the firms’ creditworthiness, compounded by the fact that the EIB has had no history of conducting business with the companies on which to base an assessment. It would make more sense in these cases to link the instrument RSFF to existing national credit programmes for innovation.

Owing to these considerations, it would initially be better to avoid defining SMEs as a target group for the RSFF. Given the EIB’s experience up to now in providing debt financing for RTD projects⁶ and given the EIBs current administrative structures, the most efficient course seems to be to focus the RSFF on large research projects and RTD infrastructures. If the instrument proves its worth, it will be possible at a later stage to expand its usage and test it out on other project types and thus other groups of borrowers.

3.3 The relationship between the RSFF and FP7

The information available to us leads us to conclude that the planned RSFF is not an integral part of FP7, in that the RSFF does not have equal status as a financing option (compared to grant financing) for FP7 applicants. Instead, FP7 applicants whose applications have been positively evaluated, but who cannot receive a grant because of a lack of funds, are to be offered the option of financing their project through the RSFF. Seen from the point of view of the low acceptance rates in FP6, this appears, at a first glance, to be an attractive prospect. However, this model has several implications which put the “attractiveness” of the RSFF in a less promising light:

- (1) The FP7 projects for which financing under the RSFF is envisioned were developed and defined with the determining factor of a proportionate amount of funding from the EU in mind, in the form of a grant. As shown above and in Appendix 1, if these projects then receive debt financing, even with subsidised interest, the cost function shifts, changing the optimum project size and project risk. It is highly probable that RTD projects for which applications have been made will have to be **restructured if they receive credit financing**. As a rule, this will also have the consequence of changing the content of the project itself (aims, methods, resources used, cooperation partners, level of technology, market positioning of the product to be developed).

⁶ According to an EIB list on project financing under the SFF from 2000 to mid 2005, the average volume of an EIB loan for RTD and innovation projects in industrial enterprises stood at around 70M € (87 projects in total, maximum value 700M € ZEW calculations; see list of projects in the Appendix 3).

- (2) FP projects involving firms are very often planned and carried out as collaborative projects together with partners from public research institutions (so-called collaborative R&D projects). For many public research institutions, financing research through loans is either out of the question for legal reasons (namely that a loan may not be taken out to cover current costs, while research primarily implies such type of costs, e.g. staff and materials) or is a highly unattractive option because of their working and financial structures.⁷ If no grant is available for a positively evaluated collaborative project, it is very likely that public research institutions will decline to take part in the project. In this case, **only those parts of the project that are accounted for by the partners from the business sector** are subject to debt financing. It is extremely improbable, in a case where the contributions to the project content that the public research institution was to make are withdrawn, that the parts of the project allocated to firms could be carried out without alteration (if this were to happen, it would beg the question of what the use was of carrying out the project as a collaborative project). Because of this – along with the effect of the different form of financing – it is to be expected that the firms involved reformulate their RTD plan.
- (3) At this point it becomes questionable whether the evaluation of the project content that took place as part of the total evaluation process for FP7 is still relevant for the reformulated project. Moreover, the project content was evaluated on the basis that the project would receive a grant and not a loan. This can have further effects on the assessment of the project's eligibility for financial assistance. It is likely that a **new assessment of the project content would be necessary** to establish its eligibility.. If, on the other hand, it is decided not to reformulate the initial project in order to avoid a new evaluation – although new evaluations do not form part of the Commission and EIB's current plan – the basic effectiveness of the RSFF would be called into question.
- (4) Making use of the RSFF as a source of financing means additional costs for the applicant and can also lead to lower returns. For one thing, redefining the RTD project requires additional resources. Additionally, the **project is delayed** with respect to the time-frame that was planned on the assumption of a grant under FP7, meaning a later project start and later final results. This can make for lower returns, if competitors introduce similar solutions or products in the meantime. Time is often the crucial factor in determining the economic success of an innovation. This applies particularly to smaller companies, who can balance out their competitive disadvantages compared to larger firms by being able to react more quickly to market and technological developments. Thus it is doubtful whether a large number of applicants are prepared to take on the extra costs and lower expected returns involved in accepting a loan if a FP7 grant is refused. This argument, too, supports concentrating on funding long term projects in medium to large RTD-intensive companies.

⁷ Scientific establishments are almost always non-profit organisations. Their income is typically composed of institutional funding and funds raised to carry out specific projects. If they take out loans to fund their research, it is not clear with what means they should repay them, since the returns on fundamental research are none in the short and medium-term and, because of the high amount of spillovers, low in the long term.

(5) Financing a project on credit may also make new demands on the **legal structure of the consortium**, for example with respect to the stipulation of liability in the case of a partial project failure. This also applies when a SPV is set up to act as borrower. Additional fixed costs can result that are all the more burdensome, the smaller the company is. If the consortium consists of a SPV owned by several large companies, it seems natural to ask why it is that the companies behind the SPV are not willing to cover the SPV's risks more thoroughly by means of bonds and similar. It then seems likely that a self-selection process will automatically favour projects with an unfavourable risk-return structure, so that the RSFF ends up focussing on such projects.

There will be a **considerable time-lag** between the implementation of FP7 and the financing of RTD projects under the RSFF. This results from the fact that the Commission must first reach a decision as to which FP7 project applications from the first call will receive grants, before applicants for whom no grant is available can be informed of the availability of a loan under the RSFF. Once the applicants have been thus informed, time must be allowed for the (likely) alterations to project content to fit the modified financial conditions, the possibility that a new assessment of the project content will be necessary and the need to check the creditworthiness of the project, that is to say of the firms and establishments wishing to act as borrowers. Only after this would it come to actually granting a RSFF loan. It therefore seems very unlikely that a significant number of FP7 projects will be financed under the RSFF in the first few years of FP7's lifespan.

Part of the attraction of the RSFF lies in its leverage effect, as well as in the use of repayments (including interest) for **revolving financing**. These factors enable the co-financing of a far greater volume of RTD activities than could be financed through grants using the same FP7 funds. However, the revolving financing will only come into effect after the end of FP7. Alongside the delay in the RSFF getting started – at least in financing FP7 projects – the average term of a loan, at 5 to 10 years, must be taken into consideration, along with an grace period of around 1 to 3 years, depending on the project. Therefore large inflows of funds from loan repayments, that could be used to grant new loans, can only be expected at the end of FP7. This means that FP7 funds are being used to create an instrument, the full economic effectiveness of which (i.e. its revolving nature) will first unfold in the subsequent budgetary period.

To guard against a situation where the full effectiveness of the RSFF only appears after a long delay, the Commission and EIB could make efforts to launch the instrument at the same time as FP7 and to **use it in the initial years mainly to finance projects outside of FP7**. This would mean that the funds taken from FP7 for the RSFF would initially be used to cover risks of projects outside of FP7. If the RSFF were used extensively to fund such projects in the initial years, circumstances could arise where the availability of EIB loans under the RSFF for FP7 projects would be limited in later years. Such circumstances would arise if some of the projects failed, with the result that FP7 funds would have to be consumed to cover the loss. To prevent

such a situation, the Commission can use its right of veto over the granting of loans within the framework of the RSFF.

