The costs of a non-innovative Europe: the challenges ahead

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Introduction[1]

The new Barroso Commission has established research and innovation as central priorities for Europe over the next decade. While growth, employment and competitiveness were considered major challenges for Europe in the past and became central elements of the Lisbon strategy, the post-2010 decade calls for a more explicit emphasis on the new challenges posed by the post-crisis world: "The aim is for Europe to lead, compete and prosper as a greener, knowledge-based economy, growing fast and sustainably, creating high levels of employment and social progress. To achieve this, Europe needs a strengthened industrial base, a modern service sector and a thriving rural economy. As 'first mover' in building this society for the future, Europe can derive important benefits by developing competitive, innovative products, rolling out the infrastructures of the future, entering new markets and creating new, high-quality jobs."[2]

Central to this aim is Europe's success in bringing about ***innovation***.

In the past most research and innovation policies have sought to promote the supply of innovations. In Europe, the rationale for this can be easily understood from the perspective of the need for institutional reform in Europe on the supply side of R&D and Innovation. European research policy offered, in the spirit of the Lisbon agenda, scope for such institutional reform, searching for opportunities for better coordination between Community and Member States' research policies. One may think in particular of the creation, over the last decade of new European concepts and institutions such as the ERA, the ERC and the EIT. The gradual transformation of Europe's research system on the supply side has actually been impressive: there is today a clear tendency towards further integration of MS' national research policies in a European framework through e.g. the concept of the "joint programming" of research. The conceptual idea was, and still is, that such supply-side institutional reforms would feed, and be driven by, broader Single Market achievements. Demand didn't really enter the picture, except for concerns with respect to the possible emergence in European high-tech sectors of market dominance and as a result a possible lack of competition. With the integration of innovation under the heading of the Commissioner for research, innovation and science in the new Barroso Commission, there is now a clear policy shift in the recognition of the need for effective supply-demand matching in research and for the particular role of demand-driven innovation for growth, welfare and well-being.

However, to illustrate the potential of such policies and their contribution to the EU 2020 strategic agenda there is a particular need to have a better understanding of the macro-economic impact of such policies. This note, "***The costs of a non-innovative Europe***", sets out to do that at three separate levels.

[1] This brief note sets out a framework within which some of the simulation achievements realized within the framework of the so-called DEMETER FP-7 project headed by Professor Paul Zagamé could be further developed to provide policy relevant answers to the costs of a non-innovative Europe. It follows on from discussions with all participants in the last DEMETER progress meeting held in Athens on September 10th, 2010. I'm particularly grateful to helpful comments from Capros Pantelis, Pierre Valette, Denise Van Regemorter and Paul Zagame on a previous version of this paper. At this stage though the views expressed in this note remain my own responsibility.

[2] Reflection paper on the future EU 2020 strategy (EU, 2009).

- On the supply side there is a long standing tradition in Europe of using macro-sectoral applied models as well as general equilibrium models to measure and simulate the impact of various policy measures. Applied modelling work, as in the case of NEMESIS, an econometric model well adapted for multi-sectoral analysis of research and development and innovation, and GEM-E3, a general equilibrium model suited to analyse energy and environment oriented policies, has already been used to assess R&D and innovation policies. For example for the case of European policies linked to the Lisbon agenda and more specifically the 3% Barcelona objective (Brécard et al, 2006), for the framework programs (EC, 2005), and for national action plans on RTD (Chevallier et al., 2006). The advantages of using such modelling frameworks are straightforward: they provide a coherent quantitative perspective on competitiveness, growth and employment. The FP7 DEMETER project is currently involved in such an exercise.
- However, the models referred to above are not particularly suitable for analysing demand-led innovation policies. This includes e.g. innovation in services, a sector barely considered in detail in such models, yet probably the sector which has been lagging most in reaping the benefits from Europe's large Single Market ***and*** in bringing about product and process innovations which respond to user and demand needs.[3] A major boost for the Single Market in services has been the implementation last year (final ratification in December 28th 2009) of the revised services directive, allowing for the administrative simplification of establishing new businesses or trading services across the EU in most commercial service sectors[4]. A main challenge will be to channel this growth impulse in the direction of service innovation. It is here that so-called Knowledge Intensive Service Activities[5] play an absolutely essential role as intermediaries enabling innovation and productivity growth to spread from manufacturing to services more broadly. However, it is not only innovation in services that is central to European growth over the next decade. Demand-driven innovation, including social innovation will also be a key feature for industrial and agricultural sectors in Europe so as to achieve a smooth transformation in the direction of long term sustainable development and a green economy. Not surprisingly, the fragmentation in regulation in both upstream and downstream markets, as well as many organisational, human capital and cultural barriers, have played a major role in increasing the risks and uncertainties associated with research and innovation activities. In short, the many regulatory barriers to innovation provide one underlying reason for the low rate of investment in R&D by firms in Europe.[6] These are the core issues addressed in the second part of this study.

