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CREST expert group report

on the design and implementation of national policy mixes

Policy Mix Peer Reviews: Synthesis Report

The report of the CREST Policy Mix Expert Group

Third cycle of the Open Method of Coordination in favour of the 3% objective

CREST

European Union Scientific and Technical Research Committee

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Executive Summary

The Peer Review Exercise

The main objective of the Policy Mix Expert Group in the third cycle of the Open Method of Coordination (OMC) was to conduct a **peer review process** capable of acting as an instrument of **mutual learning**. The specific aim of the process was to help countries better understand the policy mixes needed to raise R&D intensity by improving overall innovation system performance.

The six countries volunteering to be reviewed during the third cycle were **Belgium**, **Estonia**, **France**, **Lithuania**, the **Netherlands** and the **UK**.

The reviews were conducted by six teams, each composed of representatives from at least three 'examiner' countries, the European Commission and an independent consultant acting as moderator and rapporteur.

The six consultants involved were responsible for preparing **Background Reports** as an input to the review teams and, eventually, **Country Reports** reflecting the results of the peer review teams' discussions with senior policymakers and stakeholders in the review countries. These were then discussed in a series of meetings open to all members of the Policy Mix Expert Group in an effort to maximise mutual learning.

Finally, a separate **Synthesis Report** was prepared by another independent consultant and presented to CREST.

Generic Lessons

The reviews generated a series of generic lessons and recommendations of relevance to R&D and innovation policymakers in all Member States. In the interests of mutual learning, these are summarised below:

Science Base

- Although 'science-push' models are discredited, a well-functioning R&D and innovation system still needs a healthy science base. Neglecting it is not an option;
- Funding criteria in the science base should focus on excellence **and** relevance, especially when resources are scarce and there is a mismatch between scientific capabilities and socio-economic needs;
- Efforts to strengthen science bases and respond to fresh challenges often require the restructuring of scientific infrastructures and institutions. Resistance to such change is commonplace and contingency strategies are needed to overcome it. Greater stakeholder involvement in the policy formulation process is advisable.

Science-Innovation Links

- Policies to improve the interaction of actors in the science base and industry are vital. Measures customised to specific contexts should involve schemes to improve the interaction of existing actors and structural reforms involving the creation and strengthening of 'bridging institutions' or 'intermediary sectors'.

Industrial R&D and Innovation

- All countries should consider how best to sensitise existing SMEs to the benefits of accessing and performing R&D and devise schemes and framework conditions promoting R&D intensive start-ups in potential growth areas;
- Efforts to improve the innovation performance of industry need to focus on sophisticated awareness programmes emphasising the benefits of both technological and non-technological innovation; on support schemes for innovative firms; and on the creation of new start-ups, particularly high-tech start-ups;
- A focus on new start-ups is a reflection of the need both to rejuvenate existing industrial structures and to encourage structural shifts to more R&D intensive and high-tech sectors. Whatever the rationale, such a focus is now a policy imperative;
- All countries should recognise that improvements in innovation performance generate a demand for R&D and constitute an effective long-term strategy for raising R&D investment levels.

Human Resources

- The future supply of the human resources necessary for an R&D and innovation system to function effectively is a concern for all countries, irrespective of the strength of current supplies. All countries need to develop sound strategies to ensure that human resource needs are met in terms of both quantity and quality;
- Common educational needs across all countries appear to exist for more life-long learning, entrepreneurship programmes and a better balance between research and teaching activities across higher education institutions such that they complement rather than detract from each other. Increasingly, the need to have more courses taught in English is also becoming a prerequisite if mobility is to be encouraged;
- Many of the barriers to recruitment and mobility in the higher education sector (salary and pension levels, immigration policies etc.) lie outside the scope of R&D and innovation policy mixes. Policy prescriptions should attempt to lower or remove these barriers across a broad front and not focus too narrowly on single issues and initiatives.

Market Development

- All countries should explore the possibilities of R&D and innovation-friendly procurement policies and encourage win-win solutions when formulating and implementing policies in fields such as health, transport and environmental protection.

Governance

- Improving the coherence of policy mixes requires the adoption of a true 'systems' perspective in which all policy mix elements are seen as the legitimate concern of policymakers preoccupied with the health of the R&D and innovation system. All countries are thus urged to adopt such an approach;
- The efficiency and effectiveness of policy coordination mechanisms leaves much to be desired in many countries. There is thus a corresponding need for all countries to critically examine existing mechanisms and experiment with new and better ways of coordinating the formulation and implementation of policies;
- Inclusive policy formulation processes involving widespread consultations and foresight exercises should be used to imbue a sense of joint ownership in the strategic directions set for R&D and innovation initiatives.

Strategic Intelligence

- Building up and maintaining the capacity to use strategic intelligence tools such as foresight, technology assessment, benchmarking and monitoring and evaluation is an imperative for all countries;
- Another imperative is the need to ensure that the results of these exercises, particularly the results of programme evaluations, feed back into the policy formulation process.

Regional Issues

- The regional dimension is critical in many larger economies and, particularly, those with a federal structure. The main lessons to emerge concern the need to strengthen 'coordination and coherence' mechanisms across regions and between regional and national policy spheres in order to tackle 'generic' problems and realise the benefits of coordinated actions.

International Issues

- Governments are urged to explore more fully the opportunities and threats posed by developments such as globalisation and open innovation and to consider the policy responses they merit, including the possibility of joint initiatives with other countries;
- All countries should strive to find a balance between under- and over-dependence on EU policies and initiatives in R&D and innovation, ensuring that national priorities are not overwhelmed by EU priorities and that EU initiatives launched in the interests of the common good are not ignored.

Policy Mix Issues

- Most countries now employ a broad range of similar instruments. Care should be taken, however, that these are appropriate and customised to the needs of specific countries, and that their modes of deployment are rationalised and not the result of *ad hoc* accretion;
- A balance needs to be struck between the use of direct support instruments (grants, loans etc.) and indirect instruments (tax incentives etc.) after carefully weighing their advantages and disadvantages in specific contexts;

- A balance also needs to be struck between competitive and block funding in the science base. For many countries, raising the proportion of funding awarded via competitive processes would stimulate excellence and overall improvements in system performance;
- There is a need for more programmes and initiatives in the R&D and innovation system as a whole to be 'aligned' to societal needs and the specific directions set by funding bodies;
- There is an increasing need for countries to focus their efforts when devising policies to improve overall R&D and innovation system performance. The generic lesson for all countries, however, is that the choices involved should be made within the context of long-term strategies that foresee the balanced development of all parts of national R&D and innovation systems.

Specific Lessons

The reviews generated a series of specific lessons and policy recommendations for each of the six reviewed countries. Rather than summarise them here, however, the reader is referred to the relevant sub-sections of Section 3 of this report.

Next Steps

Based on the reception given to each of the Country Reports and to the final Synthesis Report, the general view of the Policy Mix Expert Group is that the peer review exercise should be repeated in the next cycle of the OMC if sufficient demand exists from Member States to be involved in the process.

If this is acceptable to CREST, the following modifications to the process should also be considered:

- Depending on the number of countries volunteering to be reviewed in the fourth cycle of the OMC, the arrangements concerning the use of external consultants to act as moderators, rapporteurs, facilitators, mentors and synthesisers may have to be adapted;
- The funding arrangements for the exercise also need to be simplified;
- The overall intention should be to keep the exercise light, with a continued focus on mutual learning and the involvement of high-level policymakers in the examining teams;
- The peer review missions to each country should be considered the true focus of the exercise, with the review and examiner countries benefiting from intensive mutual learning, while presentations of the Background Reports and the final Synthesis Report should provide an opportunity for more widespread mutual learning;
- During the fourth cycle, exchanging results and experiences with the parallel OECD peer review exercise would extend the opportunity for mutual learning;
- Finally, greater efforts should be made to ensure the speedy dissemination of the results of the peer reviews to a wider audience.

If CREST does not support the continued existence of the Policy Mix Expert Group, it should nevertheless contemplate:

- Exploring how countries still interested in conducting policy peer reviews with an emphasis on mutual learning can continue to do so under the auspices of CREST;
- Explore the demand within CREST for 'heavier' and more resource-intensive peer reviews of national policies and R&D and innovation systems, i.e. those aimed at producing critical and judgemental conclusions based on exhaustive analyses;
- Recommending that other CREST Expert Groups explore how 'mutual learning' peer reviews with a policy mix perspective (i.e. peer reviews that specifically look at the policy mix options available to resolve particular problems) can be used as a tool to promote mutual learning concerning other issues of interest to CREST;
- Using the series of generic issues raised in this Synthesis report as an input into CREST discussions about important future topics to be covered by the OMC process.

1 Introduction

1.1 The Aim of the Exercise

This document constitutes the third report of the Policy Mix Expert Group set up by CREST within the context of the Open Method of Coordination (OMC). The overall remit of the group is to encourage mutual learning amongst Member States concerning the policy mixes needed to improve overall R&D and innovation system performance. This is seen as a necessary step if the targets set by Heads of State at the European Council meetings of Lisbon (2000) and Barcelona (2002) are to be met.

The main objective of the Policy Mix Expert Group in the third cycle of the OMC was to build on a pilot exercise carried out in the second cycle of the OMC by conducting a peer review process capable of acting as an instrument of mutual learning within the context of the OMC. The aim of the peer review process was to help countries better understand the policy mixes needed to raise R&D intensity by improving overall innovation system performance. In contrast to conventional, resource-intensive peer reviews aimed at producing critical and judgemental conclusions based on exhaustive analyses, the emphasis in this 'light' exercise was to encourage the sharing of information about policy-related issues between senior policymakers and to generate generic lessons for the formulation and implementation of effective policy mixes.

1.2 The Countries Reviewed

The three countries reviewed in the pilot exercise[1] in the second cycle of the OMC were Romania, Spain and Sweden. In the exercise conducted during the third cycle, the six countries volunteering to be reviewed were **Belgium**, **Estonia**, **France**, **Lithuania**, the **Netherlands** and the **UK**.

1.3 The Process Involved

The overall process commenced with the self-nomination of the six 'review' countries and expressions of interest from a range of 'examiner' countries. This was followed by the appointment of a team of independent experts to act as moderators of the peer reviews and coordinators and mentors of the process as a whole. The next step involved field visits by the independent experts to the review countries and the preparation of a Background Report on each of them, utilising publicly available information updated and amended as necessary by representatives from the review countries. In turn, these reports were made available as background material to the examiner countries, in preparation for a visit to each review country by teams composed of representatives from at least three examiner countries, the European

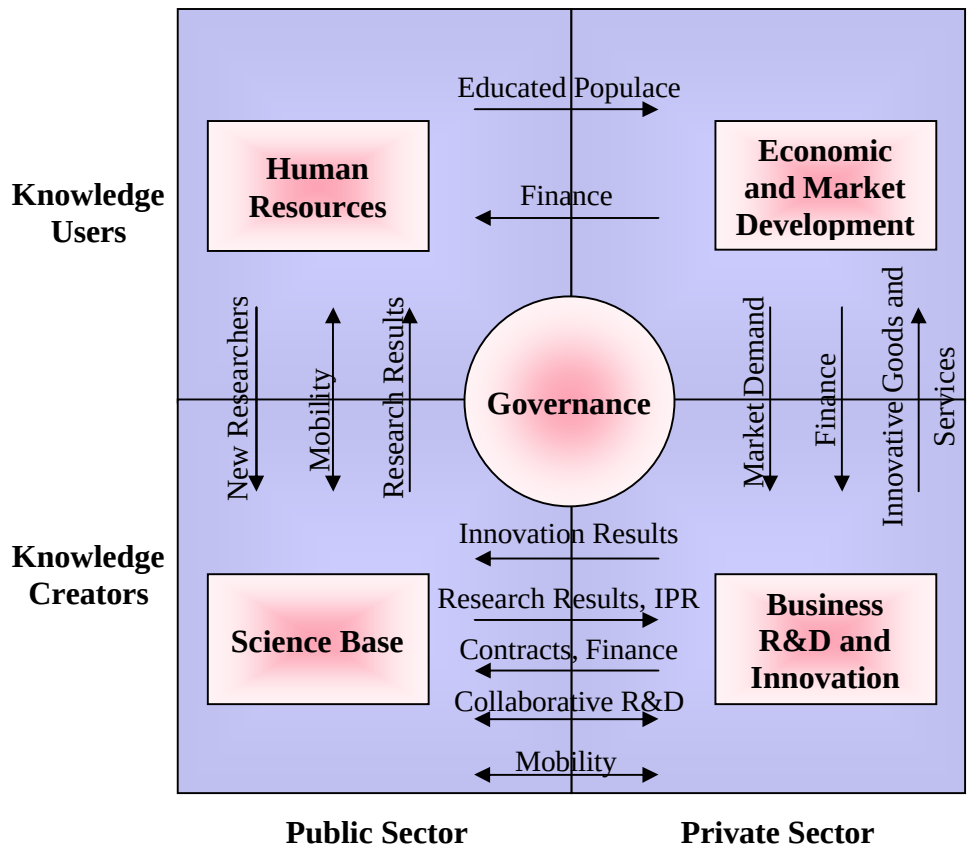
[1] CREST Expert Group (2006), Policy Mix Peer Reviews, The Report of the CREST Policy Mix Expert Group, Second cycle of the Open Method of Coordination in favour of the 3% objective, EUR 22096

Commission and the independent consultant acting as moderator and rapporteur. These teams held a series of discussions with a variety of R&D and innovation policymakers and key stakeholders in each country. The commentaries of these teams were then reflected in six Country Reports and discussed with the review countries in a series of feedback missions designed to report back key findings to senior policymakers, to validate the findings of the Country Reports, and to deepen understanding and mutual learning. All six reports were then presented and discussed by CREST representatives in a series of three formal Peer Review meetings in Brussels. Subsequently, the key issues to emerge concerning the formulation of effective policy mixes were summarised in this Synthesis Report by another independent consultant, discussed in a further meeting of the Policy Mix Expert Group in Brussels, and presented ultimately to CREST.

1.4 The Analytical Framework

During the course of the whole exercise, the simple analytical framework used in the pilot exercise in the second cycle of the OMC to link the different domains of an innovation system was once again used to structure both discussions and reports. Policy mixes were conceived as the aggregate of policies affecting four major domains: Human Resources; the Science Base; Business R&D and Innovation; and Economic and Market Development. The governance system linking policies in all these domains was also of central interest. The Exhibit below depicts all these domains and some of the more important links and flows between them.

Exhibit 1 A Simple Model of an Innovation System



Although innovation systems are typically much more complex than depicted here, this simple model provides a convenient way of visualising some of the more important domains within an innovation system and the relationships between them. It also provided a useful framework within which to ask questions during the peer review exercise relating to:

- The relative scale of the challenges nations confront both within each of the four innovation system domains and across them;
- The range of policy responses to these challenges and their 'location' within the innovation system, e.g. 'reinforcement' policies to strengthen particular domains such as the science base or business R&D and innovation, or 'bridging' policies designed to improve the links or flows between domains, e.g. policies to enhance university-industry interactions or to improve the flow of capital from capital markets to innovative high-tech firms and start-ups;
- The match between problems and policy responses within and across domains;
- The conflicts and synergies between policies within and across domains;
- The governance of policies within and across domains.

1.5 The Background Reports

Using the above scheme, the Background Reports concentrated on the major innovation system performance indicators in each domain; the major challenges facing each innovation system; the governance structures within which policies were formulated and implemented; major policy objectives and implementation strategies in each domain; and, if available, evidence of policy effectiveness.

1.6 The Country Reports

After the visits by the review teams to the six countries being reviewed, reports summarising the findings of the teams were prepared. These reports generally contained:

- Overviews of the six national innovation systems and policy mixes, based on the initial background reports and supplemented by material gathered on the visits;
- The commentaries of the six separate review teams on the policy mix in each country, with detailed coverage of the topics discussed during the reviews;
- A series of specific lessons for the formulation and implementation of effective mixes in each national setting;
- Lessons of particular relevance to the examiner countries.

1.7 The Synthesis Report

In this final Synthesis Report[2], Section 2 contains a comparative analysis of the R&D and innovation systems and policies of the six countries, based on a synthesis of the contents of the individual Country Reports. Section 3 then reproduces edited versions of the recommendations contained in the Country Reports for each of the reviewed countries. In Section 4, some of the broader generic lessons to emerge from the Country Reports are presented. Finally, Section 5 comments on the peer review process itself, summarising the lessons learned from the exercise and suggesting ways forward during the course of the next cycle of the OMC process.

[2] The information and views presented in this report reflect the available data and opinions of the review teams at the time of the peer reviews. They do not generally reflect subsequent changes in either the available data or the perspectives of the review teams.

2 Comparative Analysis of R&D and Innovation Systems and Policies in Six Countries

The analysis in this section is based on the six reports prepared by the review teams and the presentations made by the individual members of the review teams at the peer review meetings in Brussels. The background reports prepared for the review teams on the R&D and innovation systems in each country are also drawn upon. The material is presented under headings that correspond, for the most part, to the R&D and innovation system domains described in the last Section, to interactions between these domains, and to the balance of policy effort across domains.