In view of the different time-frames involved in putting FP7 and the RSFF into action and the presumably high demand for RSFF loans from projects outside of FP7, it seems questionable to couple the RSFF closely to FP7, at least in the form in which the RSFF is laid out in the draft document under discussion. Such a close relationship between the two would be appropriate if

- (1) the RSFF is an attractive financing option for applicants as compared to a grant, so that projects are conceived from the outset with credit financing in mind. An incentive to choose the option of a loan would be necessary, such as the availability of a much larger sum to finance a project. Whether this is practicable and compatible with the design of FP7 seems questionable, and should be separately verified;
- (2) Use of the RSFF is restricted to fixed project types within FP7, for which RSFF financing is offered as the only, or primary, option (e.g. large RTD investments in fixed capital within the framework of FP7 projects or the construction or expansion of public RTD infrastructures).

In the model suggested in discussion document of 28/07/2005, the RSFF only comes into use as a secondary option to a grant (i.e. when no grant can be allocated to a positively evaluated project because of a lack of funds from the budget). This promotes the expectation that the RSFF will only play a peripheral role in FP7. In contrast to this, projects conceived outside of FP7 can be expected to take on more relative importance. This should not be seen as a bad thing. In fact, it is a sign of a “division of labour” between the various programmes and initiatives at EU level, in order to reach the common goal of strengthening Europe as a site for research and increasing expenditure on RTD (the Barcelona objective). Projects that can be productively joint-financed by means of the instrument RSFF are often part of initiatives outside of FP7.

The Commission proposals of the 21st September 2005 for a council decision on FP7 implicitly assume the integration of the RSFF in FP7 as described in the second variant above, in that they only refer to the RSFF being used for large European actions that require a combination of financing methods including loans (joint technology initiatives, large collaborative research projects, new research infrastructures and other large projects, such as Eureka projects).

We find that it would make sense in the context of the introduction of the RSFF to **clarify** whether it is primarily intended as an **instrument to finance FP7 projects** or as a financial instrument to promote **private (and public) RTD investment in Europe in general** (and in particular in medium-sized companies). In the first case, it would seem appropriate to focus on particular types of projects and to integrate the instrument firmly within FP7. In the latter case, the relationship between FP7 and the RSFF is essentially limited to the origin of the EU funds used to cover the additional risk of default taken in providing debt finance to very high-risk projects. Whether these funds are taken from the FP7 budget or from other EU budgetary lines seems of secondary relevance to us. The question should certainly not be allowed to complicate the handling of the RSFF, as would be the case for example if great pains were taken to finance

as many FP7 projects as possible via the RSFF, even if these projects are less well-suited to being promoted (in terms of their expected effects on the economy as a whole, for example) than other available projects.

Based on the characteristics of the RSFF, it seems logical to try out linking it with the new CIP. Both the orientation towards the capital market and the fact that debt instruments are more appropriate for use with individual companies' projects mean that the goals and structure of the RSFF are much closely linked to those of the CIP than those of the FP. The RSFF could even be used as an additional source of financing outside of the FP and CIP and still achieve its aims. In this case, the additional funds necessary could be obtained by increasing the EIB's equity.

3.4 Demonstration effect for the commercial banking sector

The Commission and EIB expect the RSFF to have the important "side effect" of triggering learning processes in the loan business. The RSFF is meant to show that it is practicable to provide debt finance for RTD plans that have insufficient available collateral at their disposal, or none whatsoever. The intended consequence of this is that lenders increase their willingness to provide loans for high-risk and unsecured projects, i.e. that they diversify their risk portfolios to include more risky projects (p. 25). The following should be noted with respect to this idea:

- (1) Commercial banks already offer finance to RTD-intensive companies under certain conditions. Indeed, it is for the very projects that form the potential target-group of the RSFF (at least in terms of the volumes of debt), that financing is on offer from commercial banks. Such projects include wide-ranging projects undertaken by large firms (within the framework of JETI; for example), investment in RTD laboratories or in the development of new products with promising market potential and investment in RTD infrastructures. In these cases, the commercial banks stand to learn little from the example of the RSFF. If commercial banks do not offer loans for such projects, or are only prepared to lend insufficient funds, this is primarily due to their negative assessment of the chances of success and of the expected returns. It is not apparent to what extent the example set by the RSFF is supposed to lead to a fundamental change in such judgements.
- (2) The credit market failure in the field of financing RTD in firms primarily affects small and young research companies. The reason that commercial banks do not offer loans to this sector lies not only in the high probability of default and the lack of collateral, but also in the low or even negative expected returns if the project succeeds. To assess the creditworthiness of the project and avoid moral hazard effects, the lender must incur relatively high expenses for screening and monitoring, as well as ensuring they maintain a mass of technological and market-specific knowledge. At the same time, the volume of such loans is generally low, so that even when the interest rates charged are high, the bank's expenditure often exceeds its income. It would therefore be necessary for banks to specialise in specific market and technology segments with the group of SMEs that carry out research, in order to reduce fixed

costs. This, in turn, would require the companies' demand for loans to be grouped and directed towards the appropriate specialised commercial bank. In reality, however, SMEs often turn to their house bank or to their regional banking system. The interposition of these banks (as intermediaries, who transfer the demand for credit to the appropriately specialised bank) causes two problems. Firstly, it creates high transaction costs. Secondly, it brings the problem of adverse selection into play, in that the intermediary banks only pass on the particularly high-risk companies and service those with a better level of risk themselves.

- (3) The successful implementation of the RSFF could contribute to the development of a specialised banking sector of this sort, by gathering and passing on experience of the screening and monitoring of such projects. However, the planned structure of the RSFF leads us to expect that SME-specific demonstration effects of this kind will be marginal, since the importance of SMEs as recipients of EIB loans financed under the RSFF will only be minor.

It is difficult to estimate what demonstration effect the RSFF will actually have on commercial banks. Even if we can assume that the example of the RSFF will have some effect, this seems to us to be too small on its own to justify introducing such an instrument.

4 Conclusion and Recommendations

This section answers the three central questions that the BMBF (Federal Ministry of Education and Research) contracted the ZEW to answer, based on the above analysis. In addition, some points are raised that would require consideration as part of the preparation for the introduction of the RSFF, as and when this may occur. The central findings of this appraisal are summarised in the form of recommendations for the introduction of the RSFF.

4.1 Utility of the RSFF as compared to FP7 grants

The central **market failure** lies, in our opinion, with the existence of positive externalities (knowledge spillovers), owing to which a firm that carries out RTD activities can only lay claim to a part of the benefit they generate. As a result, firms invest less in RTD than would be necessary to maximise the benefit to society. **Subsidies for private RTD activities** have proved their worth as a research policy instrument to compensate for these externalities. As an additional instrument, **exclusive rights of use of the RTD results** (intellectual property protection) are often granted for a limited period. This instrument can be critical for legal reasons, when it affects patent or trademark rights, which should be allocated to certain owners. Any interference with these rights would have to be covered by separate contractual agreements. **Debt financing alone**, on the other hand, is **not a suitable** way of raising private RTD expenditure to the level required to maximise the benefits of RTD for society. This is because it lacks the element of subsidisation that is necessary to achieve this aim (cf. Appendix 1).

Aside of these basic arguments, debt financing under the RSFF in the manner suggested, i.e. as a secondary alternative to a grant, is also unsuitable for a number of FP7 projects because of their complex structure. As a rule, FP7 projects involve the participation of several firms and several public research establishments from different member countries. Debt finance is usually not an option for public research establishments, as they are not permitted to take out loans to finance running costs or are possibly not seen as creditworthy. Problems also arise in the case of a consortium of companies. If a joint research project that had applied for FP7 funding is then financed by means of a loan instead of a grant, additional costs will presumably be incurred and the project delayed (because of the need to address the question of liability in the case of partial default and/or possibly set up an SPV to act as borrower).