[3] See in particular Van Ark et al. (2009) on the productivity gap in services in Europe vis-à-vis the US. This gap appears, according to Van Ark, closely linked to the use in services of Information and Communication Technologies (ICT). Use of the latter in services can itself be considered as an engine of innovation.

[4] Such as trade; construction; regulated professions such as accountants, engineering, architects, etc.; hotels and restaurants; real estate; and tourism. It should however be noted that financial services, health, employment and social services are excluded from the directive.

[5] The concept of Knowledge Intensive Service Activities (KISA) or Knowledge-Intensive Business Services (KIBS) cover firms and associations that specialise in producing services to support the business processes of private firms and public organisations – technical services (T-KIBS) include computer support, R&D, engineering, industrial product and process design, etc., professional services (P-KIBS) – including accountancy, legal services, market research, and business-related creative services (C-KIBS) covering advertising in particular, but also elements of architecture and design.

[6] See the arguments put forward by the Expert Group for DG Research on "The role of Community research policy in the knowledge based economy", December 2009,

- Third, there is the question about the effectiveness of European RDI policies, and in particular their leverage impact on private investments. EU RDI policies currently represent only a small fraction of most MS' RDI policies in volume terms. However, they have over the years had a growing leverage effect on national policies through various initiatives such as "joint" technology initiatives and research programming. Furthermore in some areas such as energy technologies and sustainability, the EC has been successful in creating new RDI frameworks such as the SET plan. The main policy question is now whether other financial instruments could strengthen the leverage not only of MS' public funds but also of private funds. The focus here is in particular on the RSFF scheme of the EC and the EIB. The third part of the study will look at the impact of transforming larger parts of the forthcoming EU FP8 funding in various forms of RSFF type of finance on European growth and employment. To highlight this impact, the basic assumption here will be that the public funding available for FP8 will be similar to the current amount of FP7.

What makes these three modelling explorations particularly interesting and worthwhile at this moment is not just their particular policy relevance within the context of the Europe2020 strategy, but also the insights they might provide on the way the current financial and economic crisis limits or broadens the likely economic impacts of such policies. We now discuss in more detail each of the proposed areas.

http://ec.europa.eu/research/era/publication_en.cfm

1. Quantifying the impact of knowledge investments on European growth and employment[7]

This first part of the exercise focuses on a straightforward quantification in volume terms of the impact of knowledge investments (defined as R&D and innovation: RDI) on economic growth and employment in Europe. The exercise is currently part of the FP7 DEMETER project which involves a large number of European modeling experts. From a methodological point of view, the main advantage of the analysis is that it is based on a state of the art macro-modeling exercise which is consistent with previous similar exercises, using the same NEMESIS model[8].

In the current financial and economic context, a macro-modeling re-assessment of knowledge investments on European growth and employment appears particularly relevant for a number of reasons:

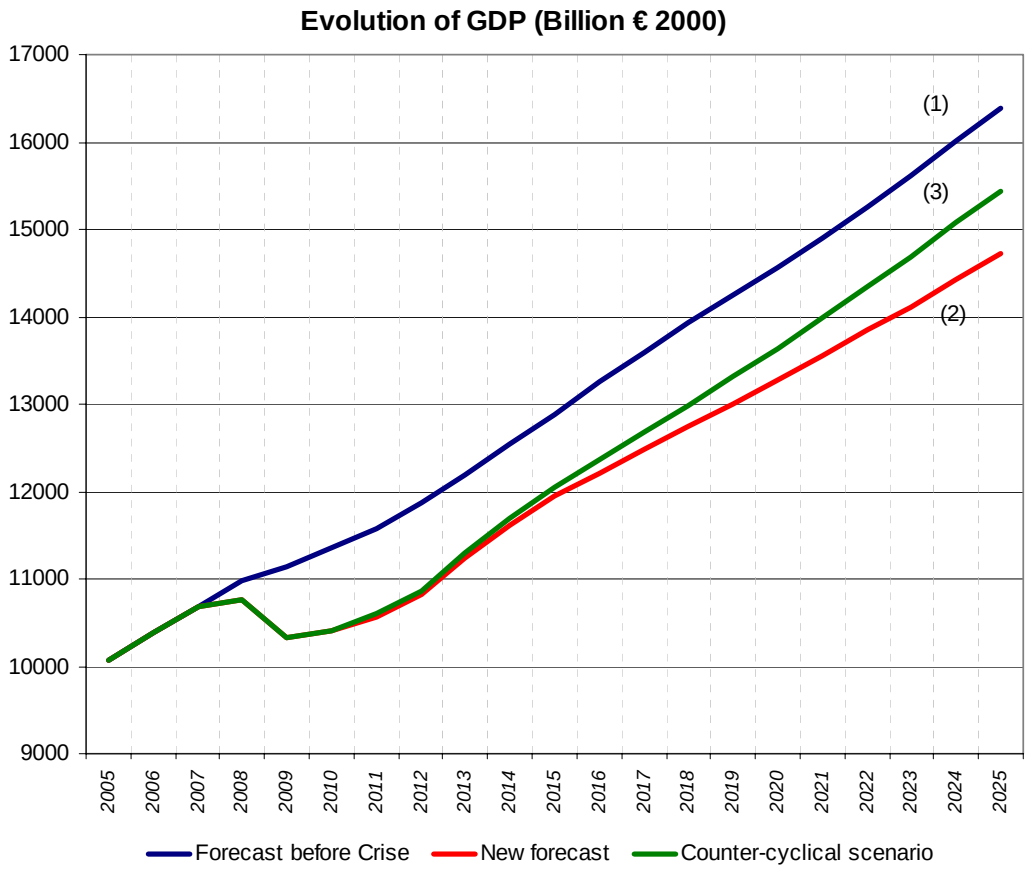
a. First, it is of direct policy relevance to re-assess some of the old supply-push knowledge investments policy targets – such as the 2002 Barcelona 3% RDI investment target – within the context of the current economic crisis. As some of the first macro-simulation DEMETER exercises illustrate[9], in the present crisis context such policies are now likely to be accompanied with ***less inflationary pressures*** and with less physical as well as human capital ***research capacity problems*** than in the previous, pre-2008 growth period. One may remember here that one of the most severe problems associated with the implementation of the Barcelona RDI investment target, was the likely overall wage-increase effect such policies might have on researchers, and scientists and engineers (S&E) wages in particular within Europe; companies, universities and public research organizations in different MS' countries and regions competing with each other in attracting top research talent within a rapidly ageing S&E population[10]. The enlargement of the EU to the new members has further compounded this problem, the large supply of S&E in those countries now rapidly drying up. Some studies even estimated that the number of additional S&E needed in order to achieve the Barcelona targets would be as many as 800,000[11].
b. Second, given the cyclical nature of knowledge investments and the particular sensitivity of such investments to risk aversion – a core characteristic of the present financial crisis – an explicit policy emphasis today on facilitating knowledge investments is likely to have a more significant growth and employment acceleration impact than what is generally assumed under normal growth circumstances. However, this impact will be very different from member state to member state and from sector to sector; it will also be heavily influenced by external factors and in particular foreign, non-EU demand. To assess all those sometimes diverging impacts, a full macro-modelling exercise is essential;

[7] For a more in debt analysis see the accompanying paper from Paul Zagamé "The costs of a non-innovative Europe: What can we learn and what can we expect from the simulation works", mimeo, September 2010.
[8] See Brécard D., Fougeyrollas A., Lemiale L., Le Mouël P, Zagamé P. (2006): "Macroeconomic consequences of European research policy : Prospects of the Nemesis model in the year 2030", Research Policy 35, 910–924.
[9] Fougeyrollas, A., Le Hire, B, Le Mouël, P. and Zagamé, P. (2010), DEMETER project: l'effort de R&D dans la crise et au-dela: quelques enseignements tires des simulations du modele NEMESIS, 12/03/2010.
[10] See David, Paul, ….
[11] Gago report for the EC Commission

c. Third, crises periods are also periods of structural change: of creative destruction both at the level of sectors and of firms. A stronger policy emphasis on knowledge investments in the current crisis period offers the possibility to address also some of Europe's major structural weaknesses in RDI. One may think of research fragmentation, the lack of research excellence and research mobility but also the poor performance of European higher education systems; all areas which need to be addressed if one wants to strengthen Europe's long term knowledge based growth ;
d. Fourth, the coming years starting from January 1st 2013, will also be characterized by the implementation of the European emission trading scheme, introducing in MS a now, clearly monetizeable taxation system on CO2 intensive industrial activities, providing the economic incentives to speed up the transition towards a sustainable European growth path. Again these funds open up opportunities for large scale investments in sustainable energy technologies.

Below we present some initial simulation results for the DEMETER project on simulating growth and employment performance on the basis of the pre-crisis and post crisis data as well as a scenario implying an increased RDI effort. The post-crisis scenario (in red) highlights the severity of the current financial and economic crisis for European long term growth. The post-crisis forecast puts the EU on a lower long term growth trajectory with actually a widening gap compared to the previous pre-crisis growth trajectory (in blue). The crisis will have left the EU permanently on a lower growth trajectory. The third scenario (in green) presents the impact on overall growth of an increase in R&D efforts from the current 1.8% of GDP in 2009 for the EU as a whole to the Barcelona target of 3% of GDP in 2010.