2.1 Background Information

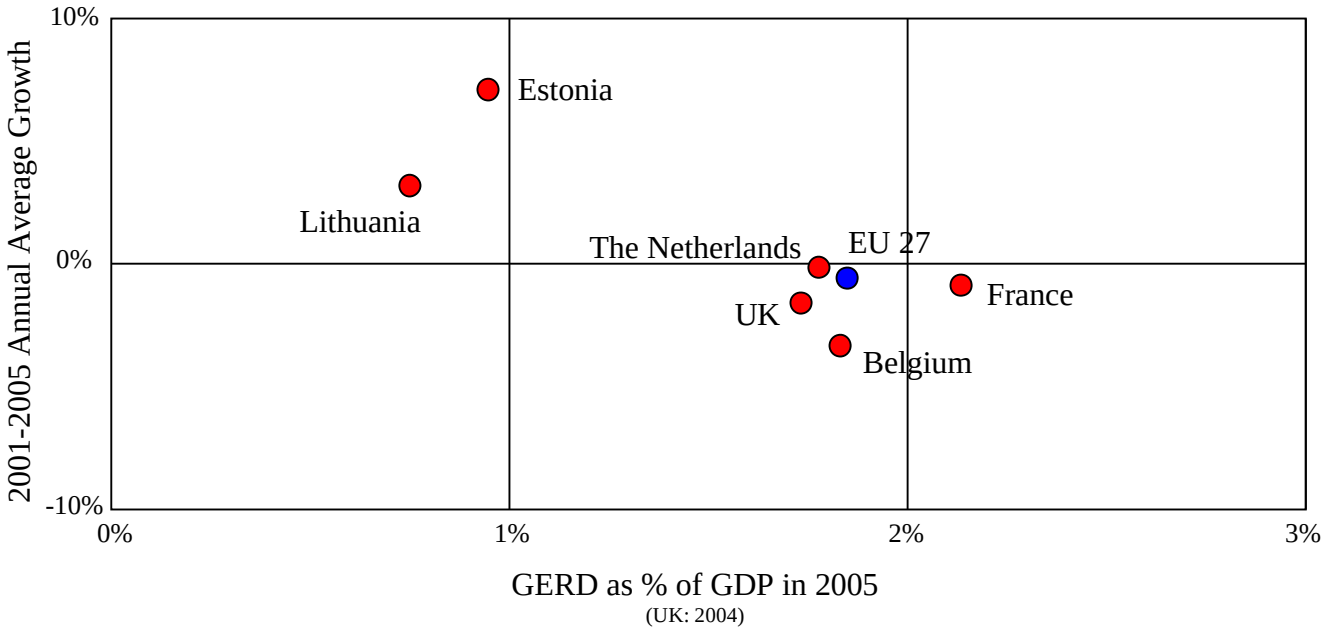
Exhibits 2 to 4 summarise the relative positions of the six reviewed countries in terms of Gross Expenditure on R&D (GERD), Business Expenditure on R&D (BERD) and trends in overall innovation performance, as evidenced by changes in the Summary Innovation Index (SII) developed by the European Innovation Scoreboard.

Exhibits 2 and 3 clearly show that R&D intensities in France, Belgium, the Netherlands and the UK are clustered around the average for the EU 27 in terms of both GERD and BERD, while those for Estonia and Lithuania lag behind. The growth rates for GERD and BERD in Estonia, however, are above average, while GERD is growing quickly in Lithuania but BERD lags behind (a function of rising levels of R&D investment in the public sector science base but not in the private sector).

Exhibit 4 depicts a similar situation in terms of relative innovation performance. None of the six countries fall within the group characterised as 'Innovation Leaders' (Sweden, Finland, Germany and Denmark are the EU countries falling into this group). France, Belgium, the Netherlands and the UK all have above average Summary Innovation Indices, but fall into the group of 'Followers' because these indicators are less than those in the leading group and all currently have slightly negative growth rates.

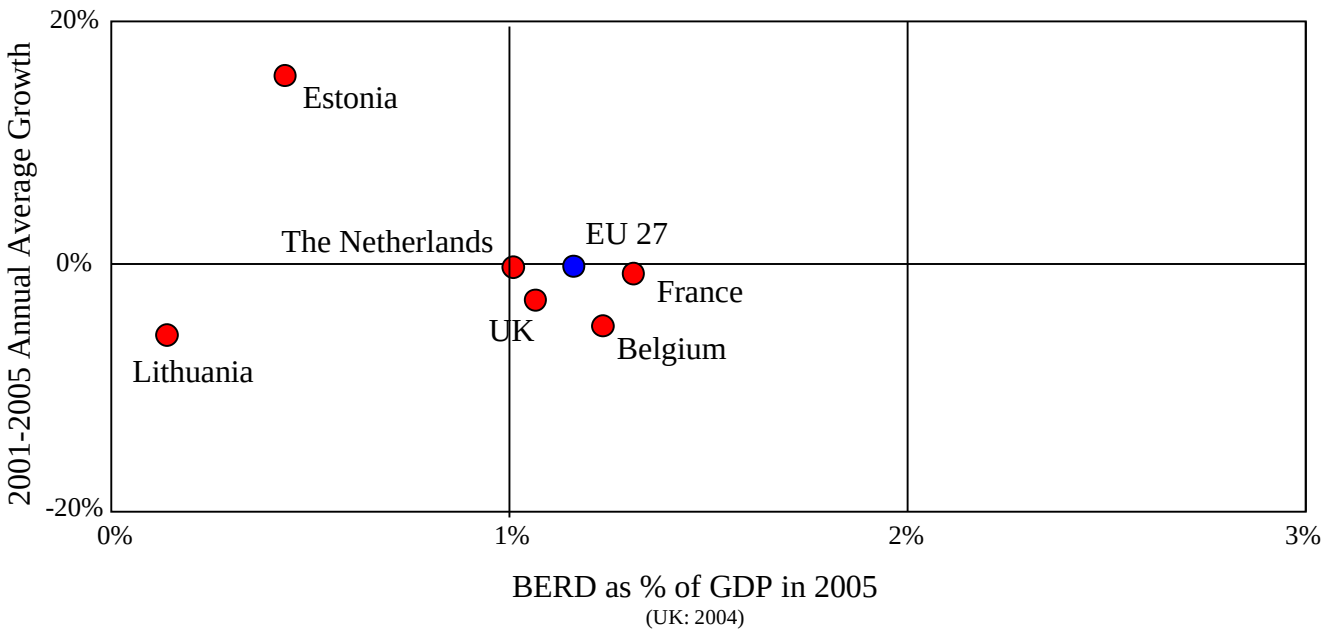
In contrast, the Summary Innovation Indices for both Estonia and Lithuania are below average, with Estonia in the 'Trailing' group and Lithuania, because of above average growth from a very low base, falling into the 'Catching Up' group.

Exhibit 2 GERD as a Percentage of GDP in 2005



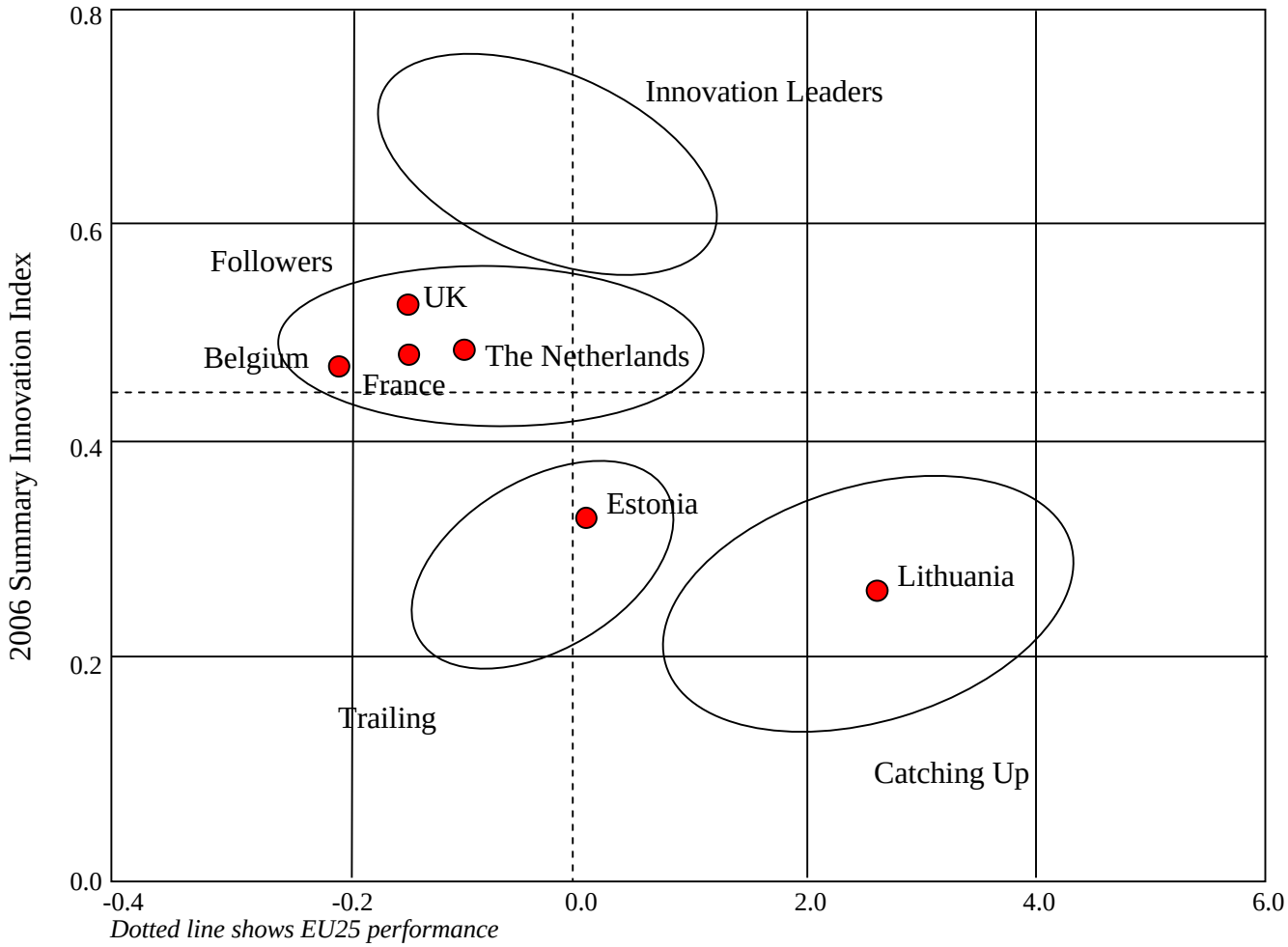
Source: Eurostat compiled by ERAWATCH

Exhibit 3 BERD as a percentage of GDP in 2005



Source: Eurostat compiled by ERAWATCH

Exhibit 4 Trends in the Summary Innovation Index



Source: Pro Inno European Innovation Scoreboard

2.2 Science Base

2.2.1 Strength and Spend

The relative strength of national science bases and the amounts available to spend either maintaining or improving them were natural foci of concern in the policy mix discussions. Even in a country such as the UK, where the peers were impressed by the performance of the science base, there was some concern that research spending as a percentage of GDP was still less than in its main competitors. In general, however, the strength of the UK science base and the focus on competitive funding regimes was praised. Even the scale of research funds awarded on an institutional basis to universities is in part influenced by the results of a national research assessment scheme. New government schemes to further develop the research infrastructure were also praised.

According to most indicators, the science bases of the Netherlands, France and Belgium are also above or close to average. In all three settings, however, a need to strengthen these science bases was recognised. In France, while public expenditure on R&D is above the EU27 average, expenditure on civil R&D is actually lower than average. In the Netherlands, there is currently a keen debate about the need for 'focus and mass', i.e. a need to focus expenditure on key research areas of scientific, social and economic significance and to build up critical mass in these areas. In Belgium too, the need for more public funding for research in priority areas is widely recognised in policy fora.

The need to strengthen science bases in Estonia and Lithuania, as evidenced by most relevant indicators, is far more acute than in the other countries. Performance is low and research spending needs to rise significantly if policy aspirations are to be met. There are signs, however, especially in Estonia, that public expenditure on research is increasing.

2.2.2 Focus and Mass

The debate in the Netherlands about 'focus and mass' has a strong resonance in some of the other nations. Whereas in the UK and France there is a primary and over-arching commitment to the concept of research 'excellence', in the other countries this is increasingly tempered (perhaps because of more limited resources) by an additional concern with 'relevance', particularly the need to focus efforts on scientific excellence and the development of critical mass in areas of strategic importance to the nation. Even in France, it is generally recognised that the science base is not adequately oriented to the needs of either industry or society. This is also the case in Estonia, where there is a weak match of academic specialisation and industrial competence, though in this setting there is also a genuine policy debate about the future orientation of the science base, i.e. whether it should be geared towards international research frontiers (excellence) or local needs (relevance).

2.2.3 Restructuring

The challenges nations face in terms of strengthening and focusing science bases are being met in many instances by efforts to restructure key elements of their scientific infrastructures. This is less marked in the UK (because of its relative strength) and the Netherlands (where the lack of conspicuous restructuring efforts are perhaps surprising in the light of the keen debate about 'focus and mass'). In France, Belgium and Lithuania, however, there is an increasingly shared recognition that low levels of competitive funding for research need to be rectified. The peer review teams for France and Lithuania suggested the need for something akin to 'Research Councils' to disburse funds via competitive schemes, and the Belgian and Lithuanian reviews also called for the international peer review of research proposals in the context of new and existing competitive schemes.

Concerning Estonia, the review team suggested the need for a modest restructuring of the institutional landscape, with more scope for a larger number of independent

Research Institutes (many of which had been incorporated into the university sector in the early 1990s). The plea in Lithuania, however, was for a more radical restructuring of the nation's institutional configuration, with an emphasis on the modernisation of the research funding system and the wholesale refurbishing of the national research infrastructure.

The review teams recognised that efforts to modernise and restructure science bases in an attempt to improve performance would be resisted in certain quarters. In particular, traditional (and often inflexible) university structures were thought to constitute a barrier to change in France and Lithuania, while the inflexibility of many Public Research Organisations in these countries was also considered to have an adverse effect on their ability to cope with rapidly changing contexts, particularly the need to respond effectively to calls for 'focus and mass'. In France, the introduction of laws affecting the autonomy of French universities is likely to improve the situation, but there may still be a need for even further reform.

2.2.4 Research Personnel

Many of the issues raised about the science base in the policy mix reviews focused on the supply and quality of research personnel. These are dealt with in a separate section on human resource issues. It is worth pointing out at this juncture, however, that the issue of 'rejuvenation' (via inward mobility) was seen as central to efforts to stimulate the science base in Belgium, whereas both inward mobility and efforts to stem actual and potential 'brain drains' (outward mobility) were considered crucial in the Lithuanian context.

2.3 Science-Industry Links

2.3.1 R&D and Innovation Paradox

The by now almost conventional concern in R&D and innovation policymaking circles regarding national manifestations of the 'European Paradox', i.e. a well-functioning science base but poor innovation performance, is apparent in all countries but particularly marked in the UK, Lithuania and, especially, Belgium, where 'valorisation' is a key policy issue. In these three settings, the need to resolve the 'paradox' is keenly felt and perceived as largely due to the relatively weak absorptive capacity of industry, rather than to any intrinsic lack of relevance of the science base to the needs of industry.

2.3.2 Orientation

In contrast, in the Netherlands and Estonia there is an additional concern that the science base is simply not oriented to the needs of industry. As noted earlier, the particular worry in Estonia is that there is little correspondence between the specialisation patterns of academic research and innovation competence in industry.

In the Netherlands, resolving the dilemma is problematic because there is no strong endorsement of the 'third way' within universities, i.e. universities prefer to stress their traditional roles of teaching and research rather than assume any responsibility to form links with, or to support, industry in the task of 'valorisation'. The peer review report for the Netherlands noted in particular that 'valorisation' activities in the public sector were in need of greater professionalisation, with specialist personnel rather than researchers responsible for 'valorisation' tasks. In Lithuania, the 'valorisation' problem is seen as a function of both lack of orientation of the academic sector and the weak absorptive capacity of industry. The situation is exacerbated by the lack of any entrepreneurial drive in the university sector to create spin-offs and the failure of IPR and spin-off regimes within the country to provide the requisite incentives.

2.3.3 Interaction

In policy terms, the need to strengthen university linkages is seen as a key step in improving overall R&D and innovation system performance. In the UK this is seen as the challenge of the 'missing middle', i.e. the need to bridge the perceived gap between research performance, which is generally seen as strong, and a weaker innovation performance. In France, Estonia and Lithuania, low levels of interaction between the actors in the science base and industry has led many recent policy initiatives to focus on increased and improved interaction between academic researchers and their industrial counterparts, whereas in Belgium the peer review team specifically recommended a shift in emphasis from support for single institutions and/or researchers to more schemes designed to foster academic industry linkages.

2.3.4 Bridging Initiatives

In fact, all countries have launched a range of initiatives to bridge the gap between the science base and industry. In the UK, initiatives are in place to encourage collaborative research; to encourage universities and Research and Technology Organisations to offer specialised support services to industry; and to encourage spin-offs from universities and public sector Research Institutes. In France, the peer review teams were impressed by the potential of the Carnot institutes (the French counterpart of the German Fraunhofer institutes) to promote science industry links; by a well-functioning incubator system that encourages spin-offs from universities and public sector research bodies; and by OSEO[3] Innovation, a scheme designed to support start-ups and SMEs with grants and soft loans at various points along the continuum from research to successful innovation. However, the peer review team also pointed to the relative lack of schemes equivalent to the technology programmes of TEKES in Finland, or to the many Competence Centre schemes to be found in countries such Sweden, the Netherlands and Austria, all of which place a very marked and tangible emphasis on the active collaboration of actors from the science base and industry.

[3] OSEO, a French agency providing assistance and financial support to SMEs in the most decisive phases of their life cycles, was formed in 2005 by bringing together ANVAR (the French innovation agency) and BDPME (an SME development bank).

In the Netherlands, there are many well-established research networks between many of the larger industrial firms and leading universities and academics in areas of traditional strength such as electronics and chemicals, though the existence of these networks is much less marked in some of the newer, emerging technology areas. Links between universities and SMEs are also weaker, but a recent scheme involving innovation credits for use by SMEs has attracted much attention and may well be worth emulating in other settings. The results of an ongoing evaluation that, amongst other things, is investigating whether the scheme induces non-transient behavioural changes amongst recipients, is keenly awaited. The Estonian policy mix review in particular considered that existing bridging schemes (e.g. a Competence Centre scheme and a spin-off programme modelled on the Finnish SPINNO programme) should be complemented by a voucher system for R&D comparable to the scheme in the Netherlands.

2.3.5 Bridging Structures

In some instances, more drastic structural changes may be necessary to forge the appropriate linkages between the science base and industry. The dearth of 'bridging institutions' specifically charged with attempting to close this gap was highlighted in the Lithuanian review, while the need for a leaner and more efficient intermediary sector was recognised in the Netherlands. In the UK, the review team suggested that the innovation system as a whole would benefit from a stronger Research and Technology Organisation sector, but it also suggested that a simpler, rationalised structure was needed rather than the addition of even more constituent elements.

2.4 Industrial RTD and Innovation

2.4.1 RTD Issues

Just as the strength of the science base is an issue in every national context, so too is the relative strength of industrial RTD and innovation performance. Concerning RTD, there is a broad disparity between the six countries involved in the policy mix peer review process in this cycle of the OMC, with BERD levels in Estonia and Lithuania far below those in the other countries. BERD levels in France, Belgium, the Netherlands and the UK are appreciable, though below average in the UK and the Netherlands, and concentrated in large national and multinational firms in high-tech sectors in all four countries, where RTD performance is generally good. In Belgium especially, BERD levels have recently declined and reaching the private sector component of the 3% Lisbon target is under threat.