For these reasons, we view the RSFF as an unsuitable form of financing for the majority of FP7 projects. In terms of achieving the research policy objective of raising private RTD investment to the level which would most benefit society, the RSFF displays some disadvantages compared to the current practice of awarding non-repayable grants.

Nonetheless, financing under the **RSFF would be suitable for certain types of RTD projects** with a European dimension. These are projects where large investments are involved, but commercial banks are only prepared to loan a limited amount and the availability of finance from other sources (from within the company itself) is also limited. An example of this would be **projects to develop completely new technologies within the framework of an SPV** in which large firms – and potentially also public research establishments – hold a stake, but are only willing to take a limited amount of risk, which is under that required for the project to achieve its optimum size. Such cases may involve fundamental technologies, which cause extensive spillovers and from which no or only small direct returns are expected.

Even for such types of project, there is no automatic guarantee that debt financing backed by public money is the most efficient form of financing to ensure that the optimum level of RTD expenditure is reached. Thus in the example given involving an SPV, public co-financing would only seem appropriate if the firms involved did not stand to dominate the market for the products manufactured on the basis of the new technology developed. The „monopolisation“ of future markets would seriously reduce the benefit to society, both because of the way the resulting market power would be exploited and because of the low level of spillovers (only spillovers that affect other markets would still be relevant). This is typically more likely to affect research joint ventures that are close to the market both in terms of time and in the fact they are developing a directly marketable product. In these cases, an agreement concerning the use of the technology by those not involved in the project should be reached when the loan is granted and set down as general conditions. Here, again, the problem of adverse selection arises, in that firms only apply for co-financing under the RSFF for projects with a low chance of success, and finance projects that have good prospects with their own funds.

In our view, the usefulness of RSFF as an alternative means of financing to grants for FP7 is limited to the types of project described above. We do not expect a significant demand for RSFF loans from the majority of FP7 projects (collaborative research within large consortia). This expectation is based on conceptual considerations. It would also be possible, in an experimental phase, to empirically test how high the actual demand is and from which projects and borrowers it comes. To do this, applicants whose FP7 applications have been positively evaluated, but cannot be awarded a grant because of lack of funds, can be offered a loan. This is notably the procedure the Commission and EIB suggest in their draft document. Nonetheless, expectations of the effects that could be achieved in this way should be kept low.

4.2 The potential of the RSFF to facilitate access to the funds available under FP7

In hitherto existing FPs, there have always been a large number of cases of projects with positively evaluated content that were nevertheless unable to be financed by FP grants because of the lack of budget funds. The programme administrators have to address the question of how the scarce programme resources can be used to the greatest effect possible with respect to the aims of the FP, namely strengthening the scientific and technological basis of the economy as well as its international competitiveness, and promoting research activities that support other EU policies. In the RSFF, an instrument is proposed that makes it possible to finance a greater volume of RTD activities with the given FP7 funds than would be possible by grants alone. However, this expansion of the available financial resources does not bring with it a general increase in firms' access to FP7 funding:

- Up to now, FP funding has been of interest to firms because it has come in the form of a grant, which directly increases earnings, thus sinking the costs of an RTD project and – ceteris paribus – raising the firm's cash-flow. Debt financing, on the other hand, increases a firm's liabilities and does not lead to earnings. In fact it increases expenses in later periods, through interest payments. Furthermore, firms are likely to incur additional administrative costs if they receive a loan for a project for which they applied for FP7 funding. Assuming that the attraction of FP7 funding for firms lies in the fact that it comes in grant form, the **RSFF does not offer firms improved access to FP7 funds.**
- Nevertheless, the RSFF could improve access to external capital for firms and establishments that wish to take out loans to finance RTD projects, as long as the credit market failure assumed by the Commission and EIB actually is primarily on the supply side and the planned research fits the criteria for support (i.e. has a European dimension). This should hold true in at least some cases. The examples given by the Commission and EIB, along with general considerations as to the financing of different project types, suggest that demand for such loans comes primarily from **individual** companies undertaking projects that are conceived to be **application-oriented and close to the market**. Such projects are normally not eligible for FP7 support because they are generally not conducted on a collaborative basis. Nonetheless, it

is very possible that just such a demand for financing arise in individual firms or establishments following their participation in projects supported by the FP or another European initiative. It makes sense to have a public financing instrument such as the planned RSFF for such projects, given the assumed credit market failure. To reach its target group as effectively as possible, however, the RSFF should be set **outside the FP**.

The RSFF would then satisfy the central points of the January 2004 proposal by the KfW-Expert Group „Investment finance“ for the introduction of a „soft loan“ for follow-up projects to RTD conducted with the support of the BMBF Thematic Programmes.⁸ The central remaining question for the RSFF would then be that of the “European dimension” of the projects, which justifies the involvement of the EIB rather than action on the part of than individual member states. This would have to be verified on a case-by-case basis.

4.3 Contribution of the RSFF to covering SMEs’ demand for financing for RTD projects and the role of commercial banks as agents

The RSFF seems to us unsuitable for improving the financing options for SMEs’ RTD plans:

- **Loans are unattractive to SMEs** as a financing instrument for RTD projects. The reason for this is that if the project fails, the company’s other activities are put under heavy pressure, possibly threatening the company’s very existence. A much more suitable way to stimulate RTD among SMEs is to strengthen their cash-flow and/or equity⁹ The former can be achieved by grants or tax subsidies on RTD expenditure. The latter can be increased through forms of financing similar to the use of equity (mezzanine capital) and by external investment (venture capital). In the available Commission and EIB documentation, forms of financing similar to equity are not mentioned in the context of the RSFF as a financing instrument for SMEs. Instead, the discussion centres on loans backed by EIB global credit lines, which would be offered to SMEs through commercial banks or other intermediaries.
- The procedure proposed for granting RSFF loans within FP7 seems to us to be **too protracted and laborious** for SMEs. It is vital for SMEs to be able to implement RTD projects swiftly, in order to get the best possible headstart in the competition against large firms. A delay of about two years is to be expected between the development of an idea for an FP7 project and finalising an EIB loan under the RSFF (for the formulation of a project proposal within a consortium, Commission approval, the Commission explaining to the firm that no grants are available due to lack of funds but that a loan could be available, reformulation of the project with a view to debt financing, EIB checks for creditworthiness

⁸ Cf. KfW Bankengruppe (2004, 14-20).

⁹ Cf. Rammer et al. (2005) for their calculation of the positive influence of an increase in equity on both the likelihood of SMEs to carry out RTD and the intensity with which they do so.

and possibly also the eligibility of the project content and finally the negotiation of the loan agreement itself).

- For SMEs, the **costs associated with the application procedure** are of particular importance. Firstly, SMEs rarely have separate resources to conduct such applications, so resources must be diverted from operational areas for the purpose. Secondly, the application costs can easily reach a significant proportion of the firm's total costs. The procedure proposed for granting loans to SMEs involves comparatively high costs and therefore seems to offer little to attract SMEs. This is particularly true in the likely event that an RTD project has to be redefined and additional agreements reached among the participant firms and establishments, when the project is financed by a loan instead of a grant. The costs incurred by the EIB as lender should also not be underestimated, given the typically small size of projects in SMEs and the relatively high costs related to granting and monitoring the loan.
- Only in exceptional cases are SMEs likely to participate in the types of project that are best suited to RSFF financing (see section 4.1).
- If SMEs are only permitted to use the RSFF indirectly through commercial banks, it could create distortions on the capital market which would disadvantage them against large firms. Thus access to loans is more difficult, or associated with higher costs. Further measures would be necessary to compensate for these disadvantages. Looking into such measures falls outside of the scope of this study. In any case, the RSFF should be judged within the context of all possible sources of financing for RTD in SMEs, so that the existence of distortions of competition alone limits the suitability of the RSFF as a financing instrument for SMEs.