Figure 1: DEMETER growth scenario's (2010- 2025)



We do not present here in more detail the reasons for the observed differences in growth forecast between the three scenarios, but it will be clear that the crisis if accompanied with "business as usual" policies risks to shifted permanently the structure of the European industry away from knowledge intensive sectors.

Box 1: Current first try-out results from DEMETER

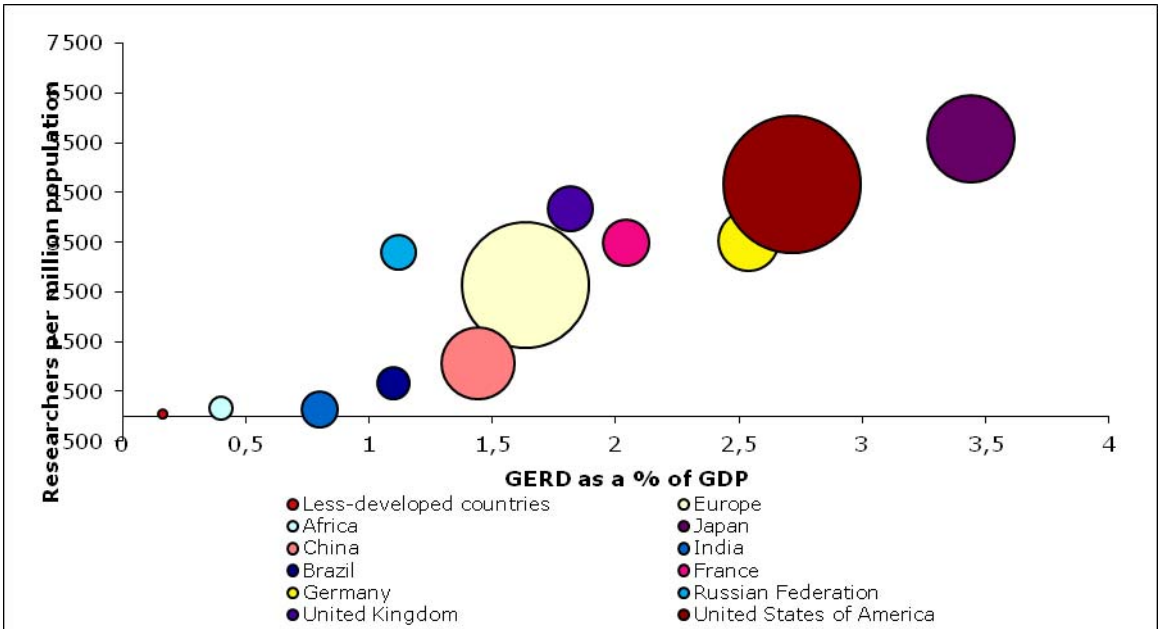
- The crisis leads to a long-term structural gap in the EU's GDP of on average some 9%. If at first (the period 2012-2015) GDP growth appears to have recovered to its pre-crisis growth level, later on the gap broadness again and the EU's long term GDP growth stabilizes at a rate below the pre-crisis growth scenario.
- Sectors are differently affected by the crisis: the large capital equipment sectors that carry out much R&D are more affected by the decline in R&D (both private and public) which leads to a long term decline in the R&D intensity of the European economy.
- A policy leading to an extra effort in R&D comparable to the Barcelona target allows to recover in 2025 43% of the GDP gap resulting from the crisis. At the same time in terms of employment complete recovery will be already obtained at the end of 2015, thanks to the strong reduction in wages during the crisis, allowing fro a more labour intensive growth path after the crisis.

One of the main reasons for the strong crisis impact on the European economy is the rapid catching-up of some of the new large emerging countries such as China, India and Brazil, in the direction of a knowledge based growth.

Figure 2 below, pulls together three R&D indicators for 2007: the size of the dots represents the absolute size of Gross Expenditures on R&D (GERD), both public and private; the position on the horizontal axis represents the countries GERD/GDP intensity: the amount of productive resources of the country as measures through the amount of GDP devoted to R&D, both public and private; and the position on the vertical axis represents the alternative human capital R&D intensity measure: the number of researchers employed in the country as per thousands of the population. The two R&D intensity measures are obviously positively correlated, even though and characteristically Russia has still a much higher number of S&E employed compared to the resources invested in its R&D system. The figure highlights the extreme concentration of R&D resources in the highly developed triad countries: the USA, Japan and the large European countries: Germany, France and the UK. All countries with large amounts of R&D efforts as reflected in the size of the dots, and high R&D intensities both in terms of productive structures and in terms of domestic human capital. The EU-27 dot is large in size, nearly as large as the US one highlighting the fact that ***if*** European R&D efforts were fully integrated as if the EU-27 were one country, it would be in a dominant position, even though its R&D intensity is well below that of the US or Japan. At the same time, and as the left bottom side of the picture shows, there are today also large newcomers emerging such as China, India and Brazil[12]. The R&D intensity of these countries might still be low, but their contribution to the world knowledge stock is actually rising rapidly.