In all countries, the need for government to stimulate private sector RTD levels is recognised and accepted. Given that RTD performance is generally sound in the large firm, high-tech sectors of the UK, France and the Netherlands, the main targets of

government efforts to **raise** RTD levels often tend to be SMEs[4], though France did set up an agency in 2005 specifically charged with supporting high-tech sectors in which larger firms are concentrated, and the 'cluster' policies of France and the Netherlands explicitly support networks of large and small firms. Support to firms is often in the form of direct measures to firms (grants, matching funds, loans etc.), though in the UK the number of firms in receipt of direct government support for RTD was considered by the review team to be quite low in comparison with some other countries, with greater emphasis placed on indirect support via tax incentives. Support for individual firms in the UK is also complemented by initiatives designed to effect structural change by improving the framework conditions necessary for the development of lead markets and more R&D intensive sectors in emerging technology areas. Longer-term change in the composition of national industrial structures is also implicit in the support for 'clusters' in countries such as the Netherlands and France[5]. In countries such as Estonia and Lithuania, where R&D intensity levels are generally low in all industry sectors, the problem is one of sensitising existing firms to the benefits of accessing and performing RTD whilst also encouraging the development of R&D intensive start-ups in potential growth areas.

2.4.2 Innovation Issues

2.4.2.1 Increasing Innovation

Although increasing R&D intensity in the business sector is perceived as an issue in all six countries, improving innovation performance is sometimes an even greater challenge. Certainly the peer review teams for Lithuania and Estonia considered that, given the generally low-tech composition of their industrial sectors, the primary emphasis should be on improving innovation performance and hence long-term absorptive capacity for R&D results rather than on more focused efforts to increase R&D intensity *per se*. In Lithuania in particular, the review team suggested the need for a much greater focus on innovation awareness programmes and technological service schemes. The Belgian review team also considered that more effort was needed to stimulate innovation, especially in the low-tech sector.

In some quarters, the issues of R&D intensity and innovation performance are specifically linked. The UK and the Netherlands in particular invoke a policy framework that treats R&D and innovation together rather than as separate entities, with improved innovation performance seen as a primary target which, if achieved, will have a positive effect on BERD levels. Despite the primacy of efforts to improve innovation performance, however, the peer review team for the UK noted the low percentage of firms in receipt of government support for innovation and suggested that efforts in future might involve raising outreach levels.

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[4] In all these countries, the main beneficiaries of R&D support initiatives tend to be the larger research-intensive firms, but because their R&D intensity levels tend to be high already, government efforts to **raise** overall levels of R&D intensity often target SMEs with lower R&D intensity levels or support the creation of high R&D-intensive start-ups.

[5] Enthusiasm for cluster policies has waxed and waned in the Netherlands, however, Although it was strongly supported in the 1990s, enthusiasm flagged early in the new millennium and has only recently been rekindled.

2.4.2.2 Improving Valorisation and Technology Transfer

In Belgium in particular, though also to some extent in the UK, 'valorisation', i.e. the translation of research into innovation, is seen as one of the major problems. This is not simply the translation by industry of the results of research carried out in the science base. It also includes the efforts of industry to transform its own R&D into successful innovations. Technology transfer, i.e. the successful adoption of technologies or 'innovations' developed elsewhere, is also seen as a critical issue in these countries.

In an attempt to improve 'valorisation', there is a requirement in some Belgian support schemes for funds to be dependent on a demonstration of intent to 'valorise' the results of R&D projects locally, i.e. within the Belgian economy. It was pointed out by the peer review team for Belgium, however, that this tended to act as a disincentive to participation and was likely to be counterproductive in the long-term, especially if it discouraged the formation of links between industry and external research performers.

2.4.2.3 Encouraging Start-ups

Within the long-term frame of improving the prospects for raising R&D intensity by encouraging structural shifts to more R&D-intensive and high-tech sectors, many countries are emphasising the need to encourage new start-ups. The countries involved in this peer review exercise are no exceptions. In France, for example, even though overall investment in innovation is low compared to some of its main competitors, there is still a plentiful supply of venture capital for start-ups and government support for these firms exists at various points along their growth trajectories. In Belgium, there are many schemes to encourage start-ups but, as the peer review team observed, some gaps for post-seed funding. In the Netherlands and Lithuania, the relative dearth of high-tech start-ups is a concern that has prompted calls for more schemes to stimulate their formation.

2.4.3 Sectoral Issues

Many of the options and choices confronting policymakers when considering 'focus and mass' issues in the science base are mirrored in the industrial sphere. For many countries there are real choices to be made in terms of supporting different types of technology, different types of firm, and different types of sector. Many of these are dealt with in a subsequent section dealing specifically with generic policy choices within overall policy mixes. Here we shall mention only options confronted by a more limited number of specific countries.

The most important of these is the balance between the civil and defence sectors, an issue of great pertinence to both the UK and France. Overall R&D and innovation performance is greatly influenced by the relative performance of these two sectors, with the performance of the defence sector contributing significantly to overall performance levels. Detailed discussion of the relative emphasis placed on the civil and defence sectors was out of scope during both the UK and France reviews, but a key issue in both settings is how government expenditure on both R&D and

innovation in the defence sector can best benefit R&D and innovation performance in the civil sector.

Another issue of interest to the UK, the Netherlands and (perhaps surprisingly) Estonia is the relative strength of their service sectors and how best to support R&D and, particularly, innovation within them (often 'non-technological' or 'soft' innovation). In all three countries, the peer review teams remarked on the lack of innovation support measures in place and the increasing likelihood that they will be needed.

2.5 Human Resources

2.5.1 Current Status

France and the UK both benefit from a good supply of science and engineering graduates. This is in marked contrast to the other four countries, where the pervasive view is that there is an inadequate supply of qualified scientists, engineers and researchers in particular. There is concern about future supplies in all countries, however. In the UK, low entry levels into research as a career and the low proportion of people in the general populace with 'intermediate' skill levels do not augur well for the onset of a knowledge-based society. It is no surprise, therefore, to learn that tackling human resource needs is seen as a major challenge, as it is in Belgium too. In France, there have been some concerns about the underfunding of the university system, with the peer review team noting in particular that industry appeared worried about the quality and relevance of PhDs. Concerns about quality suffering as the educational system expands without proportionate funding increases were also voiced in Lithuania, where the incentives to follow a career in research were also said to be extremely low.

2.5.2 Needs

The peer review teams highlighted a range of measures capable of fulfilling specific human resource needs in the countries examined. In France and Belgium, the need for a rethink of the responsibilities of academics in terms of the balance between research and teaching was called for. The perceived problem was that the teaching burden on academics wishing to do more research was too high. In contrast, the complaint in Lithuania was that the acts of teaching and research were too often carried out by different communities, with little apparent synergy.

The review team for Belgium outlined a number of other needs. These included the need to create more posts in both academia and industry for researchers, especially Belgian emigrants wanting to return to Belgium (in both instances the Belgian authorities were referred to exemplar initiatives in Spain); the need for the greater use of English within Belgian universities in order to attract foreign students and rejuvenate the science base; the need for more entrepreneurship programmes in universities; and the need to shift to life-long learning regimes. The latter was also

recommended by the Estonian review team, which additionally called for more research-based training schemes in universities. In Lithuania, the main pleas were for more entrepreneurship programmes (compare Belgium); the need for better links between industry and teaching as a further way of reorienting universities towards the needs of industry; a greater focus on vocational training; and, last but not least, better pay and conditions for academics and researchers.

2.5.3 Barriers

Some of the review teams pointed out potential barriers to the fulfilment of these needs. In France, the traditional rigidity of universities and public research organisations was seen as a barrier to both recruitment and mobility, though recent policy initiatives affecting the autonomy of these institutions could eventually alter this situation. In Belgium and Lithuania, barriers to university-industry mobility were mentioned in particular, and in Lithuania the retention of the practice of 'habilitation' (the requirement that PhDs have to prepare a further thesis in order to be able to commence teaching activities) was seen as both a diversion from such people undertaking research and a disincentive to follow academic careers in science.

2.5.4 Initiatives

In addition to pointing out human resource needs and potential barriers, most of the review teams also acknowledged the existence of a range of initiatives already in place to tackle human resource problems. In France and the Netherlands in particular, a number of such initiatives have been launched, including some aimed specifically at improving research career prospects. A number of mobility programmes aimed at attracting returnees have also commenced in the Netherlands, Belgium and Lithuania, though more will probably be needed.

2.6 Market Development

The simple conceptual model of a national innovation system used to inform the peer review process was deliberately broad enough to cover policies acting upon overall economic and market development, since many of these have indirect and sometimes fairly direct implications for R&D and innovation activities, the latter in particular. In the policy mix discussions during the six peer reviews, however, there was comparatively little coverage of such policies. The exception was the UK, which has a strong tradition of 'hands-off' policies and places a strong emphasis on liberalisation, deregulation and well-functioning goods and service markets. It is also in the vanguard of efforts to stimulate the demand for R&D via public procurement and initiatives promoting the development of lead markets. In comparison, the peer review reports noted that there were few such efforts in the Netherlands, Belgium and Lithuania, though the report on Estonia did view cluster developments as a way of stimulating the long-term demand for R&D.

2.7 Governance

2.7.1 Commitment and Direction

During the course of the peer review process, all the review teams were impressed with the importance attached to R&D and innovation in the host countries and the commitment shown to the realisation of policy goals in these areas. The strength of this commitment was particularly impressive in the UK – where, as noted earlier, a 'systems approach' to policymaking has been adopted in which R&D and innovation are seen as inextricably linked. This is also the case in the Netherlands, where the commitment to a policy direction epitomised by the slogan 'focus and mass' was also praised by the review team, though it was felt that this vision was not widely shared amongst all policy stakeholders and that a sense of urgency concerning its realisation was missing. In Belgium too, although there is an overt commitment to the Lisbon targets at the federal and regional levels, it was not clear to the review team that the strength of this commitment is the same across the regional authorities.

In France, the peers appreciated the fact that a new strategic direction and associated policy initiatives had been based on a keen awareness of the problems confronting France as it attempts to reform its national science and innovation system. There was a sense, however, that not all stakeholders within the research community were persuaded of the need for reform. This was the case in Estonia too, for although a 'systems approach' has recently been adopted, it was not readily apparent that this was widely appreciated by all stakeholders. One possible remedy for this, suggested by the peer review team, would be to build on recent foresight exercises and facilitate the greater involvement of different stakeholder groups, particularly industry, in policy formulation processes.

The peer review teams for Estonia and Lithuania noted the strength of the commitment in both countries to a transition to knowledge-based societies and to the 3% R&D targets (though not by 2010, given very low starting points). In Lithuania, there was a strong commitment to support for R&D and new science-based clusters, but less overt commitment to improved innovation and the absorptive capacity of industry. Similarly, in Estonia, although a commitment to improving innovation capacity was apparent, most public support was actually geared towards R&D and the science system.

2.7.2 Coordination and Capacity

The general comment in all but one of the countries was that although commitment was sincere and formal mechanisms in place to ensure the coordination of policy formulation and implementation across ministries and agencies, coordination was actually rather weak. In France and Estonia, for example, although high-level councils are in place to oversee matters, doubts were expressed by the peer review teams concerning their ability to provide the needed leadership and coordination. In the Netherlands, where similar criticisms of weak coordination were voiced, the

formation of a new 'Innovation Platform' does at least provide a potential way forward for a shared vision and greater coordination.

The problem appears more intractable in Belgium, however, given its complex political structure (one federal level, three regions and three language communities) and the split of responsibilities between them. The end result is that coordination is particularly weak across the Belgian regions, especially concerning problems of a generic nature. The review team did suggest, however, that there was scope for new, informal coordination mechanisms to complement strengthened formal mechanisms.

In Estonia and Lithuania, weak coordination is greatly exacerbated by a general lack of administrative capacity in the general sphere of R&D and innovation policy formulation and implementation. Both systems are expanding or set to expand, but both are constrained by these human resource problems.

The one country to escape mild censure for weak coordination was the UK, which was praised for its strong governance system. Unlike many other countries, the UK has not followed the recent trend to establish a high level council to ensure coordination. Instead, in June 2007, it designated a single ministry (the Department of Innovation, Universities and Skills (DIUS)) to take the lead in policy formulation spanning higher education, research, skills and innovation, albeit one with close historical links to both the research and innovation communities.

2.7.3 Restructuring

The creation of DIUS was accompanied by the announcement of a new Technology Strategy Board, an independent agency set up to administer support programmes. Although many countries operate with a ministry/agency structure dividing responsibilities for policymaking and policy implementation, this is a new departure in the UK. As noted by the peer review team, however, these changes are only the latest ones in a recent phase of restructuring characterised by the adoption of an holistic 'innovation systems' perspective and a desire to rationalise delivery instruments. Contrary to the trend of 'accretion' in many other countries, i.e. the continuous addition of policy instruments designed to fill gaps in policy portfolios, the UK has deliberately sought to streamline its delivery mechanisms. The need to rationalise in this way has also been recognised in the Netherlands.

A strong wave of restructuring is also apparent in France and in Estonia, which like France has seen the unprecedented launch of a raft of new structures and programmes in the very recent past. The need for change has also been recognised in Lithuania, which is also planning a new Technology and Innovation Agency.

2.8 Strategic Intelligence

Whatever the governance system, policy formulation has to be supported by sound intelligence, often delivered by so-called 'Strategic Intelligence' systems and instruments, which can include foresight exercises, policy reviews, benchmarking exercises, technology assessments and monitoring and evaluation exercises.

The status and functioning of strategic intelligence systems was a topic of discussion in all the peer reviews. The UK has a good, well-established system with a long track record in foresight and evaluation in particular, with the results of intelligence gathering operations feeding into an open, transparent and inclusive process of policymaking. A feature that especially impressed the peer review team was the long time horizon (ten years) for strategic planning. The team did note, however, that an evaluation of the UK's R&D tax credit scheme was perhaps overdue and eagerly awaited by other nations contemplating the greater use of such instruments.

The Dutch also have a strong evaluation culture and have been responsible for a number of potentially influential strategic intelligence exercises. Nevertheless a concern was expressed in the peer review that the results of some of these exercises did not seem to feed back adequately into policy formulation. A similar concern was voiced in France, where it was hoped that a new strategic intelligence system recently put in place would nullify these qualms.

In Estonia, there has been an extraordinarily rapid growth in strategic intelligence and policy development capability – a sign of its commitment to investment in R&D and innovation as a key to the door of a knowledge-based society. However, the increased budgets associated with this commitment, particularly for research, have put great stress on policy development capability in Estonia given the administrative capacity constraints mentioned earlier. The hope is that these limitations can be overcome, for there are still pressing tasks ahead, in particular the need to launch a foresight exercise to identify and mobilise industrial clusters worthy of support.

The peer review team for Belgium noted that each of the regions had good strategic intelligence capabilities, but that there was a demand, especially from industry, for the development of an over-arching perspective to encourage synergy, avoid duplication and signal potential conflicts across the regions. At present, the Federal level does not provide this, given that its responsibilities for R&D and innovation are limited to support for research for its own needs, space and nuclear power, international collaboration, R&D tax schemes and IPR regimes.

The situation in Lithuania lags behind that in the other countries. Strategic Intelligence capabilities are low and also hampered by limited administrative capacity. The need for strategic intelligence, on the other hand, is high, especially to establish priorities for the science base and to decide whether it should be aligned to international frontiers or local needs. The current foresight exercise is a step in the right direction, but only if mechanisms are in place to ensure that the results are taken into account when formulating new policies.

2.9 Regional Issues

The governance of an R&D and innovation system is inextricably linked to the overall governance system in place in a country. This is especially so in countries with a federal structure, with governance responsibilities divided between a federal level and largely independent regions or federated entities. In such countries, R&D and innovation governance systems can sometimes mirror overall systems (with each

region assuming responsibility for R&D and innovation policies affecting its own region and the federal level taking responsibility for issues that affect the nation as a whole) or divide responsibility in various ways (e.g. by according responsibility for R&D policy to the federal level and innovation policy to the regional level). Whatever the division of responsibilities, it is not surprising that discussions about relevant and appropriate policy mixes in such countries should be dominated by considerations of governance and policy coordination.

This was certainly the case in Belgium, whereas in the other countries there was scant coverage of regional issues. There was some discussion in the UK of the explosion of science parks that has occurred over the last twenty years, and of the scope that exists for regions to have a greater say in the determination of policies likely to stimulate innovation in particular. In France it was apparent that there was an overt political commitment to decentralisation, though signs also that this commitment had not been internalised in policy implementation spheres. But there was little discussion of the regional dimension in the other countries.

The R&D and innovation governance system in Belgium mirrors that of the overall governance system. Each of the regions has responsibility for both R&D and innovation activities within their own borders, with the federal level assuming responsibility, as noted earlier, for research relevant to its own needs, R&D and innovation in high cost, high-tech sectors such as space and energy, framework policies such as tax and IPR regimes, and international collaboration. Within this system, the main topic of concern discussed during the peer review process was not the coordination of policies within each region, but the weak coordination of policies across the regions. It was noted that the policy mixes in the separate regions were both different and, increasingly, diverging. In itself, such customisation is not a problem, but it was also pointed out that there were areas of overlap which, if tackled jointly, could avoid duplication of effort and create synergies. The problem, therefore, was that the (increasing) tendency of the regions to act autonomously negated any possibility of realising these benefits of coordinated action, especially since the federal level has no remit to formulate and implement policies tackling such 'generic' issues.

In such circumstances, the peer review discussions focused on the need to resolve this dilemma within the constraints of the overall political situation. As noted earlier, the review team commented firstly that there was a need to strengthen existing formal coordination mechanisms and to complement them with new, informal coordination mechanisms, and secondly that there was scope for the greater sharing of strategic intelligence between the regions. It was also suggested that the regions consider exploiting the 'common pot' and 'virtual common pot' mechanisms pioneered in the EU's ERANET scheme to fund more cross-regional initiatives, and to take fuller advantage of EU cross-regional initiatives as a way of creating synergies and accessing complementary assets.

2.10 International Issues

2.10.1 Globalisation, Open Innovation and Foreign Direct Investment

All regional and national R&D and innovation systems function within the context of larger international and global systems. Consideration of developments in these 'parent' systems should therefore provide the backdrop for policy discussions in all national and regional contexts. Within the context of the policy mix peer review discussions, it was apparent that all countries were aware of the elements that have come to epitomise the terms 'globalisation' and 'open innovation', e.g. changes in trade, investment and employment flows, the changing spatial patterns of production and R&D activities, and the increased interaction of global actors. Implicitly, therefore, considerations of the threats and opportunities provided by globalisation and open innovation did influence policy choices. In most settings, however, concerns with globalisation and open innovation primarily manifested themselves primarily in terms of discussions about foreign direct investment (FDI), especially FDI involving investment in R&D facilities.