This assessment of the importance of the RSFF as a financial aid to SMEs should not mislead the reader into doubting the very real importance of government measures to counteract the SMEs' difficulty access to external capital (caused by a lack of collateral, highly asymmetric information due to a very short firm history, or limited initiative of private investors to invest into early stages of firm development). Such measures, however, should not concentrate on credit financing RTD that aims at basic research, but rather on (a) financing innovation activities and investments that are near to the market and (b) financing companies as a whole in the early stages of their development.

The **role of commercial banks as intermediaries** if the RSFF does indeed include SMEs as a target group seems to us to be largely unproblematic in the form suggested. The central problem of adverse selection, which can often arise when intermediaries are used on the credit market, only plays a small part in the case of RTD projects and research-intensive SMEs. This is because the high risk of default and high loan processing costs lead commercial banks to refuse to offer loans or to demand interest at a rate far above that for an EIB loan. The latter is all the more true since Basel-II, under which the individual risks of single projects and/or firms come into the interest calculation.

However, it seems to us that involving commercial banks is of little use, because of the high administration costs implied. These result from the fact that broad access to the instrument RSFF for SMEs must be guaranteed to avoid discriminating against individual SMEs. It seems doubtful to us that this can be achieved by making global loan agreements with one or only a small number of commercial banks in each member country. In any case, the high administrative costs on the EIB's side make for a stark comparison with what will presumably only be a low demand for loans from SMEs.

A further point, which at present appears to have been ignored in the Commission and EIB's discussion document, is the possibility of a disparity in the timing of credit decisions within a single project. This could occur in cases where several SMEs from different member countries are involved in a FP7 project and apply for RSFF loans. The applications would apparently have to be made in each country to the commercial bank responsible for transacting RSFF loans. If the various banks process the applications at different speeds, an additional delay for the project can result. It would also be necessary to decide what should happen if some of the SMEs participating in the FP7 project are granted RSFF loans, but others refused because of their lack of creditworthiness. Since this is likely to have repercussions on the way the project content is organised, which will affect all of the project partners, it is possible that the project would have to be redefined and the loan subsequently renegotiated. All of this would raise costs for all of the participants and delay the project further.

4.4 Useful further Information about the RSFF

The planned RSFF is an innovation in the field of research policy instruments. The introduction of innovations in any field, including politics, is plagued by uncertainty and calls for flexibility and the willingness to experiment. Thus, at the present time, it is neither to be expected nor to be demanded that a fully developed concept for the practical implementation of the RSFF should yet exist. Many questions relating to finer points will only be able to be answered in the implementation phase. Furthermore, a number of issues can only be decided on a case-by-case basis, such as the concrete form of the loan agreements and questions of liability. In the following we will briefly discuss some general aspects of the implementation of the RSFF, which we consider to be of importance for the functioning and of the instrument and for the sort of effects it may have. If the RSFF is introduced, these points will need to be addressed.

- *Loans versus guarantees:* The Commission and EIB draft document under discussion works on the basic assumption that EIB loans should be used. However, it would also be possible to achieve the desired effect of expanding the volume of RTD projects financed using FP7 funds by granting guarantees to commercial banks. This would remove the main obstacle cited for commercial banks granting loans for RTD activities, namely the lack of collateral. In the right circumstances, giving guarantees would be associated with low administrative costs.

- *Employing commercial banks to administer loans for projects requiring less than 12,5m €:* The Involvement of commercial banks to grant small and medium-sized loans to firms, funded on the basis of global lines of credit made available by the EIB to individual banks, raises the issue of adverse selection. In such a model, commercial banks have an incentive to finance loans to firms with a bad credit rating through the government funds available and firms with a good credit rating (i.e. high securities in the case of default) using the bank's own funds.
- *The EIB's relationship to other creditors:* Where does the EIB stand as compared to other creditors if a firm goes bankrupt? Does the EIB offer subordinate debt, for example? If so, a loan in this form would be far less of an obstacle to a firm taking out further loans, in the context of the Basel II guidelines, than a secured loan with a commercial bank would be. Waiving the requirement for securities, as is the case with so-called "soft loans", would not serve as an example to commercial banks, but would only make it easier for firms to secure additional loans. This form of loan is not mentioned in the available documentation.
- *Form of financing:* Within the framework of the SFF, the EIB has numerous financial instruments at its disposal (loans, subordinated loans ("Nachrangdarlehen") and other forms of mezzanine capital, guarantees, project-specific derivatives etc.). Which forms of financing should be used for the RSFF, and should particular financial instruments be favoured (e.g. mezzanine capital)?
- *Credit term, modes of payment and repayment:* What should be the term of the EIB loans? Is it planned to make partial payments (for example to limit moral hazard)? How long should the grace period be?
- *Project risk:* What assumptions are made about the level of project risk and its distribution over time?
- *Project monitoring:* In what ways are the credit-financed projects to be kept under observation on a running basis? How high will the costs be for this and who will bear them?

4.5 Recommendations

The proposed RSFF is an innovative instrument which has the potential to improve financing conditions for certain types of RTD projects. Like every innovative measure, the RSFF brings with it uncertainties as to its concrete form and implementation, as well as in terms of its effects and success. Suggestions and recommendations for modifications to the RSFF as it is currently conceived have been made at various points in the evaluation of the initiative. The recommendations we believe to be the most important are summarised in the following points:

- (1) The RSFF should be **focussed on the types of project** cited in section 4.1 (i.e. large investments in RTD projects with a European dimension), for which commercial banks only offer limited credit and there is limited access to other sources of finance (from within the

firm itself). These are exactly the types of project mentioned by the Commission in its proposals of the 21st September 2005 for a council decision on specific programmes within FP7. At the same time, it should be noted that debt financing under the RSFF is not appropriate for every RTD project that falls into one of these types, but that the limitations stated in section 4.1 (among others) should be taken into account. When it comes to financing such projects, no difference should be made based on whether they originated in FP7 or as a result of other initiatives (e.g. EUREKA or technology platforms).

- (2) The introduction of the RSFF as a new research policy instrument need not be within FP7. Alternative options would be to couple the RSFF to the CIP or to use the RSFF as a specific financing instrument within the framework of the EIB's SFF. Thus it is not obligatory that FP7 funds be used to finance the RSFF. A plausible alternative means of financing would be through the EIB increasing its own equity .
- (3) The nature of the RSFF is such that, in our opinion, it would be better placed outside of the research framework programme itself. Nevertheless, taken as an **experimental phase**, the RSFF could be offered as a financing option in certain programme areas of FP7, to gauge how high the demand for debt financing for FP7 projects is and from what clientele it comes. To this end, it would be necessary, in our view, to equip the RSFF with only limited financial resources. For one thing, it would provide a thorough demonstration of the high level of insecurity concerning the effectiveness of the instrument. Furthermore, the desired information as to who would typically apply for financing through this instrument would be known as soon as the applications came in, or at the latest when a small number of the projects were implemented.
- (4) In the model proposed in the draft document of 29/07/05, the RSFF would only be offered to projects whose applications have been positively evaluated but who could not be offered grants because of the scarce budgetary resources of FP7. **This model should not be pursued.** It would bring additional costs to the applicant, delay the implementation of the project and lead to high administrative costs.