[12] This would even be more visual in Figure 1 if countries such as South Korea would have been added.

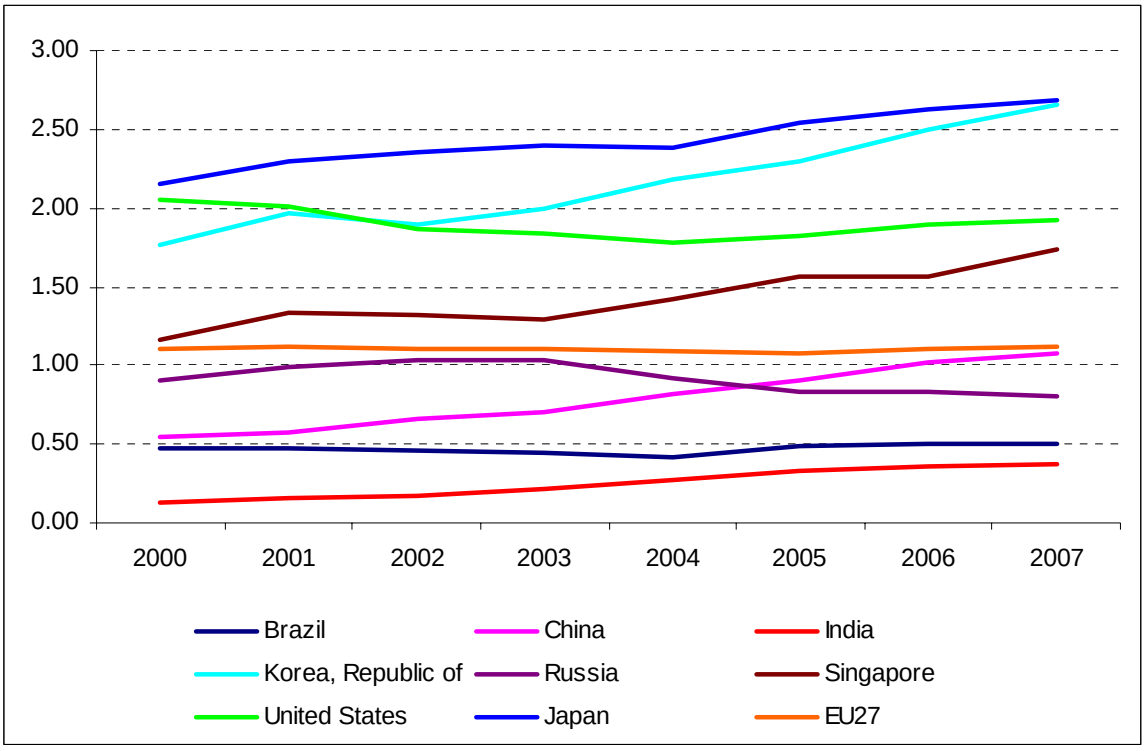
Figure 2: Distribution of GERD across the world (2007)



Source: UNESCO and UNU-MERIT

If the 2002 Barcelona target with its strong emphasis on private R&D investment had one symbolic meaning, it was of course the attempt of the EU to catch up with the US in private knowledge investments. Today, and as illustrated in Figure 3 on the percentage of GDP devoted to private R&D investments the EU has actually been caught up by China.

Figure 3: Trends in Business R&D expenditures (BERD as % of GDP)



The current globalization trend has led to the emergence and multiplication of world class knowledge centres in emerging economies. It is no longer the case that emerging economies are laggard in technological development. Due to large investments in higher education and research, favourable demographic dynamics, the outsourcing of manufacturing activities but also increasingly of product development from rich countries, new hotspots of innovation have emerged in emerging countries. This isn't just a challenging development for the EU-27 as Figure 3 highlights. It affects at different levels the old Triad (US-Japan-EU27) private R&D world dominance: Korea having caught up with Japan and now leading the world, Singapore catching up with the US and China with the EU-27. As documented in a recent Harvard Business Review article which interestingly calls for a complete turnaround of US manufacturing industry from the current trend towards outsourcing, a large part of high tech components of many mass consumer products are now not only manufactured but also designed in China, South Korea and India (Pisano and Shih, 2009). It is of course true that this global shift is mainly concerned with the D of R&D, that is with the somewhat more routinized segments of Development which do not need to be tightly integrated or co-located with other (more fundamental) research capacities but also benefit from agglomeration effects. The less routinized and most science based segments of inventive activity appeared up to now to remain extremely concentrated in the US, Japan and the EU-27 – what counts here is the proximity to leading edge academic research, the advantages of co-location with other firms and thick local markets for specialized inputs, services and human capital, so-called knowledge agglomeration externalities.