The discussion in France noted that FDI in France was both decreasing and not oriented to research. In the Netherlands, Belgium and Lithuania, failure to attract and retain FDI related to R&D, despite efforts to do so, was also an issue. Estonia, however, had experienced high FDI recently and plans to attract even more via efforts to improve the science base. In the UK, the discussions in the policy mix reviews focused not only on the need to attract R&D to the country, which was recognised as a policy goal, but also the need to assist local firms to become key international players, even if this involved their locating some R&D outside of the UK. The two-edged sword of globalisation was fully recognised, but the UK stance is that an open economy is a strength, and that more benefits are likely to be derived from it than from vain attempts to isolate the UK from international developments.

2.10.2 EU Policies and Initiatives

All the countries reviewed are Member States of the EU. National (and regional) policies are thus likely to be influenced to a greater or lesser extent by EU policies and initiatives in the sphere of R&D and innovation. In the discussions of national policy mixes, it was quite apparent that EU policy thrusts such as the Lisbon goals, the 3% target, the drive towards the European Research Area (ERA), the rise of ERA-Nets and Technology Platforms and the use of Structural Funds to support R&D and innovation had all influenced national policy developments to a greater or lesser extent. This was most readily observable in Estonia and Lithuania, where Structural Funds in particular provide a dramatic opportunity for improving their national R&D and innovation systems. A warning note was sounded in the review of Lithuania, however, concerning the setting of policy goals. These should reflect national needs and priorities, the team warned, rather than just mirror the policy goals of the EU as a whole. The review report also suggested that a focus on involvement in science-

driven Technology Platforms should not be at the expense of involvement in more innovation-oriented platforms, and that the country should consider focusing on a limited number of key platforms rather than spreading resources too widely.

In the Netherlands, EU policies were discussed largely in terms of the compatibility of the ERA goals with the national emphasis on 'focus and mass', particularly in terms of the need to concentrate research resources and efforts in the university sector. This was also an issue in Belgium, though discussions here focused much more on how ERA-Nets and other EU initiatives might be exploited (or copied) to support cross-regional initiatives.

In both the UK and France, EU policies and initiatives did not figure appreciably in the policy mix discussions.

2.11 Policy Mix Issues

So far this section has focused on topics that relate to specific domains within national R&D and innovation systems (e.g. the science base, industrial RTD and innovation, human resources, and market development); to topics at the intersection of these domains (e.g. science-industry links); and to different aspects of the governance of these R&D and innovation system domains (with strategic intelligence and regional and international issues all having some bearing on governance). The remainder of this section focuses on policy mix issues that tend to span all these domains, namely the issues of:

- Breadth, i.e. the range of policy instruments included in a policy mix;
- Balance, i.e. the balance that exists between the different types of instrument used; and
- Focus, i.e. the different 'targets' of policies and policy instruments, be they actors, activities, technologies or sectors.

2.11.1 Breadth of Policy Mix

As an issue, this was not discussed at any great length in any of the countries. The review teams in the UK, France and the Netherlands all commented on and complimented the number and range of policy instruments within their respective policy mixes, with no apparent gaps in coverage and great interest in particular instruments (e.g. the R&D tax incentive schemes in the UK, the innovation voucher scheme in the Netherlands, and the Competitiveness Clusters in France). Conversely, in Lithuania there was some comment that the overall policy mix lacked any measures capable of having an appreciable impact on behaviour patterns in the science base. There was no specific reference to the breadth of the policy mix in the discussions in Belgium and Estonia. It is obvious from the background reports prepared for all the reviews, however, that all countries deploy an impressive range of policies, and that the main issue from a policy mix perspective is not lack of breadth but the balance between different types of instrument and the targets of these instruments.

2.11.2 Balance of Instruments

2.11.2.1 Direct and Indirect Measures

Issues concerning the choice between different types of instrument arose in the discussions in all countries. Most commonly these took the form of debates concerning the appropriate balance between direct and indirect support mechanisms for R&D performed by industry, i.e. between the use of direct grants, matching funds and loans to support R&D activities and the use of indirect fiscal or tax schemes of various complexions. In the UK, the discussions centred on the position of tax incentives as the central plank of public sector support for R&D in industry, a *volte face* from the position in the 1990s, when this instrument was not even part of the policy armoury. Moreover, UK policymakers are currently considering the use of further tax measures to encourage FDI.

These indirect measures are complemented in the UK by a comprehensive suite of direct instruments, but in the absence of any firm assessments of the efficiency and effectiveness of the tax support schemes (as noted earlier, the results of an evaluation are keenly awaited), the review team suggested that the UK might take a more proactive stance and shift the balance slightly more towards the use of direct instruments. In direct contrast, in most of the other countries, the tendency is to introduce more indirect support schemes, with France, the Netherlands, Estonia and Lithuania all either thinking of expanding existing schemes, introducing such schemes, or being urged to do so by their respective review teams. All of this suggests that current policy 'wisdom' is to hedge bets and "not put all one's eggs in the same basket".

2.11.2.2 Push and Pull Mechanisms

One contemporary issue in R&D and innovation policy circles is the relative balance between 'push' and 'pull' mechanisms in an overall policy mix. When discussing R&D, this translates roughly into mechanisms increasing the 'supply' of R&D, e.g. support for R&D projects in both the science base and industry, and support for mechanisms that increase the 'demand' for R&D, particularly within industry. Similarly, when discussing innovation, 'push' mechanisms provide support for innovation projects and 'pull' mechanisms stimulate the demand for innovations, e.g. regulatory reforms that require safer foodstuffs and medicines or more environmentally-friendly technologies.

This issue is discussed more in some contexts than in others. The policy mix discussions in the UK certainly focused on ways of creating new 'lead markets' and the role that innovation-friendly procurement policies could play in these developments. There was also discussion in Lithuania and Estonia of the need to develop the innovation capacity of industry and the long-term effect this would have on the demand for R&D (see later). But generally speaking, as noted earlier when discussing the lack of attention paid to market development strategies, there was little overt discussion of the balance between 'push' and 'pull' initiatives despite some of the efforts of the European Commission, amongst others, to raise interest in ways and means of increasing the emphasis on demand-side measures.

2.11.2.3 Competitive and Block Funding

R&D funding mechanisms within the science base tend to be a mix of 'block funding' to institutions, with institutions free to decide themselves on the subsequent disbursement of funds and allocations to individual institutions dependent on formulae and indicators of varying degrees of transparency; and 'competitive funds' awarded as the result of competitive processes, e.g. research grants to individual researchers or teams of researchers awarded on the basis of scientific quality and, occasionally, socio-economic relevance.

The exact balance between these mechanisms is often difficult to ascertain in any one setting, not least because many hybrid versions can exist. Advising on the correct balance between them is also difficult, because while competitive funding tends to promote excellence and block funding awarded on the basis of opaque criteria (and/or political favour) can induce complacency, too great an emphasis on competitive funding regimes can promote volatility and create instability in the research eco-system.

The peer review teams nevertheless commented on the balance between competitive and block funding in five of the six countries. In the UK, the comments were generally favourable, with praise for the competitive funding practices of the Research Councils and the incorporation of research performance criteria into the formulae determining the allocation of block funding to universities. In the other countries, the comments were less favourable. In the Netherlands, for example, the high proportion of funds awarded to universities on the basis of student numbers and the lack of any research performance criteria in the determination of these block allocations was criticised. In Belgium, too, a greater emphasis on competitive funding (up to 50% of the overall total) was urged, while in Lithuania the peer review team stressed that the funding of public research and higher education needed more competition-based elements, with less institutional funding for research and budget allocations for teaching based on performance as well as student numbers.

2.11.2.4 Aligned and Non-aligned Funding Modes

An important dimension along which funding mechanisms can vary is the degree to which the research performed has to be in line with the 'top-down' aims of the funders. The most obvious examples of mechanisms at opposite ends of the spectrum are R&D tax incentives, which can benefit all firms performing R&D irrespective of the nature of the R&D performed (non-aligned R&D), and R&D projects supported within the context of R&D programmes, where the projects have to be aligned to the overall 'top-down' aims of the programmes (aligned R&D). At first sight this might seem to be another way of distinguishing between direct and indirect modes of funding (see above), but mechanisms can vary along the 'aligned/non-aligned' dimension even within direct funding modes. Much funding of academic research, for example, takes the form of open calls for projects in a broad range of areas where alignment with the goals of the funder is not a prerequisite (other than the need to satisfy the requirement of research excellence). Such direct mode but 'non-aligned' funding is called 'responsive mode' funding in the UK and it differs dramatically from the type of 'aligned' direct mode funding that occurs within the context of R&D programmes with well-defined top-down goals.

Discussions during the peer reviews touching on the balance between aligned and non-aligned mechanisms tended to focus on the direct and indirect mode balance (see above) and the need to increase the emphasis on aligned mode funding in order to ensure that R&D is in line with industrial and societal needs. In the UK, there was general praise for the emphasis on excellence in the funding practices of the Research Councils in the science base (which for the most part disburse funds via the non-aligned, 'responsive mode' mechanism), but a recommendation for more 'programmatic' direct mode funding involving industry (see above). This need for a greater emphasis on 'aligned' funding modes was echoed in all the other countries too. In France, the Netherlands, Estonia and Lithuania, the call was for more programme funding and mission-oriented research to complement non-aligned funding for individuals and institutions in the public and private sectors, whereas in Belgium there was a particular plea for more programmes reinforcing science industry links. In all cases, the rationale was to ensure that a greater proportion of the R&D funded in the countries concerned corresponded to perceived national needs and priorities. There was also a call in all countries for a greater emphasis on cluster schemes linking different R&D and innovation actors in particular locations and hence serving the specific needs of these communities.

2.11.3 Focus of Instruments

2.11.3.1 Audiences

There is a debate in all R&D and innovation policy settings not only about the choice of different instruments and the optimal balance between them, but also about the 'audiences' and 'domains' upon which they should be targeted.

In terms of the membership of particular audiences, these can include R&D and innovation actors involved in particular scientific and technological sectors (information and communication technologies; nanotechnologies; life sciences etc.); in different sectors of industry (high-tech/low-tech; civil/defence; manufacturing/services etc.); and in different types of organisation (universities; research institutes; large MNCs; SMEs; start-ups; spin-offs etc.).

The relatively large amounts spent on defence in the UK and France inevitably led to some discussion of the balance between civil and defence activities (with both being urged not to neglect R&D in civil areas) and, critically, the need to search for synergies, especially in terms of the development of 'mutual use' technologies and cross-over from defence R&D to commercial applications in civil sectors. In terms of some of the other 'audiences', the UK was also urged to develop more programmatic interventions in key technology areas and industry sectors (see earlier); to reinforce its research institution infrastructure; and to increase its understanding of the role of R&D in the service sector given its importance in the UK.

A greater focus on key technology areas is also a central motif of current Dutch policy, although the peer review team did suggest that there was a need for the better 'profiling' and 'branding' of these areas if the right choices were to be made and the areas chosen were to attract foreign direct investment. Scarcity of resources also

underpinned recommendations in Lithuania for a greater focus on key areas, clusters and technology platforms.

In France, there was much discussion of the modernisation of universities and other institutions in the science base, but there have also been new policy initiatives to strengthen support for high-tech sectors (in which large firms dominate). The Agency for Industrial Innovation (AII), for example, was set up in 2005 to promote the development of industrial activities in the high technology segment.[6] The AII's mandate is to identify and select so-called Mobilising Programmes for Industrial Innovation (PMII) and to contribute to their funding. These large-scale programmes for industrial innovation are based on multi-disciplinary research and development and involve pre-competitive development activities.

There was a focus on support for SMEs, start-ups and spin-offs in all countries, and recommendations for increased levels of support in all these countries too. In France, Estonia and Lithuania, however, there were particular emphases on support for innovation in SMEs in traditional and/or low-tech sectors. In the latter two, the focus on SMEs in low-tech sectors was understandable, given that they dominate the industrial landscape.

2.11.3.2 Domains

In policy mix terms, policymakers can choose to focus policy instruments not only on particular 'audiences', but also in particular 'domains', using the term 'domain' in the sense it was used in the simple conceptual model of a national innovation system that guided the peer review process. This comprised four main 'domains' (the science base, industrial RTD and innovation, human resources, and market development).

In terms of the relative emphasis placed on policy initiatives in these different spheres and the balance of effort across the domains, the most important points to note probably concern:

- The primacy of human resource related problems and the need for concerted efforts to resolve them in all countries, irrespective of the relative strength or weakness of each R&D and innovation system;
- The relatively light emphasis in most countries on demand-side measures and policies to enhance market development;
- The tendency in some countries (the UK and the Netherlands in particular) to treat R&D and innovation as two sides of the same policy coin;
- The strong emphasis in most countries on measures designed to link the science base with RTD and innovation in industry;
- The tendency for policies in countries like Estonia and Lithuania to focus on the science base and high-tech sectors, while the recommendations of the peers advocated a much greater emphasis on support for innovation in industry and in 'traditional' industries in particular.

[6] There are also plans to merge the AII with OSEO early in 2008.

3 Specific Recommendations from the Peer Reviews

This section presents the lessons and recommendations emerging from the individual peer review reports for each of the six reviewed countries.

3.1 Main Lessons for the UK

3.1.1 Bridging Agencies/Instruments

The increasing variety of programmes and instruments for implementing research and innovation policies leading to 'knowledge-driven industries' often require the creation of a special, dedicated agency, which in many countries operates in close connection with those ministries responsible for science, innovation, industry and economic competitiveness. Historically, the UK has not had such an agency, but the peer review team considered that such an agency, separated but closely connected to the Department of Trade and Industry (DTI)[7], might well be needed for the management of programmes supporting the implementation of the UK's new Technology Strategy. The peer review team thus welcomed plans for the Technology Strategy Board to become such a body.[8]

The review team also considered that comparable bodies in other countries could serve as useful models against which to benchmark the activities of the Technology Strategy Board. Relevant examples from other countries include: Tekes (Finland); Vinnova (Sweden); and the more recent Agence de l'Innovation Industrielle (France).

3.1.2 Key Technological Research Needs

The existence of a gap between the science base and the R&D and innovation needs of the business sector, especially in relation to the development and demonstration end of the R&D spectrum, was clearly identified by representatives of both large and small scale businesses (the so-called "gap in the middle"). This seems to reflect a pressing need to reconsider the role of dedicated technological research institutes as public platforms for high-level technological services (thus complementing the 'third mission' of universities). It appears that, at present in the UK, such institutes are expected to evolve mainly in 'critical' areas (for example, energy or sustainable production and consumption, and also in areas such as measurement and standardisation in various technical domains).

There was some feeling that the research centres associated with former nationalised industrial sectors (such as energy, transport, telecommunications, etc.) had been lost

[7] The new Department for Innovation, Universities and Skills (DIUS) subsequently took responsibility for the R&D and innovation-related activities of the old DTI.

[8] The agency status of the Technology Strategy Board was formally announced in June 2007 after the peer review visit.

with the privatisation of these industries and the parallel privatisation of some of the public sector research laboratories in these areas. There may thus be a need to (re)consolidate the UK's network of technological research institutes in order to bridge the gap that seems to affect the business sector. This should be done in direct consultation with stakeholders from the UK's dominant and emerging industries, particularly the UK's industrial associations. It should also take into account relevant infrastructures of European interest (included in the European Strategy Forum on Research Infrastructures (ESFRI) roadmap).

It was also pointed out that several countries on the continent have a long tradition of supporting innovation in business either directly, through the funding of public/private joint R&D projects, or through the development of research institutions dedicated to applied research. Large companies as well as small and medium-size businesses take advantage of this support, which is provided, for example, in Germany through the Fraunhofer Gesellschaft and in Sweden through Vinnova.

However, the transformation of the Technology Strategy Board into a new self-standing agency may offer an opportunity to take advantage of this experience, perhaps by benchmarking some of the present practices in other European technology agencies. Furthermore, the new Energy Technology Institute could examine the experiences of similar agencies on the Continent (for example, the Commissariat à l'énergie atomique in France), or even the experiences of 'lead' institutions in other technological areas (e.g. institutions effectively in charge of the R&D 'roadmap' in their respective fields or sectors).

3.1.3 Regional Innovation and the Role of the Technology Strategy Board

At a regional level, while the UK's Regional Development Authorities (RDAs) provide a wide range of moderate scale instruments to support all forms of R&D and innovation activities at the level of individual businesses, with these activities performed either on their own or in collaboration with R&D organisations, the technology programmes associated with the Technology Strategy Board could potentially become highly appropriate platforms for developing multiple-actor collaborations and for instigating structural changes in the industrial fabric, through the strategic concentration of technological potential around the following areas:

- Technology areas with a clear, strategic focus on long-term sustainability in fields such as energy, health and transportation (including public transport and automotives), in which the DTI (now DIUS) could promote the creation of specific lead markets (in Europe) for new or highly innovative technologies. These could be developed through targeted public technology procurement policies and tailored public-private partnership instruments[9];
- Strongly and visibly integrated sectoral or regional clusters, which would promote the technology profiles and associated R&D agendas expected to have a major impact on the long-term development of the respective sectors/regions. These

[9] The pilot Innovation Platforms operated by the Technology Strategy Board perhaps address this issue and may offer an appropriate example.

could be delivered through competitions between technology programmes developed by the regions, tailored according to their specific needs, and identified on the basis of regional foresight studies. Relevant examples from other countries include: the Finnish Centres of Excellence programme in science, technology and innovation; the Swedish Competence Centres; and the German Inno-Regio Programme.

3.1.4 Evidence of the Impact of the R&D Tax Credit

The impact of the – relatively new – R&D Tax Credit will have to be assessed as soon as enough data is available. When designing the evaluation of this scheme, the UK should benefit from the experience of France. Two years ago, France started to assess the impact of its own research tax credit system, which was introduced at the beginning of the 1980s. In the methodology used, comparisons are made between the performance of two populations of companies: those that have taken advantage of the tax credit; and those that have not. Such a control group approach should be considered in the UK too.

3.1.5 Further Diversification

Despite the UK's large number of financial and fiscal instruments for stimulating R&D and innovation activities in the business sector, in particular in SMEs (with special emphasis on grants for R&D and R&D tax credit schemes), it might be useful to have an even further diversification of instruments through complementary alternatives such as:

- Tax incentives related to R&D incomes (for further promotion of the development of demand-driven, industry-led R&D activities);
- Tax incentives to attract major foreign R&D centres/activities;
- The wider and more popular use of both loan and capital instruments, including venture capital specifically for R&D and R&D-related activities.