The RSFF should **abandon addressing SMEs as a target group**, as it would be an unlikely exception for the financing requirements of an SME (according to the EU definition of the term) for RTD activities to be able to be met within the framework of projects with a European dimension. In fact, the main need is for smaller loans for non-collaborative projects that are close to producing a marketable product. This also means abandoning the idea of offering global lines of credit to commercial banks.

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6 Appendix 1: Financing Structure and Project Size

In this section we will show how different financing structures affect project size. The effects hold under quite general assumptions making them robust in spite of the abstract model framework.

Let x denote project size. This may represent the number of persons involved in a research project or the number of working hours. Project size includes office facilities, equipment, and office supplies. If we assume that the choice of project size affects all factors in a similar way, it will be appropriate to concentrate on a single factor. We assume that the expected revenue $E(x)$ and the cost $C(x)$ depend on the project size.

Positive but decreasing marginal productivity implies a concave revenue function $E(x)$. Hence increasing the project size by one additional unit increases the revenue by a positive increment, but the increment becomes smaller for larger projects. An explanation may be found in the fact that the effort required to coordinate a team increases as the team size grows.

We can assume a weakly convex cost function. This means that extending the project size by one additional unit causes higher additional costs the higher the project size already is. In contrast to strong convexity, the present case includes constant cost for every increment to the project size. The upper graph shows the shape of these functions.

A firm maximizes its profit. This is the difference

$$\pi(x) = E(x) - C(x). \quad (1)$$

The first order condition is

$$E'(x^*) = C'(x^*). \quad (2)$$

Due to the properties of the revenue and cost functions this condition determines a unique project size x^* . The size of the project is chosen such that extending the project by an additional unit of x would not be profitable because the additional cost would exceed the additional revenue.

Firms are only concerned about their own profit. Since R&D projects typically create positive external effects (spillovers), third parties benefit from the firm's activity.¹⁰ This means that the social benefit exceeds the revenue of the investing firm. If $S(x)$ denotes the spillovers as a function of the project size, then

¹⁰ In economics the discussion on external effects was incited by Coase (1937). The distinction between technological (the present case) and pecuniary external effects was introduced by Scitovsky (1954). These concepts have become essential elements of well-established textbooks, e.g. Cullis and Jones (1992) or Mueller (2003). One

$$S(x) + \pi(x) = S(x) + E(x) - C(x) \quad (3)$$

describes the social benefit from a research project of size x .

The expression includes the benefit to third parties, the revenue of the firm, and the cost of the investment to the firm. The upper graph shows that the function of the social benefit lies above the revenue function. The condition for the maximum social benefit is

$$S'(x^o) + E'(x^o) = C'(x^o). \quad (4)$$

x^o denotes the socially optimal project size. We can show that $x^o > x^*$ holds, i.e. that a firm chooses a smaller project size than would be socially desirable.

Proof: From (2), it follows for the function (4) that

$$S'(x^*) + E'(x^*) > C'(x^*), \quad (5)$$

because $S'(\cdot)$ is positive by definition. The left hand side of (5) is too large and the right hand side is too small for (4) to hold. The socially optimal project size is larger than x^* because C' increases and E' decreases when the project size grows. The project has to be expanded to a size of x^o for (4) to hold. This shows that firms choose smaller project sizes than are socially desirable.

The difference between the social optimum and the firm's optimum results from the fact that the firm concentrates solely on its own profit whereas, from the social perspective, benefits to other firms from spillovers are also taken into account. Since the social benefits exceed the private benefits, it is acceptable that the activity carry higher costs. In turn this implies that projects should be extended.

Research subsidies are supposed to strengthen the incentive for firms to invest in R&D. One example is cost sharing, also known as Pigou-Subsidy.¹¹ The introduction of a subsidy which grants a partial payment of α % of the R&D expenditures means that (1) can be rewritten as follows:

$$\pi(x) = E(x) - (1 - \alpha)C(x). \quad (6)$$

Only the share of cost that the firm has to bear enters the profit function. The optimal project size is determined by the first order condition

$$E'(\hat{x}) = (1 - \alpha)C'(\hat{x}). \quad (7)$$

variant of this phenomenon of one firm benefiting from another firm's activities is spillovers. See Arrow (1962) or Audretsch and Feldman (1996).

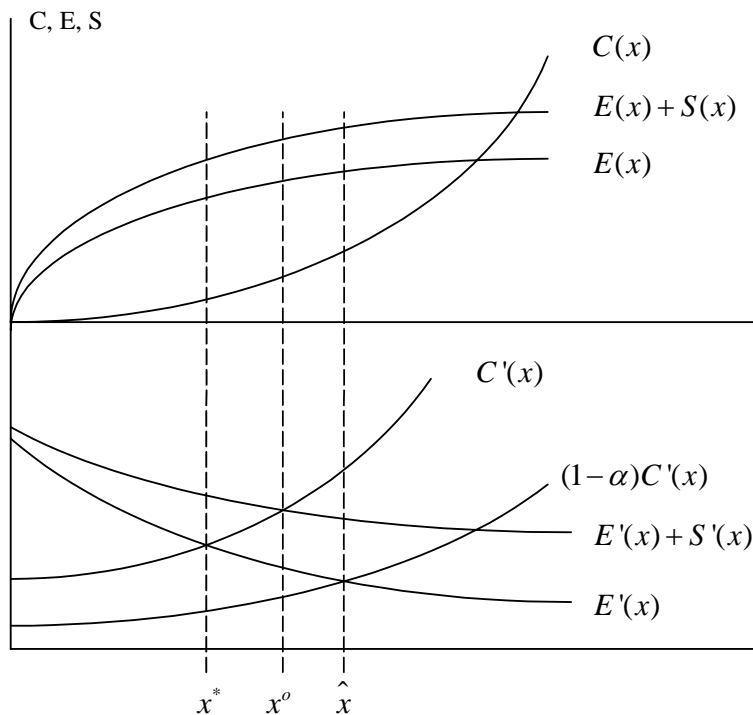
¹¹ See Ewers et al. (2005).

When $x = x^*$ and combining with (2) results in

$$E'(x^*) > (1-\alpha)C'(x^*). \quad (8)$$

If a firm receives a percentage-based subsidy for its R&D expenditures, it will choose a larger project size than without the subsidy. For the condition for the profit maximum (7) to hold, x has to be set larger than x^* in (8), for the right hand side to increase and the left hand side to decrease.

Figure 1



We have shown that the socially optimal project size exceeds the profit maximizing size $x^o > x^*$. Furthermore, a α -% subsidy effects an extension of the project such that $\hat{x} > x^*$. The reason for the extension is a reduction of the relevant marginal cost. The firm compares the additional revenue from an increase in x to the additional costs. If the state covers the share α of the costs the additional revenue is compared to cost $(1-\alpha)C'(x)$. So the extension of the project is profitable from the firm's perspective.