But emerging countries have shown a remarkable capacity in moving upstream in the value chain, from outsourcing of manufacturing activities to autonomous process technology development, then to product development, design, and applied research. Together with a national targeted technology policy, Eastern Asian countries have successfully and aggressively pursued the goal of a rapid increase in the scientific quality of their universities, using both monetary and non-monetary incentives as well as institutional reforms. Furthermore contrary to the US, Japan and Europe, the economic crisis appears to have affected much less the growth performance of those countries and in particular does not seem to have affected governments fiscal positions. There is hence no reason to assume that the knowledge catching-up efforts of those countries would be limited to the D-types of activities mentioned above. More likely is the opposite assumption: that is that participation in these D-types of activities will ultimately have spill-over effects in the sense of building local capacities to expand further and move more in basic research, possibly even magnified by some of the new approaches to innovation, which are leading to the development of global, open networks of activity. The countries with the potential to compete for global knowledge hubs in certain fields will be characterized by the fact that they have pockets of academic excellence; that they have strong educational programs; that they can fund major programs to create research infrastructures and attract leading academic researchers; that they have already strong entrepreneurial activities that respond to market incentives; that they can benefit from sophisticated users.

These are precisely all the features European MS will have to focus upon in strategically opting for a revamped Barcelona target. It will indeed not just be the total amount of R&D investments which will count, but also the way those additional investments are "matched" by strongly needed institutional reforms. It are those issues which are central in the next section discussing the challenges of a European Innovation Union.

2. Measuring the growth and employment impact of an Innovation Union in Europe

The central policy focus in the second part is on market-driven innovation. Innovation should be understood here in the broadest sense of the term, i.e. also including social innovation. With the integration of innovation under the heading of the Commissioner for research, there is now a clear policy shift in recognition of the need for effective supply-demand matching in research and for the particular role of demand-driven innovation for growth and employment. Such supply-demand matching between research and innovation is relatively straightforward in manufacturing with firms focusing on their research and development (R&D) activities. Whilst firms focus increasingly on the D part, and public research institutions such as universities and public research organizations focus on the R side which is more basic in nature. However, the supply-demand matching is more complex when entering service sectors. In these cases the role of users as demand drivers is often paramount; at the same time existing regulations, organizational structures, local habits and cultural factors, sometimes constitute formidable barriers to change, and to innovation in particular. However, it would be a mistake to just consider innovation in services as being confronted with barriers. There are today so many forward and backward linkages between industrial, agricultural and service sectors that the shift towards more demand-driven innovation represents challenges across a much wider spectrum of sectors than services only. Furthermore, the European 2020 Strategy which challenges all MS to embark on a major transition to a sustainable, green economy will not just depend on fundamental and applied research or on new scientific insights into alternative energy sources, but also and crucially on demand-driven innovation, as well as on shifts in regulation, in organization and in habits.

In short, this transition represents a "grand" policy challenge. How should an appropriate innovation framework be designed, and at what level? As highlighted in the recent Expert group report on "The role of Community research policy in the knowledge based economy", a demand and user-driven innovation policy framework is likely to require more coordination between MS and Community as regards research and innovation policy. At the same time, and given the wide diversity within the EU in levels of development, demographic structure as well as geographical distance from urban centres, local and regional policies will also have to play a role in enhancing the wide diversity in the demand for goods and services.

The relevant policy challenge is to connect these societal challenges to major new growth and employment opportunities for Europe. Realizing the ideal of a green economy or of an inclusive society, will require knowledge about the many barriers in many of those areas. Second, it requires a new toolbox at the EU level, going beyond the traditional limits of national and European research and innovation policies, also involving procurement policy, competition policy, as well as many sector specific service sectors such as energy, health, transport, social policies and many more. Furthermore, change will involve also many aspects of social innovation including territorial development with a central role for local innovation.

From what has been said, it will be clear that it will be difficult to measure the macro-growth and employment potential of such policies. As was highlighted above, the present introduction of, for example, the revised services, the Bolkestein directive has been claimed to have an important but at the same time relatively limited impact on European growth. This is because the services the directive is most directly addressing are only traded across EU countries at a limited scale. However, this crucially depends on the extent to which the new "Single Market" in commercial services can indeed become an engine for innovation: a truly "Single Market for Innovation". It is that potential which needs to be assessed at the macro-level. Hence the importance of carrying out macro-sectoral simulations which fully take into

account the regulatory, institutional and international tradability diversity of service innovations.