In addition, the UK should consider placing greater reliance on direct support measures within the policy mix as a whole to avoid long-term harm to the national R&D and innovation system if indirect support measures prove less effective than postulated.

3.1.6 Broader Lessons/Suggestions

The UK should also consider:

- Providing more resources (perhaps through the Research Councils) for curiosity-driven, high-risk ideas which are neither goal-oriented nor immediately exploitable and, critically, not subject to the same accountability constraints as funding for more market-facing R&D (while maintaining an output and quality driven evaluation culture as a pillar of the national R&D and innovation system);

- Providing visible support to those players in the R&D and innovation system wishing to be involved in the take-up of new knowledge (with particular emphasis on strong collaboration schemes between industry and universities);
- Putting more focus on increasing the numbers of academics employed in private enterprises and the business sector by providing greater support for mobility schemes.

3.2 Main Lessons for France

3.2.1 Overall System

The readiness for reform in higher education and the research and innovation system in France is genuine and not only limited to government. It is being approached carefully and slowly, which in the long run may be more efficient than fast but not thoroughly thought-through changes. The reform, however, needs to be based on a general consensus that central authority and regulation have to be reduced in favour of more personal responsibility and more competitiveness.

Also, taking into consideration factors such as human resources, the size and potential of the country and its traditional role in world affairs, the peers felt that France ought to have very ambitious objectives and aspire to be among the five best performing counties in the EU and among the global innovation leaders. In their opinion, France should strive to achieve this goal in the medium-term.

Facing globalisation challenges will require more in-depth reflection on the different roles of French actors: government, research and innovation agencies, research organisations, universities and grandes écoles etc. and their respective relationships with large companies and, most importantly, SMEs. New instruments favouring concentration and critical mass are moving in the right direction, but a larger degree of flexibility and, therefore, autonomy is required if the system as a whole is to adapt quickly to changing circumstances.

Although total government funding for R&D is around 1% of GDP, funding of civil research is only 0.6%, which in international terms is low. Hence the need to increase funding levels for civil research is clear and undisputable. The potential of so-called 'dual use' R&D should also be further exploited. Moreover, despite the large absolute size of the French R&D budget, sooner or later a choice may have to be made as to what disciplines and areas to support.

3.2.2 Governance

The peer review team considered a model with two powerful and committed ministries sharing responsibility for research and innovation policy and working in partnership to be practicable, though only provided there is commitment and understanding of roles among the two. In order to improve these, formal coordination

channels like the Inter-ministerial Committee for Technical and Scientific Research (CIRST) should be strengthened.

Also, the effectiveness of the high-level consultation bodies (i.e. the High Council for Science and Technology (HCST) and CISRT) would be improved if communication with the Prime Minister were reinforced and streamlined through formal but also flexible channels.

3.2.3 Regions, EU and Internationalisation

The French government should de-centralise programmes, thus exploiting the potential of regions, while avoiding the 'fractalisation' of programmes (i.e. reproduction at a lower scale of the same policies and programmes). Specialisation in specific roles might be needed. For example, basic research could be the responsibility of the central government, while innovation promotion and innovation programmes could be under the leadership of regions. More generally, measures taken at regional, national and European levels need strong coordination.

France should also be more pro-active and aggressive in fostering the participation of the national research system in the Framework Programme. It should consider European funds as part of the domestic R&D and innovation budget and not simply as additional funds (while paying due regard to the issue of subsidiarity).

Finally, there is no denying that internationalisation of the French research and innovation system is a state priority. The Ministry of Foreign Affairs should be sensitive to this need by giving leadership to the Ministry of Research in matters of research, with all the necessary supervision. This would constitute a policy mix approach and would avoid the current compartmentalisation of responsibilities.

3.2.4 Science-Industry Linkages

The introduction of project-based funding via the National Agency for Research (ANR) was welcomed. However, the competitive part of funding for universities and large research organisations ought to be further increased, in order to stimulate universities and the large research organisations to become more interactive and entrepreneurial partners in a future knowledge-based society. In addition to scientific excellence, criteria for the allocation of research funds should, at least in some instances, include relevance and interaction with industry and society – an increasingly important task for universities and research organisations in knowledge-based economies. This is especially important for the large research organisations. The planned assessments of research units and organisations by the Agency for the Evaluation of Research and Higher Education (AERES) will certainly be valuable in this respect.

A system for the peer review-based assessment of the performance of universities and research organisations in their third-stream activities, including the utilisation and commercialisation of research results, should be implemented. Such an assessment system has been developed within CREST/OMC in Brussels.

With regard to linking science and industry, it is suggested that the Competitive Clusters initiative should be extended to emerging, research-based clusters, where universities and research organisations would take a more leading role and where government support would be vital. Last but not least, the importance of an efficient branding for Competitiveness Clusters should be considered.

Furthermore, it is suggested that financial restrictions, which affect the balance between loans and grants at OSEO, should be removed. Grants ought to be increased, especially to fund the first initial phase of commercialisation, which contains verification of commercial potential and technical performance and forms the basis for determining the choice of strategy for commercialisation. This is particularly important for research results gained in universities and research organisations.

The review did not explore the extent to which cooperation in international networks and markets exists already. But this is an important need in many countries and should be considered also in France.

3.2.5 Human Resources

As a more immediate response to human resource problems, flexibility should be introduced in terms of the proportion of their time that faculty members are required to dedicate to teaching and research respectively. For instance, the share could be calculated as an average across the whole work force of the university, which would allow greater specialisation in different roles (education, management, research).
In a more mid- to long-term perspective, the higher education system should be granted the necessary autonomy to develop its own strategy, as long as it is consistent with national policy. It is expected that a change in governance structures, in particular in terms of staff management, would alleviate some of the problems connected with human resources. However, this is a sensitive issue that might have repercussions for the whole research and innovation system.

3.2.6 Scientific Productivity

Project-based funding should be further increased until a 'healthy' balance between competitive funding and block grants is reached, as this should contribute to raising scientific excellence as well as enhancing efficiency in the public research system. This should make human resources more flexible. However, this will pose a significant challenge to overcome the inflexibilities inherent in the quasi-civil servant status of researchers. Scientific excellence will have to be the prime factor in the career advancement of researchers in order to compete effectively in a globalised world.

In order to alleviate the transition from the present contracting regime to a more project-based regime, a feasibility study should be commissioned that explores the possibility of an independent funding council model, perhaps aligned with AERES.

3.2.7 Evaluation and Policy Learning

In order to learn from previous policies, formal procedures linking policy evaluation to policy design and formulation should be put in place.

3.3 Main Lessons for the Netherlands

3.3.1 Overall Strategy

On overall R&D and innovation policy strategy and the position of this in policymaking, the reviewers made the following recommendations:

- First of all, R&D and innovation policy should remain high on the political agenda as it remains a cornerstone of economic development. Continuation of a co-ordinating body such as the Innovation Platform (IP) is an important step in this direction. The inclusion of the Finance Ministry as one of the stakeholders will help with the implementation of the IP's plans;
- In various areas, e.g. education; the structure of the research system; public attitudes to risk and entrepreneurship etc., it seems that there is a need for fundamental change in the system. To quote Aho[10] on the actions proposed in his report:

  > *"The opportunity to implement the proposed actions will not be available for much longer. Europe and its citizens should realise that their way of life is under threat but also that the path to prosperity through research and innovation is open if large scale action is taken now by their leaders before it is too late."*

- All actors should therefore be aware of the sense of urgency implicit in this view and the fact that the problems of Europe (and the Netherlands) cannot be solved by simply adding more money into the system. It will also require steps aimed at making the system and its inter-linkages work better;
- In areas with a potential for public private partnerships and industry-oriented research, more efforts should be made to focus on a few priority areas where critical mass in R&D and innovation can make a difference. This needs better coordination between all the actors engaging in these prioritisation exercises;
- There should be a better branding of these priority areas and the creation of an attractive international profile to attract Foreign Direct Investment (FDI).

[10] The Esko Aho Report (2006), "Creating an Innovative Europe".

3.3.2 The Dutch Policy Mix

Regarding the mix of policies, the following recommendations were made:

- In terms of the mix of policies, the Netherlands has a broad package of instruments addressing the key challenges. An area where more efforts are perhaps needed is overall support for new business start-ups and entrepreneurship;
- Despite existing initiatives and programmes, more effort should be made to interest young children and youngsters in science and technology and to address the shortage of skills in general. This could be complemented by initiatives to stimulate creativity. Although policy instruments are in place, their size and scope do not match the urgency of the problem as presented to the review team during its visit. The level of effort needs to be stepped up. To address skills shortages, one effective measure suggested by the peers was the gradual introduction of a quota system directing students towards academic fields where there are shortages.

3.3.3 The Science System

The science system, and in particular the interaction of the science system with the business R&D and innovation system, needs reinforcement. The following steps should thus be considered:

- The Dutch innovation system needs better co-operation between the various actors in the science system and better coordination of efforts to reinforce the linkages between the science system and the system for industry-oriented research. In addition, the Dutch ministry in charge of research should build a strategic research agenda to guide the decision-making of the thirteen universities concerning the allocation of institutional funding. A more strategic approach (e.g. involving better vision and priority setting by government, increased collaboration with European partners in world class research partnerships, strategic alliances with industry in specific fields etc.) should help counter the fragmentation of Dutch science and ensure its results are better exploited;
- A larger share of the funding for public research should be based on the criterion of research quality. Research assessment practices with consequences for funding allocations should be used more extensively;
- Fewer and better-financed knowledge brokers, business facilitators, incubators, science parks and seed funding facilities are needed to link science to business. More needs to be achieved in terms of knowledge transfer, the creation of spin-offs and researcher mobility between universities and industry;
- Valorisation of public research and technology transfer should be professionalised. More people with a business background should be actively involved in the process or act as intermediaries. A streamlined array of better-supported intermediaries would add clarity and improve efficiency. This should go hand in hand with an active stance concerning the ‘third mission’ of the universities;

- The pro-active use of existing IPR rules and frameworks by Dutch public research organisations should be reviewed, in line with the aim of professionalising overall valorisation.

3.3.4 Ministry Agency Relationships

One recommendation concerning governance relates to the relationship between the SenterNovem agency and its corresponding ministry:

- A more flexible relationship between SenterNovem and the Ministry that allows the agency an opportunity to develop and experiment with new instruments would be beneficial.

3.3.5 Good Practice Exemplars

A number of practical examples were put forward that could serve as an inspiration for Dutch R&D and innovation policy:

- The UK system of rewarding the highest performing university departments via its Research Assessment Exercise (the assessment of performance is also likely to include a measure of valorisation activity in future) does seem to result in focus and mass, though adoption of such a system could raise other issues, e.g. the viability in research terms of universities outside the top 20;
- The UK's experience with its Technology Programme Innovation Platforms, two of which are currently being piloted, could be of benefit to the Smart Mix programme in the Netherlands. Further information about the Technology Innovation Platforms can be found at:

  www.dti.govuk/innovation/technologystrategy/innovation_platforms

- The Dutch authorities might also benefit from the UK experience with employer-led government programmes like 'Train to Gain', which aims to increase the level of skills in the workforce;
- The UK's plans for foreign investment, as published in the DTI's five-year strategy in early 2007, and the foreign investment strategies of Sweden could be of great interest to the Dutch Foreign Investment Agency, since they are all based on exploiting existing R&D and innovation strengths.

3.4 Main Lessons for Belgium

3.4.1 General Recommendations

The internationalisation (globalisation) of the R&D and innovation landscape and the challenges it presents should occupy a more prominent position on the national policy

agenda, with policymakers at federal and federated levels having a common understanding and a shared vision of the steps needed to meet these challenges.

Belgium occupies a central socio-economic and political position in the EU and has an open economy, based upon a century-long tradition of international trade, in which there is a high representation of multi-national companies (MNCs). Framework conditions capable of attracting and retaining international companies are thus crucial. Consequently, Belgium should further increase its efforts to raise the profile of favourable framework conditions for R&D and innovation on the EU policy agenda.

3.4.2 Coherence and Cohesion

Discussions between the review team and different stakeholders in the Belgian system clearly demonstrated agreement on the need for more policy orchestration and the use of a truly 'systemic' view involving all stakeholders at the levels of the federal authority and the federated entities. Such an approach would allow the overall R&D and innovation system to respond to challenges more appropriately and enable individual stakeholders to take better advantage of the opportunities provided. As a result, 'win-win' situations for all actors could be realised. More precisely, the following actions could/should be considered:

- Develop a common vision, via an actor-driven approach, concerning ways of optimising and fine-tuning the policy mix within the existing socio-political and institutional setup. In addition, common goals should be defined and pursued concerning the opportunities offered for valorisation in a globalising environment;
- Consider the extent to which current formal co-operation and advisory mechanisms could be used as fora to orchestrate and create more intra-Belgian policy coherence (e.g. via a discussion of strengths and weaknesses). A redefinition of the roles of these fora could be considered;
- Establish task forces (similar to the task force covering the Belgian automotive sector) involving the federal authority and all the federated entities in order to analyse specific issues hampering the effectiveness of the policy mix for the actors involved, e.g. the increasingly divergent sets of funding mechanisms and instruments in the different entities;
- Establish special ad-hoc panels to address international challenges, e.g. the attractiveness of Belgium as a location for international R&D activities;
- Further clarify the competences within the federated entities and the linkages between them, in order to make the R&D and innovation landscape more easily understood by all the actors within the Belgian R&D and innovation system.

3.4.3 Priority Setting and Policy Development

Recommendations in this sphere include the following:

- Establish knowledge sharing platforms at an overall Belgian level. These would help define and fine-tune an appropriate policy mix. Such platforms could also

monitor progress towards the achievement of a common vision and common goals;[11]

- Foresight activities and prospective analyses support the definition of R&D and innovation priorities at the level of the federated entities, but not at the level of the federal authority. In view of the contribution of these activities to the success of science and innovation policies at the community and regional levels, the federal authority level should consider establishing similar activities, especially foresight activities spanning Belgium as a whole;
- The research proposal selection mechanism should make more use of international peer reviews as a way of ensuring international excellence, even if this means that more proposals will have to be submitted in English;
- Evaluation should be better integrated into policymaking mechanisms at all levels This should include mid-term as well as ex-post evaluations in order to facilitate timely adjustments. Transparency, learning and international openness are crucial elements of such evaluation systems. Furthermore, evaluation should move away from analysing direct outputs and shift towards the analysis of longer-term effects and impacts;
- Additional measures should be taken to further increase the internationalisation of Belgian R&D. Efforts should include the setting up and promotion of either bilateral or multilateral cooperation programmes with selected countries in order to face global challenges (climate change, health etc.).

3.4.4 Excellence in Public Research

A higher degree of competition for public research funds would stimulate excellence. Denmark, for example, plans to increase the proportion of funds awarded via competitions to 50 per cent of all research funding by 2010. Moreover:

- Grants should be both substantial and long-term, since these factors enable universities to develop stable, long-term strategies to boost knowledge capacity;
- Research grants should cover all costs. The rules for research grants allocated on a competitive basis should be revised, with grants covering the full costs of the institution. This should also be the case even if private industry is co-financing the projects.

There is a general need for concerted programmes aimed at fostering trans-community/regional co-operation between both public and private sector research teams. Such concerted programmes could be funded either by the federal authorities, with selection organised at a community/regional level in the same way that the Belgian Inter-university Attraction Poles (IUAP) scheme[12] operates, or by using the 'virtual common pot' principle successfully tested within the EU's ERANET scheme, in which each community/region would fund its own participants.

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11 The Policy Support Centres in Flanders, for example, could monitor progress towards the achievement of global challenges across all the regions.

12 This was an initiative set up at the federal level to promote collaborative research between universities across the regions and the communities.

Belgium should make strenuous efforts to realise the Barcelona goal of 1% of GDP for the public funding of research by 2010. In relation to this, the Belgian authorities should:

- Reinforce fundamental (basic) research, especially in view of the increasing need to support and strengthen research infrastructures and provide the equipment necessary to carry out excellent research;
- Strengthen and extend existing policy measures providing long-term financing for excellent research groups;
- Set up concerted measures to provide support for large-scale research infrastructures;
- Support basic and applied 'strategic frontier' research.

3.4.5 Education and Training

Bachelor and Master courses taught in English are rare in Belgium, yet these are a prerequisite if the intention is to attract foreign students and professors. If this is the case, the experience of other countries suggests that 25% to 50% of Bachelor and Master courses could be offered in English within ten years. Such a shift would also facilitate cross-community cooperation within and beyond the Belgian R&D and innovation system. If language laws are prohibiting or limiting the use of English in Bachelor and Master courses, these laws deserve to be reconsidered in the light of missed opportunities.

In relation to the challenge of 'life-long-learning', Belgium should consider opening new universities with 'life-long-learning' programmes paid for by companies or even by the students themselves. Such a move would further stimulate the dissemination of knowledge within society.

3.4.6 Scientific Careers and Mobility

Grants rewarding the best PhD students with post-doctoral fellowships or professorships should be made available, and the best performing post-doctoral fellows and professors should be rewarded with higher salaries or bonuses, with part of their salaries related to performance assessments based on quality of research and levels of cooperation with industry. Greater flexibility in payment policies at universities would also allow universities both to attract new staff from other countries and retain high quality Belgian researchers and lecturers.

Special attention should be paid to the capacity of Belgian universities and public research organisations (PROs) to create stable positions for incoming researchers. At present, public funding appropriations for universities are mainly determined by the number of students, rather than by the amount of researchers or the quality of their performance.

Since the Belgian industrial fabric is dominated by low and medium-tech SMEs, few have research units capable of attracting academic engineers or researchers.

Initiatives designed to encourage the flow of researchers from academia to industry via the creation of appropriate positions in industry should therefore be strengthened.

3.4.7 Valorising Research and Technology Transfer

One important way of increasing the attractiveness of Belgium to international technology firms is to develop further the excellence and international ranking of university research. This involves increased funding for basic research, but also efforts to raise the profile of Belgian research on an international stage.

In addition to attractive science bases, the locational decisions of MNCs can be influenced by fiscal measures, including tax reductions for direct R&D investments, R&D labour and sales of 'new to market' and 'new to firm' products and services. Measures such as these help increase a country's attractiveness to R&D intensive MNCs. Actions facilitating the creation and reinforcement of MNC's subcontracting chains would also be helpful.