The magnitude of the effect resulting from a subsidy on the firm's decision depends on α . The optimal subsidy causes firms to choose the socially optimal project size $\hat{x} = x^o$. The diagram shows the case where the investment is higher than is socially desirable due to the subsidy. The theoretical analysis does not allow for a statement of the precise magnitude of the subsidy. It

depends on many factors like technology, the geographical proximity of other firms¹², labour turnover¹³, or the firm's ability to use other firms' knowledge (absorptive capacity)¹⁴. An adequate subsidy has to consider these factors.

Besides the subsidy as an incentive mechanism for R&D activities loans may be offered to firms. For the analysis we have to distinguish two cases: (i) Without a loan the firm would not conduct any research, (ii) the firm would also conduct R&D without receiving a loan

In the first case (i) we consider firms which need external capital for investments. SMEs typically have more difficult access to the capital market because their R&D projects are too risky or young firms do not have securities. In this case, it is essential that the firm gain access to the capital markets to be able to conduct R&D. This unambiguously constitutes a welfare gain.

When firms have sufficient own liquidity for conducting R&D (ii) the model introduced above may be used to analyze debt financing. Debt means that a firm has to raise capital for the investment on its own. If it is not available at the beginning of an investment it will be available in exchange for interest rate payment. The interest rate will determine the profitability of the investment. If the interest rate is lower than the market rate, the loan will be subsidized and the effect will be analogous to the direct subsidy. A loan with an interest rate of zero corresponds to a subsidy of approximately 3% when the market rate is 3%. Consequently, the effect of a loan with a subsidized interest rate is not identical to that of a direct percentage subsidy on the investment costs. If the credit interest rate is equal to the market rate there is no incentive for firms to choose a project size other than x^* , because the firm has to bear all the investment costs on its own. The results of the present analysis suggest that credit only affects the project size if it has a subsidizing component. Conversely, a loan at the market rate is equivalent to financing an investment with a firm's own funds.

The formal analysis is a considerable simplification because it disregards many details which exist in reality. Nevertheless, the conclusions from the model suggest that subsidies are an adequate instrument to lead firms to choose the socially optimal project size x^o . Therefore, a shift from subsidies towards credit financing is critical. Firstly, the firm's project size \hat{x} when subsidised approaches the optimal project size. A shift from subsidies towards credit financing causes firms to choose a project size that deviates from the optimal one. Secondly, the design of an investment project is laborious. Introducing credit financing instead of subsidies requires a reorganization of the research project that entails additional costs for the firm. Additionally, this implies delay. Particularly in the context of R&D, it may be essential to offer an innovation on

¹² Technology clusters like Silicon Valley in California are an example. See Audretsch und Feldman (1996) or Arnold et al. (2003).

¹³ See Saxenian (1994).

¹⁴ See Cohen and Levinthal (1989).

the market earlier than competitors (See Section 3.3). These two arguments show that credit financing is not an appropriate instrument to make firms choose the socially optimal project size.

When loans are offered with interest rates below market rates this instrument has a subsidizing component. Then the statements for R&D subsidizing hold. The first difference is the weaker subsidizing effect because the subsidy consists only of the interest rate differential between the market interest rate and the effective credit interest rate. The second difference is that credit financing allows more applicants to be provided with funding due to the leverage effect: Credit financing allows the realisation of projects that would not have been realized without the facility. Furthermore the repayment may be used to grant additional loans. This aspect turns out to be relevant when the demand by firms for financing exceeds the funds available from the public sector. Then the leverage effect means that funding can be granted to more firms than would be the case with direct subsidies, which cover a significant part of the investment costs.

7 Appendix 2: Firm Size and Demand for Credit

In this section we will first explain the demand-side market failure on the credit market as described in Section 3.1. The market failure consists of the fact that small firms do not demand credit for conducting an uncertain research project even though it has a strictly positive expected profit, because they evaluate the consequences of a possible failure of the projects too negatively. We will then describe why risk neutral and risk-averse firms take different decisions. This will show that SME set higher standards of project profitability, so that there are projects that large firms would realize and SME would not.

We will distinguish small from large firms according to their cash flow. We assume that larger firms conduct several projects which generate a steady flow of return. These returns allow the firm to conduct new investment projects or cover unexpected payments. Small firms have only few projects and there may be periods without cash flow from completed projects. If unexpected payments become acute another research project must be liquidated before its completion such that the profit from that project cannot be earned.

Typically, research projects are uncertain. If they succeed, the payoffs exceed the investment costs and the profit is strictly positive. If they fail, there is either no payoff at all or a reduced payoff, which falls short of the investment costs. The decision of whether to conduct an uncertain research project depends on the probability of success. If the expected profit is positive because the probability of succeeding is high enough, the project will be carried out; otherwise it will not. In the following analysis we will show that small firms demand a higher success probability than large firms, so that small firms conduct fewer projects than large firms.

Assume that a R&D projects requires an investment of 1 and that this investment is financed by debt that is to be paid back without fail. Let $1+x$ be the payoff in case of success with

probability p . With probability $1-p$ there is no success and the payoff is $1-y$.¹⁵ We disregard the interest payments on the loan to facilitate computations without affecting the interpretation of the model. To allow for a comparison of the behaviour of small and large firms we analyze the decisions of firms with respect to identical investment projects. In the model we will neglect the duration of the project, which would necessitate discounting of the payoffs because they happen in later periods.

A large firm expects profit equal to

$$E\pi = -1 + p(1+x) + (1-p)(1-y). \quad (9)$$

This simplifies to the condition

$$px + (1-p)(-y) > 0 \quad (10)$$

for the investment project to be realized, when the expected profit is strictly positive. This transforms into

$$p > \frac{y}{x+y} \equiv p^s. \quad (11)$$

This means that an investment is realized when the probability of success exceeds the threshold p^s . If the project fails the firm still has to pay back the loan. The return from the project $1-y$ is not sufficient and the firm has use funds from the returns from other projects.

A small firm has no free cash flow by definition. This means that in case of failure a small firm has to terminate a project prematurely and it cannot earn the profit from this project. This reduces the overall firm profit in the case of failure by an amount G . The expected profit from a research project for a small firm is

$$E\pi = -1 + p(1+x) + (1-p)(1-y-G). \quad (12)$$

A small firm will also realize the research project only if the expected profit is strictly positive. Then the condition transforms into

$$px + (1-p)(-y-G) > 0. \quad (13)$$

Solving for p implies

$$p > \frac{y+G}{x+y+G} \equiv p^k. \quad (14)$$

This means that a small firms realizes the project only if the success probability exceeds

¹⁵ We assume $x > 0$, $y > 0$, and $0 < p < 1$.

Comparing (11) and (14) shows that small firms demand a higher success probability than large firms do - i.e. $p^k > p^s$. Thus there are research projects with a success probability below p^k but larger than p^s that would be realized by large firms but not by small ones.

The analysis has shown that debt financing of uncertain investment projects – which is typical property of R&D projects – prevents small firms from conducting them. Intuitively, it seems that large firms have a sufficiently large number of projects to spread the risk and to ensure a steady flow of revenue from other projects, so that it never becomes necessary to liquidate a project before its completion. Conversely, in case of failure small firms have to liquidate parts of the firm's projects to pay back the loan. This may be a current project with specific investments which cannot earn the full revenue if liquidated prematurely. In the extreme case of an individual enterprise (or an entrepreneur with full personal liability) this implies that the entrepreneur has to pay back the loan from his private assets.