Currently, a simple element of demand-driven R&D is already in the models used by DEMETER. Technical change is explained by investment in R&D, based on the results of econometric studies (e.g., Mairesse and Mohnen, 1999) linking a stock of R&D expenditures to productivity. Later, knowledge externalities were explicitly inserted in a variable composed of R&D stocks of other sectors and countries and from public R&D (Fougeyrollas *et al.*, 2001). Innovation is then endogenised using these knowledge variables and the R&D decision for the representative firm of the sector is derived from maximization of the firm value, simultaneously with the demand for other production factors. The increase in demand in a sector boosts its R&D and then its innovation. Another mechanism of demand-driven innovation that can be incorporated in the models by means of the learning-by-doing approach, i.e. innovation (productivity) is linked to past experience. This is particularly relevant to the energy modules of the NEMESIS and GEM-E3 models. This is achieved with "experience curves" where productivity depends on accumulation variables (as cumulated investment or production). But as will be obvious, all these representations of demand-driven innovation are far too simplified to describe the growth impact of demand-driven innovation, particularly in services.

The striking fact remains that while services represent the largest part of value added and employment in most Member States' domestic economies, their contribution to international trade, and in particular intra-EU trade, has remained only a fraction of the corresponding trade in manufacturing and agricultural products. For some services this is intrinsically linked to the nature of their activity. For many other services, though, information and communication technologies have provided new opportunities for international trade. In many commercial services the newly implemented services directive could therefore have a potentially significant impact, leading to a growth impulse in both intra- and extra-European trade.

3. Increasing the effectiveness of European RDI policies

At the moment the European Research budget is primarily encapsulated within a multi-annual grant provision system under the Framework Programmes (FP). While substantial in volume (FP7 amounts to € 50 billion), it remains small compared to the total of MS' national funds. Up to now the main purpose of European policies has been to increase the leverage of such EU funding on national research budgets. Many of the new initiatives under the heading of "joint" technology initiatives and research programming have contributed to increasing such leverage. However, the main policy question in a crisis period such as the current one, is whether the FP R&D support system could have a higher leverage on private R&D funding.

Currently, the EC uses alternative funding instruments to a limited extent. The Risk-Sharing Finance Facility (RSFF) represents a first "European scale programme" by the European Commission (EC) which uses debt-based finance, to complement its more traditional FP 7 grant financing for RDI. The risk-sharing feature refers to the sharing of risks between the EC and the European Investment Bank (EIB). The RSFF was established on June 5th, 2007, through a co-operation agreement between the EC and the EIB. The origins of the RSFF go back to discussions at the beginning of the 2000s with the Lisbon declaration and the ensuing internal discussions at both EC and EIB level on how the broad Lisbon strategic goals could be implemented. As a debt-based finance facility for RDI, the RSFF is also, in contrast to RDI grants and/or subsidies, first and foremost a demand-led instrument. It had been set up with the aim to create additional financing capacity in Europe of up to € 10 billion in support of RDI in all sectors covered by the Framework Programme 7 (FP7) and covering all MS. Both the EIB and the EC capital contributions at € 1 bn each to RSFF underpin the risk. The EIB contribution to RSFF comes out of the Bank's own reserves; the EC contribution comes out of the FP7. Whereas the EIB contribution represents a self-funded EIB participation based on the EIB's Knowledge Economy investment criteria, the EC contribution is governed by specific FP7 eligibility criteria.