Greater efforts should be made to constitute a policy mix tailored to the needs of different business audiences, especially SMEs in traditional sectors. This mix should contain:

- Direct subsidies with conditional loans to carry out research projects;
- Support mechanisms offering specialised consultancy services (e.g. international project management, technological surveillance etc.);
- Awareness campaigns sensitising traditional and low-tech SMEs to the benefits of accessing, applying and performing R&D;
- Direct subsidies enabling low-tech SMEs to hire engineers and researchers or to use high-tech SMEs as mentors or exemplars of good practice.

Measures of this nature already exist to some extent in Belgium, but they need to be strengthened if Belgium is to increase the absorptive capacity for R&D and innovation amongst traditional SMEs.

Reward schemes in the form of salary increases or bonuses for researchers in universities and research institutes winning research contracts from either public or private sources would help resolve the problem of low salaries for staff in these organisations. In particular, schemes rewarding links with the private sector would have a beneficial impact on knowledge exploitation.

Public co-financing of the participation of private sector and public sector bodies in international research programmes and cooperative initiatives should be encouraged. In particular, some of the opportunities for co-financing offered by the EU Framework Programme should be considered by the federal authority and the federated entities.

Public co-financing of cross-community and cross-regional R&D and innovation initiatives involving universities, public research organisations (PROs) and other knowledge institutions (including private sector organisations) should be stimulated.

Existing programmes to promote the creation and early stage growth of new technology-based firms (NTBFs) should be evaluated and, if necessary, strengthened. Measures to stimulate entrepreneurship amongst researchers and professors should include mechanisms safeguarding their academic positions if their efforts to set up spin-offs flounder.

3.5 Major Lessons for Lithuania

3.5.1 General Principles

The starting point for all subsequent policy measures should be a thorough discussion of the form and nature of the Lithuanian R&D and innovation system and the roles played by government, researchers, businesses and other actors. A strategic vision and a set of broadly agreed principles concerning the specific profile of the country in terms of innovation, business location, the role of public science for industry and the responsiveness of the science and education system is needed to guide a dynamic process of transformation. Industry in particular should be involved in these discussions and the setting of a strategic vision, which in turn should lead to a stronger focus on traditional industries and services and their innovative potential.

The experience of the UK suggests that remuneration and reward schemes for Lithuanian researchers should be tied to performance improvements and changes in behaviour likely to enhance the conditions for innovation. The allocation of funds to research institutions should also depend in part on assessments of performance.

As a general principle, the aims and objectives of all major initiatives such as tax incentives and technology platforms should be clearly stated and agreed in conjunction with all major stakeholders, with these actors involved in the policy formulation process from the very early stages.

Policy coordination needs to be improved between ministries. The Science, Technologies and Innovation Development Commission, established in 2002 and relabelled in 2005, was formally chaired by the Prime Minister and co-chaired by the Minister for the economy and the Minister for science and higher education. Recently, however, this body has not functioned. Rectifying this would improve the prospects for coordination and send an important signal to all stakeholders concerning the importance of R&D and innovation. The involvement of the Prime Minister would also improve the profile of R&D and innovation in the country and help improve coordination.

In addition, in order to make coordination more sustainable and less vulnerable to shifts in overall political priorities or external events, a focus on building links bilaterally or multilaterally between Ministries should not be overlooked.

3.5.2 Concrete Actions

The availability of money from the Structural Funds to support the development of R&D and innovation infrastructures presents an enormous opportunity for Lithuania to develop both its structures and its policy mix. One important step will be to build up the capacity of the policymaking and implementation system, since administrative capacity constraints are a current handicap. It is recognised, however, that this will be a long-term project given the scale of the task and personnel scarcities.

In the short-term, the aim should be to create specialist agencies for the organisation and implementation of basic and application oriented funding (Research Council and Technology Agency models respectively), as well as efforts to improve strategic intelligence capabilities and the feedback loops into policy formulation. This would allow policymakers to concentrate on design and strategy. However, it will be important not to 'cut and paste' models in use elsewhere without further customisation. The aim should be to learn from good practice elsewhere and adjust the models chosen to the Lithuanian context.

In terms of strengthening the relevance of science-driven activities to innovation and the economy in general, there needs to be a strong engagement of knowledge users in priority setting and the formulation and implementation of relevant measures. Impacts are likely to be mid- to long-term rather than short-term, however, as learning and the build up of absorptive capacities in industry all take time.

The policy framework needed to encourage the mobility of researchers in the public science system and foster an entrepreneurial culture leading to the formation of spin-offs and the exploitation of intellectual property needs to be improved. Changes of this nature involve cultural change and typically take a great deal of time. In the short-term, however, actions can be taken to kick-start and catalyse these changes. One important step would be to clear up the legal issues surrounding university spin-offs and IPR within public institutions. In concrete terms, allowing universities, institutes and individual researchers to have a share in IPR and to benefit from the formation of spin-offs would stimulate exploitation and commercialisation.

Within the public science base, there is a need for the rationalisation and consolidation of the existing institutional configuration in order to provide a stronger focus on high quality teaching and make publicly funded research more responsive to the needs of industry and society in general. As any reorganisation of this nature would almost inevitably lead to either the fusion or termination of institutions, the peer review team recommends, as a first step, an independent benchmarking exercise conducted by international experts. Moreover, this review should be conducted as soon as possible.

There is also a need within the public science base, especially within universities, for modern governance structures, with greater accountability and more effort devoted to strategy formulation and implementation. This should involve giving external stakeholders a greater say in the development of these strategies.

The funding of public research and higher education needs more competition-based elements, with less institutional funding for research and budget allocations for teaching based on performance as well as student numbers. The aim must be to improve the quality and relevance of research and teaching via greater competition for resources and transparent allocation mechanisms. There may be political obstacles to such changes, but the availability of Structural Funds provides an ideal opportunity to overcome them.

Activities should be initiated to increase the number of well-qualified PhDs and post-doctoral fellows in the system in order to make the science base more dynamic. This should be done as soon as possible, as it would strengthen the science base in a sustainable way. Most importantly, if real talent is to be encouraged to follow a scientific and engineering career path, there is a clear need to improve the overall level of salaries, especially for PhD and post-doctoral fellows.

A better and more sustainable science-industry relationship is needed. Building on recent experiences with foresight and policy discussions concerning initiatives such as technology platforms and cluster developments, one step should involve the institutionalisation of a priority setting discourse with industrial representatives from both high-tech and more traditional sectors.

Collaborative R&D schemes involving pubic and private sector actors would also be useful, especially in terms of allowing industry to specify projects of relevance to their needs. Furthermore, in addition to cluster developments (such as the recently developed 'Valley' concept), schemes akin to the Danish 'Innovation Consortia Enterprises' initiative could be used to further develop linkages in a way that is especially appealing to more traditional, less R&D active companies. In this model, at least two academic and research institutions – one of which is a technological service partner – work together on concrete innovation projects in which the research component is supported by government.[13]

Mobility between the public realm and industry should be encouraged and efforts made to reduce existing hurdles. Again, schemes similar to the Danish 'Training of Industrial PhDs' scheme, in which industry and scientific institution share the training and salary costs of a PhD student, could strengthen both linkages and the attractiveness of research careers.

Vocational training and life-long learning schemes already in existence should be rationalised and consolidated, again with a common vision of industrial and societal needs guiding the consolidation process. This will require the various ministries responsible for these programmes to coordinate their efforts. This may not happen overnight, and the process will lead to long-term rather than short-term impacts, but the first steps still need to be taken as soon as possible.

[13] For details, see http://fist.dk/site/english/publications/2005/evaluation-centre-contract-innovation-consortium-programme/evaluation-of-the-centre-contract-innovation-consortium-.pdf

3.5.3 Timescales

The priorities suggested by the review team vary in that some are likely to have short-term impacts while others will only have appreciable impacts in the longer-term. The figure below differentiates between these different priorities. It is important to note, however, that all remain priorities calling for immediate action.

Exhibit 5 Overview of Concrete Actions and Impact Timescales

Priorities with Short-term Impact	**Priorities with Long-term Impact**
Restructure and enlarge funding agencies (and increase the % of project funding)	Build capacity in the system (in government and stakeholder circles)
Rigorous performance review of research system to prepare for rationalisation and consolidation	Consolidate the science system, clarify roles, create critical mass and adjust internal governance system
Remove legal barriers to commercialisation	Stimulate entrepreneurship among researchers
Increase number and retention of PhDs	Proceed with education reforms, including rationalisation of life-long learning and vocational training
Intensify strategic discourse with industry and implement schemes for industry-science cooperation (e.g. more 'Valleys')	Bring 'low-tech' industries into contact with science base

3.6 Main Lessons for Estonia

3.6.1 Strategic Orientation of R&D and Innovation Policy

Estonia trails in many R&D and innovation-related indicators and is attempting to sustain a phase of rapid catching-up. In particular, R&D spending in recent years has increased rapidly and the country has set very high targets for R&D intensity for the mid-term future.[14] In the opinion of the review team, however, the main pre-occupation of Estonian R&D and innovation policy should not be to reach the 3% target at any cost, but to raise the innovation capacity of enterprises in a broad sense (going beyond considerations of R&D alone), and to address a number of important societal problems.

Raising R&D levels will not be enough given that the 'demand' for R&D in Estonian industry is not well developed, particularly in the more traditional sectors with low R&D intensity and many SMEs. Broader measures aimed at triggering innovation

[14] Despite the investment in R&D in recent years, R&D intensity has risen only slowly, though this is a consequence of corresponding increases in GDP within the context of a rapidly catching-up economy. The review team considered that Estonian R&D and innovation policymakers should carefully monitor these indicators, but it did not consider slow growth rates in some indicators of R&D and innovation performance to be a major cause for concern for Estonia given that some of these indicators are not particularly good at reflecting the development of catching-up economies and innovation systems.

(technological and non-technological) in both high-tech and traditional sectors are needed to foster an innovative culture and stimulate, in the long-term, the demand for R&D.

3.6.2 Science System and Science-Industry Relations

While the strength of the science base is a question receiving much attention in Estonian R&D and innovation policy, the review team felt that there should be a stronger emphasis on measures to raise the research and innovation capabilities of enterprises. In parallel, a priority for the science system should be to develop a greater orientation towards the needs of the Estonian economy and society. The ability of the science and education system to supply appropriate levels of skilled labour should also be strengthened via measures to attract more students and to improve the quality of the higher education system as a whole.

In the view of the review team, there are some critical imbalances in the Estonian R&D and innovation system. The most debated one is the imbalance between the science sector (where most research is performed) and the enterprise sector (which conducts very little R&D). In part, this is a problem of transition on which R&D and innovation policy has only a limited handle: it needs some years of development before the enterprise sector can grow into either a significant performer of R&D or into a funder and user of the R&D performed in public research institutions, which are primarily located in universities. Policy efforts to stimulate linkages between industry and these research institutions, however, may be hampered by their location within academic settings pervaded by a traditional 'basic research' ethos. In other countries, many 'quasi-public' Research and Technology Organisations (RTOs) are an important part of the innovation system and serve as a link from research to the business sector. Estonia should build on the experience gained with its own Competence Centre programme and explore the possibility of establishing such RTOs on a public-private partnership basis.

3.6.3 Raising the Innovation Capacities of Firms

Within the context of a greater focus on raising the innovation capacity of enterprises, cluster-oriented initiatives of the type implemented primarily at a regional level (e.g. in Austria) would probably be more appropriate than pure R&D support measures. Again, the search for suitable clusters should not be confined to high-tech sectors, but should also include low-tech ones as well.

Innovation voucher schemes, such as those introduced in the Netherlands, are also worth considering as a way of lowering the barriers to innovation and improving the innovation capacities of enterprises, especially SMEs. It may also be worthwhile encouraging a discussion about tax-related support measures, specifically those targeted at different types of innovation expenditures (R&D, training, personnel etc.), though care would need to be taken to maintain the simplicity of the current tax regime. All of these measures would strengthen innovation capacity and improve the long-term demand for R&D.

3.6.4 Governance and Policy Learning

The review team was impressed with the level of conceptual thinking about the systemic development of R&D and innovation systems in Estonia, but concerned that overall administrative capacity within the relevant ministries, councils and agencies was insufficient to cope with the demands of the many new policy measures and initiatives being considered and launched. In this sense there is a real danger of an 'implementation gap' resulting, in the long-run, in policy failure. New initiatives (including those suggested in this report) should not be contemplated unless there is a significant increase in administrative capacity.

The review team was also concerned about the ability of the Science and Technology Council to coordinate the many different policy elements being implemented by different ministries and agencies, since policy formulation and coordination is still the responsibility of two separate sub-committees dealing, respectively, with R&D and innovation, and under-staffing is once again an issue. Similar institutions to the Science and Technology Council in other countries are better staffed and play a more proactive role in the formulation and coordination of policies. It is also not clear if all relevant ministries are involved in the design of an effective policy mix. The structure, staffing, responsibilities and mode of operation of the Council may thus need to be overhauled if it is to become an effective mechanism for the formulation and coordination of the Estonian policy mix.

4 Generic Lessons

The main aim of the policy mix peer reviews was to encourage mutual learning amongst Member States concerning the policy mixes needed to improve overall R&D and innovation system performance and raise R&D investment levels. Discussions during the reviews were thus deliberately meant to be wide-ranging and to span developments in a number of related policy domains, namely human resources, the science base, industrial R&D and innovation, economic and market development and the overall governance of the R&D and innovation system.

Analysis of the six Country Reports confirms that broad policy mix concepts informed the policy discussions in all six countries, with most of the topics discussed mapping easily onto the simple conceptual framework used to inform the process (see the Introduction to this report). The headings used in Section 2 of this report bear testimony to this.

Although the majority of the topics discussed in the reviews fall into the categories represented by these headings, the emphasis placed on the various categories and the nature of the discussions in each category varied across countries.

The major differences between countries are described in Sections 2 and 3. To recap briefly, the discussions in the UK focused on the soundness of the R&D and innovation governance system and the systemic approach to improving the overall performance of the system. In France, the emphasis was on the institutional reforms needed to confront new challenges, whereas in the Netherlands the discussions focused not so much on institutional reforms as the policy shifts needed to focus resources on areas of strategic importance. Given its political structure, regional issues, governance structures and the coordination of policies across the regions and communities dominated the discussions in Belgium. In the remaining two countries, given the relative stage of development of both the Estonian and Lithuanian R&D and innovation systems, it is not surprising that the discussions focused more on the establishment of functioning systems than on the fine-tuning of well-developed systems, as was the case in the other countries. In particular, much discussion was focused on the perceived need to develop their industrial R&D and innovation bases hand-in-hand with the development of their science bases.

Despite the fact that the precise emphasis placed on different issues varied from one country to another and that the overall policy mixes in each country are undoubtedly context specific, there were enough commonalities for some ‘accepted wisdom’ and ‘generic lessons’ to emerge. These are presented below under the headings used to structure Section 2 of this report.

4.1 Science Base

Although ‘science-push’ models are discredited, a well-functioning R&D and innovation system still needs a healthy science base. Neglecting it is not an option.

Funding criteria in the science base should focus on excellence **and** relevance, especially when resources are scarce and there is a mismatch between scientific capabilities and socio-economic needs.

Efforts to strengthen science bases and respond to fresh challenges often require the restructuring of scientific infrastructures and institutions. Resistance to such change is commonplace and contingency strategies are needed to overcome it. Greater stakeholder involvement in the policy formulation process is advisable.

4.2 Science-Innovation Links

Policies to improve the interaction of actors in the science base and industry are vital to overcome both the lack of relevance of the science base to industry and the weak absorptive capacity of industry. Remedial measures, which should always be customised to fit the local context, should contemplate schemes to improve the interaction of existing actors and structural reforms involving the creation and strengthening of 'bridging institutions' or 'intermediary sectors'.

4.3 Industrial R&D and Innovation

All countries recognise the need to stimulate private sector R&D levels, particularly in SMEs, since R&D levels in many of the larger European firms are comparable to those elsewhere in the world. This means that all countries should consider how best to sensitise existing SMEs to the benefits of accessing and performing R&D and devise schemes and framework conditions promoting R&D intensive start-ups in potential growth areas.

Similarly, the need to improve the innovation performance of industry is seen as a priority in all countries, especially in countries with a high proportion of low-tech industries and SMEs with weak innovation track records. Again efforts to improve the situation need to focus on sophisticated awareness programmes emphasising the benefits of both technological and non-technological innovation; on support schemes for innovative firms; and on the creation of new start-ups, particularly high-tech start-ups.

The focus on new start-ups is a reflection of the need both to rejuvenate existing industrial structures and to encourage structural shifts to more R&D intensive and high-tech sectors. Whatever the rationale, such a focus is now a policy imperative.

All countries should recognise that improvements in innovation performance generate a demand for R&D and constitute an effective long-term strategy for raising R&D investment levels.

4.4 Human Resources

The future supply of the human resources necessary for an R&D and innovation system to function effectively is a concern for all countries, irrespective of the strength of current supplies. All countries need to develop sound strategies to ensure that human resource needs are met in terms of both quantity and quality.

Common educational needs across all countries appear to exist for more life-long learning, entrepreneurship programmes and a better balance between research and teaching activities across higher education institutions such that they complement rather than detract from each other. Increasingly, the need to have more courses taught in English is also becoming a prerequisite if mobility is to be encouraged.

Many of the barriers to recruitment and mobility in the higher education sector lie at the margins of the R&D and innovation policy mixes discussed in this report. They include low salaries and non-transferable pensions, the structure of the educational sector and the roles and responsibilities of the organisations within it, and even immigration policies. Policy prescriptions should attempt to lower or remove these barriers across a broad front and not focus too narrowly on single issues and initiatives.

4.5 Market Development

Policy instruments designed to stimulate the demand for innovation and R&D are the most neglected in the policy armoury despite their undoubted potential. All countries should explore the possibilities of R&D and innovation-friendly procurement policies and encourage win-win solutions when formulating and implementing policies in fields such as health, transport and environmental protection, especially in terms of developing new R&D and innovation-intensive lead markets.

4.6 Governance

The coherence of policy mixes and the efficacy of coordination mechanisms across ministries, agencies and regional governance structures are generic problems related to the complexity of modern R&D and innovation systems. Tackling the problem of coherence requires the adoption of a true 'systems' perspective in which all the policy mix elements covered in this report are seen as the legitimate concern of policymakers preoccupied with the health of the R&D and innovation system. All countries are thus urged to adopt such an approach.