Note that we have assumed risk neutral behaviour in the above analysis. This means that firms consider only the expected revenue of the projects and they would be indifferent between a certain and an uncertain return as long as both have the same expected value – that is the sum of the payments weighted with their probability of occurrence.¹⁶ Risk neutrality is an appropriate assumption for agents on capital markets or stock markets. A single investor may diversify his investments over a number of firms, acting as a stockholder who is risk neutral with respect to individual firms' investment decisions.¹⁷ With SME and personal enterprises the share of personal wealth that is involved in the venture is so high that diversification is no longer possible. In this context risk aversion is a sensible assumption. This means that small and large firms not only differ in their willingness to engage in debt financed investments but also take systematically different decisions.

We will show that SME with risk-averse managers are willing to invest a smaller amount than a large risk neutral firm would do for identical projects. To this end we introduce a simplified concept of consumer utility. This is a measure for the consumers' valuation of wealth. For large firms, which are risk neutral, success is measured by their profit which is counted in amounts of money. Hence, success is a linear function of the profit. This implies that a large firm's valuation of each additional unit of profit is constant, irrespective of whether the profit is high or low. This is different for single persons or SME. Typically, private consumers have a positive valuation of additional wealth (money). However, we can imagine that the valuation of an additional unit of wealth decreases the higher the wealth of that person already is. In the economic literature this is called positive but decreasing marginal utility. The shape of a so-called utility function is depicted in figure 2. The concave shape of the function results from the positive and decreasing marginal utility. An additional unit of wealth increases the value of the function. Therefore it

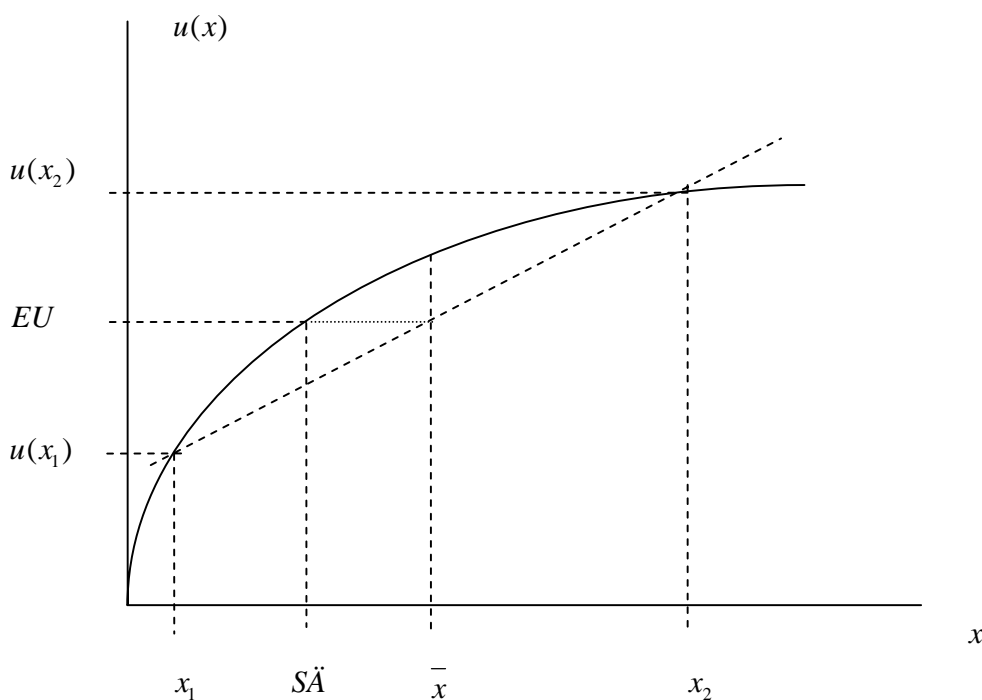
¹⁶ Microeconomic analysis of the behaviour under uncertainty in the context of risk neutral and risk averse agents can be found in Deaton and Muellbauer (1987, 380ff) or Gravelle and Rees (2004, 446ff).

¹⁷ See Franke and Hax (2004).

increases monotonically. Since the valuation for an additional unit of wealth decreases, the slope becomes flatter.

Let x_1 and x_2 with $x_1 < x_2$ be the possible outcomes of an uncertain investment where success x_2 and failure x_1 occur with the same probability $p = 0,5$. The expected payoff is $\bar{x} = \frac{1}{2}x_1 + \frac{1}{2}x_2$. Therefore \bar{x} lies precisely half-way between x_1 and x_2 . If this investment opportunity is offered to a risk neutral firm, it is willing to invest any amount up to \bar{x} . The firm will be indifferent to undertaking the investment or refraining from it if the investment cost is exactly \bar{x} .

Figure 2:



A risk averse agent (a small firm) will not consider the expected payoff but the expected utility from his participation in an investment project. In case of success the agent has utility $u(x_2)$, otherwise $u(x_1)$. From figure 2 we can show that the maximum amount that a risk averse investor is willing to pay is lower than \bar{x} . The risk averse agent will consider his expected utility $EU = \frac{1}{2}u(x_2) + \frac{1}{2}u(x_1) \equiv u(S\ddot{A})$. In the graph EU is half-way between $u(x_2)$ and $u(x_1)$. When this investment project is offered to the risk averse agent, he will have to decide the maximum amount he is willing to pay. This means that he will pay a fixed amount to obtain either a high payoff x_2 with probability $\frac{1}{2}$ or a small x_1 amount with probability $\frac{1}{2}$. The graph shows that the same expected utility EU is generated by the uncertain investment and by a certain payment of

$S\ddot{A}$. This payment is called certainty equivalent.¹⁸ $S\ddot{A}$ is on the left of \bar{x} . This is a consequence of the convexity of the utility function. For illustrative purpose we have chosen a simple example. In general risk averse agents have a certainty equivalent that is lower than the expected value of the uncertain payoff. This holds for several different payoffs x_3, x_4, \dots and for other probabilities than $p = 0,5$.¹⁹

The above analysis is a simplification of reality. It describes typical behaviour of firms or of private consumers and it cannot cover all decisions that agents may be confronted with. This illustration has shown that there are investment project that may be realized by large firms but not by small ones. The reason is not the restricted access to debt financing but the reduced willingness for small firms to engage in risky projects. Therefore, the results suggest that a reduced willingness to realize research projects not only the consequence of a lack of credit supply, but also of a demand-sided market failure.

¹⁸ Vgl. Neuss (2003).

¹⁹ See Takayama (1994).