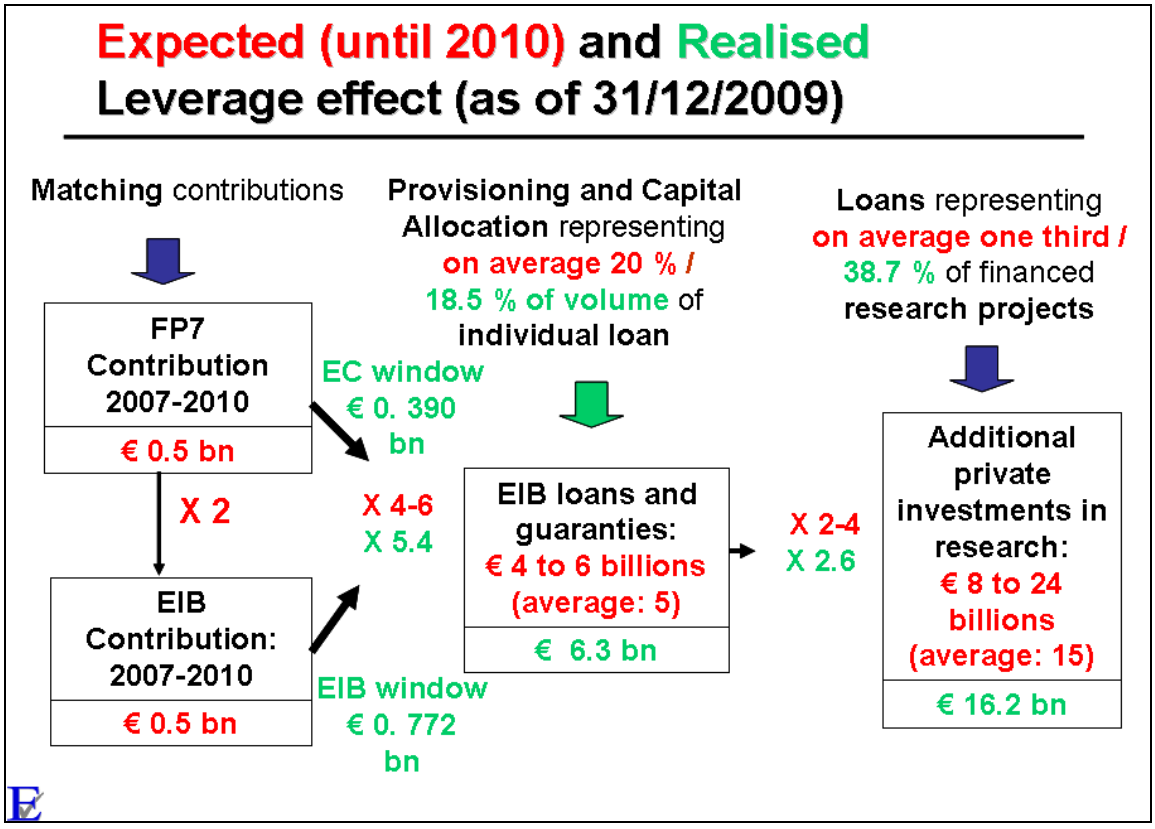
Viewed in retrospect, the establishment of the RSFF was well timed. Put in place in 2007, few could have predicted the ensuing financial crisis and the accompanying dramatic shift in risk aversion in financial markets. Since 2007, there has actually been a significant decline in the availability of finance for private investment in the EU so that access to finance for RDI investments became an even more urgent need. Though the objective of RSFF was initially to meet the structural needs of RDI financing, it also met anti-cyclical needs. The creation of the RSFF was therefore perfectly timed and its success actually greatly enhanced by the financial crisis. RSFF, which was originally designed as a demand-led, debt financing based programme for high risk activities such as RDI, suddenly appeared a particularly welcome risk crisis instrument greatly "facilitating" access to private finance for R&D intensive companies in Europe when banks were becoming hesitant in taking on board such risky investments on their own.

However, despite the successful rolling out of RSFF, private investment in RDI has been, and still is, well below the level necessary to achieve the goals set by the Lisbon agenda. Private RD investment as a percentage of GDP, represents no more than 1% as it did in 2000, half of what it amounts to in the US. Furthermore, the financial crisis has not just had a profound impact on the structure of the European banking industry with as a result a significant shift in risk aversion, it has also had a significant impact on the long term sustainability of public debt

in most Member States, resulting in severe pressures on the public funding commitment for RDI for at least the period up to 2013, the period the RSFF was initially designed for.

As a demand-led financial facility, RSFF funds complement first and foremost other sources of debt capital available for low to sub investment grade RDI intensive entities including large as well as small and medium-sized enterprises (SMEs), research infrastructures and universities and other public research institutions. In all cases, RSFF concerns companies, institutions or projects mature enough to demonstrate a clear capacity to repay debt on the basis of a credible business plan. Based on its own financial evaluation, the EIB assesses the level of financial risks and decides the value of the provision and capital allocation (for expected and unexpected loss).

The mid-term evaluation of the RSFF, which has only been operational for three years, highlights that the leverage effect of RSFF loans has been substantial. In this sense the facility appears institutionally well designed. The leverage on private funding achieved so far reached a factor of 14, triggering some € 16.2 billion of investments in RDI in Europe.



As a third part of the modelling exercise we propose a number of alternative scenarios, starting each time from the assumption that a similar amount of funds will be allocated towards FP8 over the period 2013-2020 as over the period of FP7, but allowing for different uses of the FP funds. The expert group on RSFF e.g. did propose that a substantially larger amount than the current € 1 billion coming out of FP7 would be devoted to RSFF in the near future under the FP8. The impact of those proposals will be simulated.