Improving the efficiency and effectiveness of coordination mechanisms is trickier, as there is no one preferred solution and much is context-dependent. In general, however, there is room for improvement in the majority of countries and a corresponding need for the critical examination of existing mechanisms and experimentation with new and better ways of coordinating the formulation and implementation of policies. Preferred (alternative) solutions appear to be the appointment of truly functional high-level councils (especially those involving Heads of State and Finance Ministries); the appointment of lead ministries to take responsibility for coordination, especially ministries with traditional links with both

the science base and industry; and the use of informal communication and coordination mechanisms to complement more formal mechanisms.

High-level commitment to future visions, policy goals and plans of action is critical for the success of policy initiatives, but so too is the degree to which all major stakeholders share this commitment and hold the same or similar visions of the future. To improve the degree to which this occurs, inclusive policy formulation processes involving widespread consultations and foresight exercises should be used to imbue a sense of joint ownership in the strategic directions set for R&D and innovation initiatives.

4.7 Strategic Intelligence

The use of strategic intelligence tools such as foresight, technology assessment, benchmarking and monitoring and evaluation is becoming a prerequisite in modern policy formulation settings. Building up and maintaining capacity in this sphere is thus an imperative for all countries, even for those with adequate current capacity, since many of these suffer from high staff turnover and the consequent loss of 'institutional memory'. Another imperative is the need to ensure that the results of these exercises, particularly the results of programme evaluations, actually do feed back into the policy formulation process.

4.8 Regional Issues

Although regional issues were only discussed to any great extent in Belgium (and to a more limited extent in France and the UK), the importance of this dimension is undoubtedly critical in many larger economies and, particularly, those with a federal structure. The main lessons to emerge concern the need to strengthen 'coordination and coherence' mechanisms across regions and between regional and national policy spheres in order to tackle 'generic' problems and realise the benefits of coordinated actions.

4.9 International Issues

Despite an apparent recognition of the importance of phenomena like globalisation and open innovation for R&D and innovation activities within the context of semi-bounded (but permeable and interconnected) national R&D and innovation systems, policy developments in many countries appear to consider these 'global' developments as marginal influences rather than as central drivers of change. Governments are urged to reconsider this stance and to explore more fully the opportunities and threats posed by these phenomena and the policy responses they merit, including the possibility of joint initiatives with other countries.

In terms of the influence of EU policies on national policy mixes, all countries should strive to find a balance between under- and over-dependence on EU policies and initiatives in R&D and innovation, ensuring that national priorities are not

overwhelmed by EU priorities and that EU initiatives launched in the interests of the common good are not totally ignored.

4.10 Policy Mix Issues

Most countries now employ a broad range of similar instruments. Care should be taken, however, that these are appropriate and customised to the needs of specific countries, and that their modes of deployment are rationalised and not the result of *ad hoc* accretion.

If both are employed, a balance needs to be struck between the use of direct support instruments (grants, loans etc.) and indirect instruments (tax incentives etc.). Both have advantages and disadvantages, and these need to be weighed carefully in each specific context, taking care to factor in the possibility of both positive and negative interactions.

A balance also needs to be struck between competitive and block funding in the science base. In many countries, raising the proportion of funding awarded via competitive processes would stimulate excellence and overall improvements in system performance. Too great a dependence on short-term competitive funding, however, would threaten the viability of long-term research agendas and the development of adequate infrastructures.

Just as there is a need for 'relevance' to be added to the criterion of 'excellence' if projects in the science base are to be attuned to socio-economic needs, there is a need for more programmes and initiatives in the R&D and innovation system as a whole to be 'aligned' to societal needs and the specific directions set by funding bodies. 'Non-aligned' initiatives, i.e. those that allow the recipients of funds to chart their own courses, are still a vital ingredient of healthy policy mixes, but not if they crowd out the efforts of policymakers to attain specific societal objectives.

There is an increasing need for countries to focus their efforts when devising policies to improve overall R&D and innovation system performance. These attempts to focus efforts can take many forms and have many drivers. One important driver is scarcity of resources. Few nations now can afford to devote equal resources to the parallel development of all parts of their R&D and innovation systems. Other drivers include the desire to build on strengths and, conversely, to rectify weaknesses. Yet another driver is the need to respond to external threats and opportunities, both of which may require a policy focus on specific parts of national and regional R&D and innovation systems, i.e. a focus on support for specific sets of actors, scientific and technological areas, industrial sectors or policy domains.

This need to focus, however, can lead to excruciating policy dilemmas. For example, even though the generic lessons recounted in this report suggest the need for the long-term development of all the different components of the R&D and innovation system, and some of the advice offered to specific countries is to develop these elements in parallel (e.g. the science base and industrial innovation components of the Estonian and Lithuanian systems), the political reality may be such that policy efforts in the short-term have to be focused on specific components of the R&D and innovation

system. The generic lesson for all countries, however, is that while many considerations will dictate the choice of specific options in the short-term, all of these choices should be made within the context of longer-term strategies that foresee the balanced development of all parts of national R&D and innovation systems.

5 Next Steps

5.1 The Peer Review Process in Hindsight

The peer review process in the third cycle of the OMC followed on from the pilot initiative in the second cycle, which involved policy mix peer reviews in Romania, Spain and Sweden. The results of these reviews were welcomed in all three countries and their enthusiasm for the process undoubtedly influenced the decisions of the next six countries to volunteer for peer reviews in the third cycle of the OMC.

During the course of these third cycle reviews, there were signs that some of the parties involved in the reviews were uncomfortable with certain aspects of the process. This was largely due to unfamiliarity, since the experience was novel not only for the six countries being reviewed, but also for other parties involved in the process. There were many changes of personnel within the Policy Mix Expert Group itself and within the Commission between the second and third cycles of the OMC. Crucially, the way the peer review exercises were conducted was also revised radically. Whereas a single consultant moderated the policy mix discussions in all three countries in the pilot exercise and prepared the Country Reports and the Synthesis Report, in the third cycle separate external consultants moderated and reported the policy mix discussions in each of the six countries, with the original consultant from the pilot round responsible for the Synthesis Report and charged with acting as mentor for the overall process.

The net result of all these changes was that the majority of parties involved were uncertain as to the exact steps to follow. This was anticipated to some extent and common procedures and templates developed to guide the process, but the overall desire to make the peer reviews learning experiences customised to the specific needs of the review countries meant that a great deal of flexibility had to be built into the process. The unintended consequence, however, was a degree of apprehension concerning the outcomes of the reviews, exacerbated to some extent by the slightly different paths taken by the external moderators in their efforts to tailor the reviews to the sometimes conflicting needs of the 'customers' in the peer review countries (with a primary interest in policy lessons specific to their own circumstances) and the needs of the policy mix peer review process as a whole (the search for more generic lessons to increase mutual learning across all Member States).

Much therefore depended on the reception given to the final Country Reports in the three peer review sessions held in Brussels over the period of the third cycle, each of which covered two of the six countries. During these sessions, as in the peer review meeting held at the end of the second cycle, representatives of all the six countries involved in the peer reviews warmly welcomed the final outputs and acknowledged that participation in the process had been beneficial. Similarly, the members of the examining review teams were unanimous in their view that their involvement had increased mutual learning concerning the development of R&D and innovation policy mixes. The generic lessons outlined in this Synthesis Report were also well received in a subsequent meeting of the Policy Mix Expert Group.

As a consequence, the general view of the Policy Mix Expert Group is that the exercise should be repeated in the next cycle of the OMC if sufficient demand exists from Member States to be involved in the process.

5.2 The Way Forward

If CREST supports this overall recommendation, the Policy Mix Expert Group also has the following suggestions concerning the organisation of the process:

- If the number of countries wishing to be reviewed is small (e.g. 2 - 4), it may be worthwhile reverting to the model of just one external moderator for all the peer reviews;
- If the number of countries wishing to be reviewed is larger than this, the use of multiple external moderators should be retained, though more effort will need to be expended on:
    - The provision of extended guidelines concerning the conduct of the process and templates guiding the development of the Background Reports, internal briefing papers for the examiner teams, the Country Reports and the Synthesis Report;
    - In parallel, greater efforts need to be expended to ensure that both the peer review countries and the examining teams (including the moderators) understand that the adoption of flexible approaches is necessary if the specific needs of both the peer review countries and the mutual learning needs of all Member States are to be met;
- The role of the moderator or 'rapporteur' also needs to be more clearly specified and understood. In some quarters the role of a rapporteur is simply to act as a secretary, responsible for merely recording the discussions of others. This was not the intention in the policy mix peer reviews, however, and it should not be the intention in the future. The success of the whole venture depends critically on the use of highly qualified R&D and innovation policy analysts capable of not merely reflecting the views of others, but also of guiding discussions, synthesising the inputs of the other team members and – crucially – adding value based on their own extensive knowledge and experience;
- The funding of the exercise needs to be rethought. The route taken in the third cycle involved the *ad hoc* use of two different Commission mechanisms to fund the external consultants, with the examiner and review countries covering their own costs of involvement. The use of two different Commission mechanisms (both involving very different remuneration rates) to fund the external consultants for separate tasks (the preparation of the Background Reports was funded via one mechanism; the preparation of other reports by another) was especially cumbersome and unwieldy. In future, efforts should be made to cover the costs of the exercise via a single, simple, flexible mechanism offering rates of remuneration likely to attract moderators of the highest calibre;
- The overall intention should be to keep the exercise light. Concern has been expressed in some quarters within the review countries that the Country

Reports are too impressionistic and lack the authority of full-blown R&D and innovation system reviews. This can be countered in two ways. One way is to scale-up the resources and effort devoted to these reviews and turn them into authoritative reviews of a critical and judgemental nature. This is certainly a possibility, but the limited number of these it will be possible to conduct will undoubtedly reduce the opportunities available for widespread mutual learning – the main objective of the exercise. Alternatively, the exercise could be kept light and greater efforts made within Member States to spread the notion that the impressionistic nature of the Country Reports is a natural and welcome result of the continued emphasis on mutual learning between high-level policymakers in the reviewed and examiner countries;

- In line with above, there should be a continued emphasis on the involvement of high-level policymakers in the examining teams;
- The original role of the Peer Review meetings in Brussels needs to be rethought too. In the pilot exercise, these meetings were conceived as the heart of the exercise in that they were meant to provide an opportunity for all Member States to review the Country Reports and to benefit from mutual learning. During the course of the third cycle, however, it became obvious that the review countries considered the actual peer review mission to their countries to be the heart of the exercise, followed closely by the feedback missions (since these involved reporting the results to senior policymakers – even the Prime Minister in one instance). In parallel, the Peer Review meetings in Brussels, each reviewing two countries, largely attracted representatives from the peer review and examiner countries alone and not from other countries (with some honourable exceptions). The opportunity for more widespread learning was thus being missed, possibly because the demands associated with attendance at four separate meetings in Brussels (three involving reviews of the six Country Reports and one involving the presentation of the Synthesis Report) were too onerous. In future, the peer review and feedback missions should be regarded as the primary opportunity for mutual learning, albeit on a restricted basis, and the opportunity for more extensive mutual learning should be limited to two meetings in Brussels: one to review the background reports prepared on the review countries; the other to listen to short presentations based on the individual Country Reports and to discuss the final Synthesis Report;
- The initial pilot exercise in the second cycle was developed in parallel with a similar exercise being conducted under the auspices of the OECD. From a national perspective, this plurality is welcome, for the coexistence of the two initiatives gives members of both the EU and the OECD more options when considering the timing of individual reviews and the composition of the examining teams. During the third cycle, however, the opportunity to liaise with the OECD and extend the opportunities for mutual learning via an interchange of the results of the various peer reviews was missed. This should be rectified in the next cycle of the OMC;
- Finally, more attention needs to be paid to the issue of dissemination and the publication of the outputs of the peer review exercises. Although the outputs of the peer review exercise in the second cycle were available on the web fairly soon after the conclusion of this cycle, it took over a year for the Synthesis Report to be printed. Delays of this nature should not be replicated this time around. If requested, CREST should also consider allowing the

outputs of the peer review process to appear on Commission websites such as ERAWATCH and PRO INNO.

If CREST does not support the continued existence of the Policy Mix Expert Group because of competing priorities, it should nevertheless contemplate:

- Exploring how countries still interested in conducting policy peer reviews with an emphasis on mutual learning can continue to do so under the auspices of CREST. OMC-NET currently provides one option, but the long lead times between application, acceptance and start dates make this option unattractive when the timeliness of a review is critical. Other support mechanisms are needed;
- Explore the demand within CREST for 'light' peer reviews not based primarily on mutual learning but closer in kind to conventional, resource-intensive peer reviews aimed at producing critical and judgemental conclusions based on exhaustive analyses;
- Recommending that other CREST Expert Groups explore how 'mutual learning' peer reviews with a policy mix perspective (i.e. peer reviews that specifically look at the policy mix options available to resolve particular problems) can be used as a tool to promote mutual learning concerning other issues of interest to CREST;
- Using the series of generic issues raised in this Synthesis report as an input into CREST discussions about important future topics to be covered by the OMC process.

Appendix 1 – Composition of the Policy Mix Expert Group

Co-Chairs	
Krzysztof Gulda	PL
Chris North	UK
Ex Co-Chairs	
Theo Roelandt	NL
Tim Goodship	UK
Rapporteur	
Marcel de Heide	NL
Members	
Christian Seiser	AT
Matthias Weber	AT
Bernard Delhausse	BE
Toivo Raim	BE
Ward Ziarko	BE
Johannes Kaufmann	CH
Jochen Zachgo	DE
Jens Peter Vittrup	DK
Marika Popp	EE
Luis Delgado	ES
Carlos Martinez	ES
Rémi Barré	FR
Jean-Paul Courbebaisse	FR
Jacques Serris	FR
Aliki Pappa	GR
Zajzon Bodo	HU
Michael Fitzgibbon	IE
Padraig O'Conaill	IE
Shaul Freireich	IL
Eirikur Baldursson	IS
Stefan Baldursson	IS
Petras Barsauskas	LT
Giedrus Viliunas	LT
Robert Kerger	LU
Juris Jansons	LV
Stef Smits	NL
Frank Zuijdam	NL
Morten Storseth	NO
Andrezj Stolarczyk	PL
José Bonfin	PT
Rolanda Predescu	RO
Ann-Katrin Berglund	SE
Per Eriksson	SE
Susanne Moberg	SE
Boris Pukl	SI
Primoz Pristovsek	SI
Marta Cimbakova	SK
Petra Lipnicka	SK
Mark Beatson	UK

Appendix 2 – Policy Mix Peer Review Schedules

Programme of the Policy Mix Peer Review for the UK
January 22, 2007 – January 24, 2007

Interview No.	Issues	Interviewees
1	Finance and fiscal innovation issues	**Caroline Barr**, HM Treasury, Head of Science and Industry Team **Chris Stark**, HM Treasury, Budget, Tax and Welfare Directorate **Nick Munn**, DTI, Head of Business Finance and Investment Unit
2	UK innovation system – impact assessment	**Mark Beatson**, DTI, Director, Science and Innovation Analysis
3	Coordination and Governance of UK science	**Sir David King**, Government Chief Scientific Advisor, OSI
4	Innovation budget and Science Budget	**Sir Keith O'Nions**, Director General for Research and Innovation, OSI
5	Patents and Intellectual Property Rights	**Ron Marchant**, CEO and Comptroller General, UK Patent Office
6	UK Technology Programme – creation of the Technology Strategy Board	**David Evans**, Director of Innovation Technology, DTI **David Way**, Director Innovation Platforms and Key Technologies, DTI
7	The Regional dimension	**Ed Metcalfe**, South East England Development Agency (SEEDA), Head of Science, Technology, Entrepreneurship & Management team, Chair of Society of Chemical Industry, and national RDA lead role for regional Science and Innovation via DTI **David Mulligan**, SEEDA
8	UK business and industry perspectives	**Chris Francis**, IBM UK **David Clarke**, Rolls Royce **Norman Price**, DTI industry secondee
9	Support to the research base	**Neil Viner**, OSI, Research Base **Prof Stuart Palmer**, Deputy Vice-Chancellor, Warwick University **Catherine Coates**, Director, Planning and Communications, EPSRC
10	Knowledge transfer	**Ashley Malster**, OSI, Research Base **Professor Rob Massara**, Deputy Vice-Chancellor and Pro-Vice Chancellor (Research & Business Development), University of Essex **Dr Doug Yarrow**, Director Innovation, BBSRC
11	Bio-medical research	**Dr Roberto Solari**, MRC Technologies **Dr Mark Palmer**, Head of International Policy, Corporate Affairs Group, MRC
Dinner	At a dinner hosted by David Evans and Jeremy Clayton, the team were able to talk to some of those they had already met together with additional representatives of the UK innovation system. The meal ended with a round-table discussion of key issues.	**Dr Mike Tubbs**, DTI Business and Finance Investment Unit (R&D Scoreboard) **Chris Hale**, Policy Adviser, Universities UK **David Rawlins**, Acting Director International Technology Policy, OSI

Programme of the Policy Mix Peer Review for France
April 26, 2007 - April 27, 2007

Date/Time	Focus	Participants
April 25th, evening		Arrival in Paris of the Review team, consultant and European commission representative
April 26th 8h30–9h30	Team briefing	Review team and consultant
9h30-10h30	Science and innovation policies in France	Review team and **Mr Gilles Bloch**, Director general for research and innovation (DGRI)
10h30-11h	TEA/COFFEE BREAK	
11h-12h	Missions and Programmes of the National research agency (ANR)	Review team and **Mrs Jacqueline Lecourtier**, Director general of the ANR
12h-13h	Competitiveness clusters, roadmaps for innovation, Agency for industrial innovation (AII), intellectual property and patents, etc.	Review team and **Mrs Agnès Arcier**, Deputy director general for competitiveness and innovation policies, Ministry of economy, finance and industry and Mr Jacques Magen, Head of the international department of the AII
13h-14h	LUNCH Direction of strategy	Review team hosted by **Mr Jacques Serris**, Deputy director for strategy and **Rémi Barré**, Director of the foresight department, ministry for higher education and research
14h-15h	Human resources	Review team and **Mr Stéphane Demarquette**, R&D human resources from l'Oréal and President of the executive committee of the Association *Bernard-Gregory*; **Mr Philippe Casella**, Deputy director for humanities and social sciences, ministry for higher education and research; Mrs **Michèle Postel**, Human resources department (National centre for scientific research – CNRS)
15h-16h	Higher education policy in France , funding processes, research and higher education clusters (PRES), doctors training, etc.	Review team and **Mr Eric Froment**, General directorate for higher education (DGES); **Mr Thierry Coulhon**, Vice-President, Conference of university presidents; **Mr Gilbert Casamatta**, President, Toulouse National institute for Technology (INPT) – PRES
16h-16h30	TEA/COFFEE BREAK	
16h-30-18h	Industrial research and development (R&D) in France	Review team and **Mrs Frédérique Sachwald**, Head of industrial R&D unit, Innovation and regional action department (DGRI)
20h	DINNER	Review team hosted by **Gilles Bloch**, Director general for research and innovation
April 27th 9h-10h	Creation and development of innovative SME's; industrial innovation - OSEO-ANVAR	Review team and **Mrs Catherine Larrieu**, director of innovation and **M. Thomas**, Head of Incuballiance, an incubator/hatchery based in the south of Paris
10h-11h	Evolution of the French Research and Innovation System and public/private parterships	Review team and **Mr Denis Randet**, Executive associate president of the National association for research and technology (ANRT) and **Mr Laurent Buisson**, Head of the service for innovation and regional policy (DGRI)
11h-11h30	TEA/COFFEE BREAK	