8 Appendix 3: List of R&D and innovation projects co-financed by SFF loans from the EIB

Country	Date	Name	Volume
Austria	19.04.2001	BOREALIS BORSTAR TECHNOLOGY SCHWECHAT	52.000.000
Austria	11.05.2001	INFINEON POWERCHIPS VILLACH	80.000.000
Austria	05.09.2001	VA STAHL LINZ PLANT MODERNISATION	25.000.000
Austria	05.09.2001	VA STAHL LINZ PLANT MODERNISATION	25.000.000
Austria	07.01.2002	VA STAHL LINZ PLANT MODERNISATION	25.000.000
Austria	07.01.2002	VA STAHL LINZ PLANT MODERNISATION	25.000.000
Austria	07.03.2002	INFINEON POWERCHIPS VILLACH	40.000.000
Austria	25.07.2002	VA TECH INNOVATION	60.000.000
Austria	03.04.2003	BOEHLER UDDEHOLM MODERNISIERUNG U. R&D	70.000.000
Austria	29.01.2004	BOEHLER UDDEHOLM MODERNISIERUNG U. R&D	60.000.000
Austria	19.04.2004	FLOWSERVE PRODUCT DEVELOPMENT	5.600.000
Austria	26.04.2004	VOESTALPINE F&E / SCHIENENTECHNIK	37.500.000
Austria	26.04.2004	VOESTALPINE F&E / SCHIENENTECHNIK	12.500.000
Austria	06.12.2004	VILLACH AUTOMOTIVE CHIPS R&D	50.000.000
Austria	13.01.2005	BOREALIS-ENVIRONMENT AND R&D	60.291.536
Austria	13.01.2005	BOREALIS-ENVIRONMENT AND R&D	23.200.793
Austria	27.01.2005	VOESTALPINE F&E / SCHIENENTECHNIK	37.500.000
Austria	27.01.2005	VOESTALPINE F&E / SCHIENENTECHNIK	12.500.000
Austria	30.06.2005	VILLACH AUTOMOTIVE CHIPS R&D	45.000.000
Belgium	09.09.2003	IMEC R&D 1	30.140.035
Belgium	09.09.2003	IMEC R&D 1	16.924.789
Czech Repub.	17.10.2003	AUTOMOTIVE SUPPLY INVESTMENT FRAMEWORK	220.000.000
Czech Repub.	08.07.2005	BENTELER AUTOMOTIVE	44.000.000
Denmark	02.06.2004	NOVOZYMES R&D	70.000.000
Denmark	02.06.2004	NOVOZYMES R&D	70.000.000
Denmark	30.11.2004	DANISCO INGREDIENTS R&D	100.906.815
Denmark	08.12.2004	NOVO NORDISK R&D III	161.535.665
Finland	10.11.2003	WARTSILA ENERGY TECHNOLOGY R&D	100.000.000
Finland	19.04.2004	FLOWSERVE PRODUCT DEVELOPMENT	2.100.000
Finland	28.05.2004	METSO TECHNOLOGY R&D (I2I)	135.000.000
Finland	13.01.2005	BOREALIS-ENVIRONMENT AND R&D	2.900.099
France	02.08.2002	EADS R&D 1 & 2	700.000.000
France	07.08.2003	PHILIPS SEMICONDUCTEURS R&D EUROPE	66.250.000
France	23.10.2003	SNECMA R&D	300.000.000
France	19.04.2004	FLOWSERVE PRODUCT DEVELOPMENT	4.200.000
Germany	20.11.2001	INFINEON TECHNOLOGIES DRESDEN	48.000.000
Germany	07.12.2001	INFINEON TECHNOLOGIES DRESDEN	66.000.000
Germany	07.12.2001	INFINEON TECHNOLOGIES DRESDEN	48.000.000
Germany	10.12.2001	SIEMENS R & D	250.000.000
Germany	15.02.2002	INFINEON TECHNOLOGIES DRESDEN	48.000.000
Germany	12.03.2002	BOEHRINGER INGELHEIM II	62.500.000
Germany	27.03.2002	INFINEON TECHNOLOGIES DRESDEN	47.999.773
Germany	02.04.2002	INFINEON TECHNOLOGIES DRESDEN	96.000.000
Germany	15.07.2002	INFINEON TECHNOLOGIES DRESDEN	48.000.000
Germany	05.09.2002	CARL ZEISS SEMICONDUCTOR LITHOGRAPHY	75.000.000
Germany	11.09.2002	IONITY KAMENZ	30.499.949
Germany	05.12.2002	RWE SOLAR MODULES	49.000.000
Germany	14.02.2003	VILLE DES SCIENCES HOECHST	8.321.005
Germany	08.04.2003	SCHOTT DISPLAYGLAS JENA	36.300.000
Germany	11.04.2003	INFINEON TECHNOLOGIES DRESDEN	47.996.272
Germany	22.05.2003	CARL ZEISS SEMICONDUCTOR LITHOGRAPHY	35.000.000

Country	Date	Name	Volume
Germany	17.10.2003	AUTOMOTIVE SUPPLY INVESTMENT FRAMEWORK	50.000.000
Germany	05.12.2003	MECHATRONIK STOLLBERG	40.000.000
Germany	19.04.2004	FLOWSERVE PRODUCT DEVELOPMENT	21.000.000
Germany	08.07.2004	MECHATRONIK STOLLBERG	20.000.000
Germany	17.11.2004	MECHATRONIK STOLLBERG	15.000.000
Germany	06.12.2004	SCHERING BERLIN PHARMA R&D	200.000.000
Germany	08.12.2004	ZIEL 2-PROGRAMM NORDRHEIN-WESTFALEN I	51.000.000
Germany	17.12.2004	BOEHRINGER INGELHEIM II	62.500.000
Germany	17.12.2004	BSH R&D INVESTMENT PROGRAMME	300.000.000
Germany	26.01.2005	MECHATRONIK STOLLBERG	15.000.000
Germany	26.01.2005	MECHATRONIK STOLLBERG	15.000.000
Germany	20.05.2005	INFINEON TECHNOLOGIES DRESDEN	42.000.000
Germany	20.05.2005	INFINEON TECHNOLOGIES DRESDEN	25.500.000
Germany	08.07.2005	IMPFFSTOFFWERK DESSAU TORNAU R&D	40.000.000
Germany	13.07.2005	MEDI-SCIENCE R&D FRAMEWORK (I2I)	45.000.000
Germany	13.07.2005	MEDI-SCIENCE R&D FRAMEWORK (I2I)	20.500.000
Hungary	17.10.2003	AUTOMOTIVE SUPPLY INVESTMENT FRAMEWORK	65.000.000
Italy	19.04.2004	FLOWSERVE PRODUCT DEVELOPMENT	7.000.000
Italy	10.08.2004	PIRELLI R&D	100.000.000
Luxembourg	19.12.2001	ARBED PRIMOREC	10.000.000
Netherlands	07.08.2003	PHILIPS SEMICONDUCTEURS R&D EUROPE	66.250.000
Netherlands	19.04.2004	FLOWSERVE PRODUCT DEVELOPMENT	12.600.000
Portugal	11.09.2001	HOVIONE PHARMA SCIENCE	10.919.414
Portugal	17.11.2004	EFACEC - MODERNIZACAO E INOVACAO (RDI)	13.500.000
Portugal	28.04.2005	INFINEON DRAM TECHNOLOGY	124.000.000
Spain	19.04.2004	FLOWSERVE PRODUCT DEVELOPMENT	4.900.000
Spain	16.12.2004	GAMESA WIND POWER RDI	150.000.000
Spain	10.01.2005	GAMESA WIND POWER RDI	80.000.000
Spain	21.01.2005	ARIES/ICSA AIRBUS A 380	25.000.000
Sweden	17.10.2003	AUTOMOTIVE SUPPLY INVESTMENT FRAMEWORK	15.000.000
Sweden	19.04.2004	FLOWSERVE PRODUCT DEVELOPMENT	2.100.000
Sweden	03.12.2004	VOLVO RDI	224.119.769
Sweden	13.01.2005	BOREALIS-ENVIRONMENT AND R&D	2.900.099
UK	19.04.2004	FLOWSERVE PRODUCT DEVELOPMENT	10.500.000
UK	18.11.2004	FORD ENGINES RDI	350.000.000
UK	01.06.2005	SMITHS PRODUCT RESEARCH & DEVELOPMENT	103.382.070

Source: EIB Website, as mid of July 2005.