11h30-12h30	Research institutions: the cases of the National institute for agricultural research (INRA) and of the National institute for research computer science and control *futurs* (INRIA) : strategies and contractualisation	Review team and **Mr Guy Riba**, Deputy director general of INRA
12h30-14h30	WORKING LUNCH New tools for local cooperation: competitive clusters, Advanced networks for thematic research (RTRA) and research and higher education clusters (PRES)	Review team and **Mr Alain Bravo**, General director, Ecole supérieure d'électricité (to be confirmed); **Maurice Robin**, Associate general director for research, Ecole polytechnique; **Claude Puech**, Director of INRIA *Futurs*; **Bertrand Demotes-Mainard**, CEO Thales Research and Technology France; **David Adams**, Vice-president for research, Paris-Sud university; **Laurent Buisson**, Head of the service for innovation and regional policy (DGRI)
14h30-15h30	European and international policy	Review team and **Mrs Laure Reinhart**, Director of strategy
15h30-16h	TEA/COFFEE BREAK	
16h-17h	Debriefing. Discussion of the Report	Review team and consultant

Programme of the Policy Mix Peer Review for The Netherlands
December 13, 2006 - December 15, 2006

Wednesday 13 December 2006

Time	Focus: Introduction and KIA	Participants
12:30 – 13:00	Arrival, Sandwiches	Examining team + Patries Boekholt
13:00 – 13:45	Welcome & Introduction Setting the scene	**Theo Roelandt** (Ministry of Economic Affairs)
13:45 – 14:45	Preparations & Briefing	Examining team + Patries Boekholt
15:00 – 16:00	Dutch Research and Innovation System, focus on Knowledge Investment Agenda (KIA)	**Jan Peter van der Toren** (IP) **Thomas Grosfeld** (IP) **Frank Zuijdam** (NWO) **Koen de Pater** (SenterNovem)
16:00 – 17:00	Informal exchange of views on Dutch knowledge infrastructure. Possibility for questions	~~?~~ **Frank Zuijdam** (on public knowledge base) ~~?~~ **Koen de Pater** (on private r&d expenditures and location factors)
18:30	Dinner	Examining team + Patries Boekholt

Thursday 14 December 2006

Time	Focus: Public Knowledge Base	Participants
9:00 – 10:30	Supporting scientific talent	**Yvonne Schaap** (OCW) **Wilma van Donselaar** (NWO) **Emile Broesterhuizen** (KNAW) **Frank van der Duyn Schouten** (UvT)
10:30 – 12:00	Excellent research facilities	**Herman van der Plas** (OCW) **Hans Chang** (FOM) **Theo Verrips** (Unilever)
12.00 – 12.15	Transfer from NWO to lunch	
14:00 – 16:00	a. Priorities in research b. Focus and mass in research c. Funding mechanisms for research	**Cornelis van Bochove** (OCW) **Peter Nijkamp** (NWO) **Douwe Breimer** (UL) **Veronique Timmerhuis** (AWT) **Diederik Zijderveld** (NGI)
16:00 – 17:30	Valorisation scientific knowledge	**Anton Franken** (STW) **Bert Geerken** (Smart Mix) **Theo Nijman** (Netspar) **Jan Vogel** (TNO/GTI) **Jan de Wit** (Akzo)
17:30 – 18:15	Discussion on impressions of the day and debriefing	Examining team + Patries Boekholt
19:15	Dinner	Examining team + Patries Boekholt, **Aafke Wortelboer**, **Frank Zuijdam**, **Koen de Pater**, **Stef Smits**

Friday 15 December 2006

Time	Focus: **Increasing Private R&D Expenditures through improving location factors**	Participants
9:15-10:45	1: Excellent R&D investment climate - General view - Acquisition policy	**Serv Wiemers** (NFIA) **Cees Oudshoorn** and **Joke van den Bandt** (VNO-NCW)

	- Focus	**Richard L'Ami** (BOM)
11:00-12:30	2: Highly skilled personnel - National Education - Foreign students - Foreign "knowledge workers"	**Teun Graafland** (Shell) **Rob Hartman** (ASML) **Nick den Hollander** (Casimir) **A.P.Taselaar** (Ministry of Justice)
12:30-14:15		Hosted by Acting Secretary General of Ministry of Economic Affairs **Chris Buijink**. Including guided tour with visit to creative industry located within Van Nelle Fabriek.
14:15-16:15	3: Knowledge infrastructure and focus & mass - Accessibility of knowledge - Public Private Cooperation - Visibility and branding of Dutch knowledge infrastructure - Shift from generic to specific support by government - Selection of themes - Innovation clusters - Regional policy (a.o. ELA triangle) - Branding and marketing of hotspots	**Willem Sederel** (GE Plastics) **Nora van den Wenden** (EZ) **Sigrid Johanisse** (EZ – Innovation programme Point One) **René Buck** (Buck Consultants) **Alle Bruggink** (ACTS/ DSM)
16:15 – 17:15	Reflections on best policy mix for increasing private R&D investments	**Hans de Groene**, Deputy Director General for Enterprise & Innovation

Programme of the Policy Mix Peer Review for Belgium
May 9, 2007 - May 11, 2007

Wednesday 9 May 2007

Time	Focus: Introduction and the key concepts of the Belgian NIS	Participants
18:00 – 20:00	Informal presentation of the Belgian NIS	In presence of the Examining team, Consultant, Organisation, and members of the CIS/CFS
18:00 – 18:10	Welcome	
18:10 – 18:30	Introduction	**Philippe Mettens** (Belgian Science Policy)
18:30 – 18:45	Importance of the process and expectations	**Bart Laethem** (President of the CIS/CFS)
18:45 – 19:00	Modus operandi of the Peer Review	**Arnold Verbeek** (Idea Consult)
19:00 – 19:30	Belgian Policy Mix, Research and Innovation System	**Claire Nauwelaers** (MERIT)
19:30 – 20:00	Informal exchange of views. Questions and discussion.	Examining team + CIS/CFS + representatives of Ministers
20:30	Diner	Examining team + Consultant + Organisation

Thursday 10 May 2007 am

Institutional and structural aspects of the Policy Mix

Time	Focus: The Mechanisms of Information Exchange and the Building of a Policy Mix	Participants
9:00 – 10:45	A1. Existing platforms and cooperation with each other	**Rudy Aernoudt** (EWI) **Xavier Dehan** (IRSIB) **Richard Martin** and **Etienne Cools** (French Community) **Philippe Mettens** and **Ward Ziarko** (BELSPO)
10:45 – 11:00	Coffee	
11:00 – 12:45	A2. Belgian Policy Mix: how are research policies and priorities defined?	**Dominique Graitson** (CWPS) **Danielle Raspoet** (VRWB) **Jan Cornelis** (FRWB) **M. Denayer** (CCE/CRB) **Paul Van Snick** (CSP^{BCR})
12|:45 – 13:30	Lunch	Peers

Thursday 10 May 2007 pm

Can an adequate Policy Mix reinforce Belgian Public R&D in a globalised framework?

Time	Focus on R&D in universities	Participants
13:30 – 15:00	B1. Fundamental research: funders and clients	**Elisabeth Kokkelkoren** (FNRS) **Benno Hinnekint** (FWO) **Joseph Martial** (ULg) **Dirk Van Dyck** (UA)
15:00 –	B2. Mobility of researchers and	**Pierre Feyereisen** (UCL - Objectif recherche)

16:00	career plans	**Jan Danckaert** (VUB - Focus Research) **Didier Flagothier** (BELSPO)
16:00 – 16:15	Coffee	
16:15 – 18:00	B3. Excellence in public R&D vs. brain drain: an important clients' view	**Karen Haegemans** (EWI) **Emmanuelle Javaux** (ULg) **Roger Bouillon** (KULeuven) **Marcel Crochet** (UCL) **François De Schutter** (VITO) **Christian Delporte** (FUCaM)
18:00 – 18:30	Discussion on impressions of the day and debriefing – preparation for tomorrow	Examining team + Consultant
19:30	Diner	Examining team + Consultant + Organisation

Friday 11 May 2007 am

How can the Policy Mix be improved in order to produce more and better R&D in the business sector

Time	**Focus Increasing the private R&D effort**	**Participants**
9:00-11:00	C1. Generating a good R&D investment climate through a Policy Mix: an industrial perspective	**Reinhilde Veugelers** (KULeuven) **Frans de Keyser** (UEB) **Jean-Jacques Degroof** (MIT) **Jeroen Deleu** (CRIF) **Luc Desimpelaer** (Barco) **Henri May** (CERTECH)
11:00 – 11:15	Coffee	
11:15-13:00	C2. Cost vs. quality of research: can a Policy Mix be fit for SMEs and MNEs?	**Charles Bienfait** (Solvay) **Stefan Gijssels** (Janssen Pharmaceutica) **Pierre Hauser** (GSK) **Jean-Louis Migeot** (Free Field Technologies) **Marc Tombroff** (Numeca)
13:00 – 14:00	Lunch	Peers

Friday 11 May 2007 pm

Valorising R&D and fostering technology transfer through a national Policy Mix settled in a globalised economy

Time	**Focus on Developing Synergies between R&D Actors**	**Participants**
14:00-15:45	D1. Transforming R&D into concrete production	**Agnès Flémal** (WSL) **Dirk Boogmans** (GIMV) **Didier Granville** (Samtech) **Luc Peeters** and **Eric Degroof** (Innotek) **Paul Verdurme** (IT-Partners) **Stéphane Waha** (NCP – UWE)
15:45 – 16:00	Coffee	
16:00 – 17:45	D2. Spillovers of R&D and technology transfers	**Véronique Cabiaux** (AST) **Claire Van de Velde** (IBBT)

		Rudy Dekeyser (VIB) **Michel Morant** (Interface - ULg) **Johan Van Helleputte** (IMEC) **Bart Van Looy** (KULeuven) **Stéphane Waha** (NCP – UWE)
17:45 – 18:00	Debriefing and recommendations for the draft report	Examining team + Consultant

Programme of the Policy Mix Peer Review for Lithuania
March 13, 2007 - March 16, 2007

Date, time	**Topics**	**Participants**
13 March 19:00	Internal reviewers meeting	Review team
14 March		
9:00 – 9:30	Welcome and Introduction; Preparations for work	**G. Viliunas**, Adviser to the Minister, MES **A. Zalys**, Director, Department of Science and Technology, MES **N. Kranauskiene**, Deputy Head, Division of International Science Programmes, MES
9:30 – 11:00	Lithuanian research system and research policy.	**G. Viliunas**, MES **A. Zalys**, MES **R. Kalytis**, Chief Officer, Division of International Science Programmes, MES **N. Kranauskiene**, MES
11:00 – 13:00	Statistics about Lithuanian research; R&D tax policy	**G. Viliunas**, MES **A. Zalys**, MES **N. Kranauskiene**, MES , Director, Agency for International Science and Technology Development Programmes **J. Petrauskiene**, Deputy Director, Agency for International Science and Technology Development Programmes **I. Simonyte**, Secretary of the Ministry of Finance **A. Misiunaite**, Head, Division of Direct Taxation, Ministry of Finance
14:00 – 16:30 (with a break)	Reform of research and higher education system	**V. Budiene**, Vice- Minister, MES **G. Viliunas**, MES **G. Jurgelaitiene**, Director, Department of Studies, MES **D. Lukosiuniene**, Head, Division of university Studies, MES **J. Deviziene**, Chief Officer, Division of university Studies, MES **N. Kranauskiene**, MES E. Butkus, Chairman, Lithuanian Science Council **P. Barsauskas**, Vice-Rector, ISM university of Management and Studies **S. Zurauskas**, Deputy Head, Division of Science and Technology, MES **J. Vaitkus**, Pro-Rector, Vilnius university **R. Valiokas**, Head of Division, Institute of Physics, Coordinator of Research Forum of Foreign Lithuanians **J. Skackauskas**, Adviser, Office of the Lithuanian Government
17:00 – 18:00	Integrated research, studies and innovation centres; Future research and industry	**J. Lazutka**, Pro-Rector for Strategic Development; Vilnius university **A. Zukauskas**, Director of IMSAR, Vilnius university

		R. Kalytis, MES **N. Kranauskiene**, MES
19:00 – 21:00	Dinner + Wrap up session	Examining team **V. Budiene**, MES, **G. Viliunas**, MES, **R. Kalytis**, MES
15 March		
9:00 - 10:00	Structural funds and R&D	**A. Zalys**, MES **E. Kasperiuniene**, Head of Subdivision, EU Support Coordination Division **N. Kranauskiene**, MES
10:15 - 10:45	**Innovation policy**	**G. Miskinis, State Secretary, Ministry of Economy;** **R. Balniene, Deputy Director, Investment and Innovation Department, Ministry of Economy;** **R. Putkiene, Head, Innovation and Technology Division, MoE** **A. Kazlauskas, Head, Division for Development of Economy Policy, MoE** **N. Kranauskiene, MES**
10:45 - 12:30	Foresight of Lithuanian economy + R&D in international companies	**V. Snitka**, Director, Research Centre for Microsystems and Nanotechnology, Kaunas university of Technology **R. Putkiene**, MoE **E. Leichteris**, Director, Knowledge Economy Forum **K. Gecas**, Director of Lithuanian Innovation Centre **V. A. Bumelis**, Director, UAB Sicor Biotech **R. Kalytis**, MES **N. Kranauskiene**, MES
14:00 – 15:00	Current competition-based funding of R&D and support for innovation	**S. Rencys**, Director, Lithuanian Science and Studies Foundation; **Project managers** from Lithuanian Science and Studies Foundation **N. Kranauskiene**, MES
15:15 – 16:00	Future prioritizing and programme funding for R&D and innovation	**E. Butkus**, Chairman, Lithuanian Science Council **J. Ulbikas**, Managing Director, EuroParama **T. Zalandauskas**, Chairman, Lithuanian Young Scientists Society **N. Kranauskiene**, MES
16:30 – 18:00	Knowledge transfer and PPP	**V. Butkus**, Director General, Fermentas UAB **A. Janulaitis**, Director for Science, Fermentas UAB **R. Kalytis**, MES **N. Kranauskiene**, MES
19:00 – 21:00	Dinner + Wrap up session	Examining team **A. Zalys**, MES **N. Kranauskiene**, MES
16 March		
9:00 - 10:00	Coordination of national policies	**V. Budiene**, MES **G. Viliunas**, MES **A. Zalys**, MES **R. Putkiene**, MoE

		N. Kranauskiene, MES
10:00 – 12:00	Wrap up session	Peer Review Team

June 11, 9.30-12.00

Focus Group 1

The Estonian RTDI Policy Mix from a Governance and Policy Learning Perspective

Estonian Participants

Mr Indrek Reimand	Head of the Research Department, Ministry of Education and Research for Estonia (Research Secretary of the State Chancellery's Research and Development Council's Research Policy subcommittee)
Mr Ahti Kuningas	Deputy Secretary General for Economic Development, Ministry of Economic Affairs and Communications for Estonia
Ms Tea Danilov	Head of the Economic Development Department, Ministry of Economic Affairs and Communications for Estonia (member of the State Chancellery's Research and Development Council's Innovation Policy and Research Policy subcommittees)
Ms Kitty Kubo	Head of the Division of Technology and Innovation, Ministry of Economic Affairs and Communications for Estonia
Mr Lauri Tammiste	Head of the Division of Economic Analysis, Ministry of Economic Affairs and Communications for Estonia
Ms Anna Laido	Counsellor, Research and Development Council Secretariat, State Chancellery
Mr Madis Võõras	Director for Technology Development, Enterprise Estonia
Dr Katrin Männik	Consultant, Representative Baltic States, Technopolis Group Belgium (observer)

June 11, 13.30-16.00

Focus Group 2

The Estonian RTDI Policy Mix: Instruments and their Implementation

Estonian Participants

Mr Ahti Kuningas	Deputy Secretary General for Economic Development, Ministry of Economic Affairs and Communications for Estonia
Ms Tea Danilov	Head of the Economic Development Department, Ministry of Economic Affairs and Communications for Estonia (member of the State Chancellery's Research and Development Council's Innovation Policy and Research Policy subcommittees)
Mr Rein Vaikmäe	Vice Rector for Research, Tallinn University of Technology (member of the State Chancellery's

	Research and Development Council's Research Policy subcommittee)
Mr Siim Sikkut	Head of Development Unit, State Budget Department, Ministry of Financial Affairs for Estonia
Mr Madis Võõras	Director for Technology Development, Enterprise Estonia
Mr Meelis Sirendi	Member of the Board, Estonian Science Foundation
Mr Tarmo Kalvet	Innovation Policy Programme Director, PRAXIS (Centre for Policy Studies)
Dr Katrin Männik	Consultant, Representative Baltic States, Technopolis Group Belgium (observer)

June 12, 9.30-12.00

Focus Group 3

The Estonian RTDI Policy Mix from a Business and Industry Perspective

Estonian Participants

Mr Ahti Kuningas	Deputy Secretary General for Economic Development, Ministry of Economic Affairs and Communications for Estonia
Mr Lauri Tammiste	Head of the Division of Economic Analysis, Ministry of Economic Affairs and Communications for Estonia (national co-ordinator of the Community Innovation Survey CIS4 in Estonia)
Mr Aavo Heinlo	Chief RTDI Analyst, Estonian Statistical Office (co-author of the Community Innovation Survey CIS4 in Estonia)
Mr Indrek Kelder	Business R&D Financing Programme manager. Enterprise Estonia
Mr Ott Pärna, CEO	Estonian Development Fund (public start up equity investment fund)
Mr Pirko Konsa	Member of Executive Board, Tallinn Technology Park Tehnopol
Mr Marek Tiits	Chairman of the Board, Institute of Baltic Studies
Dr Katrin Männik	Consultant, Representative Baltic States, Technopolis Group Belgium (observer)