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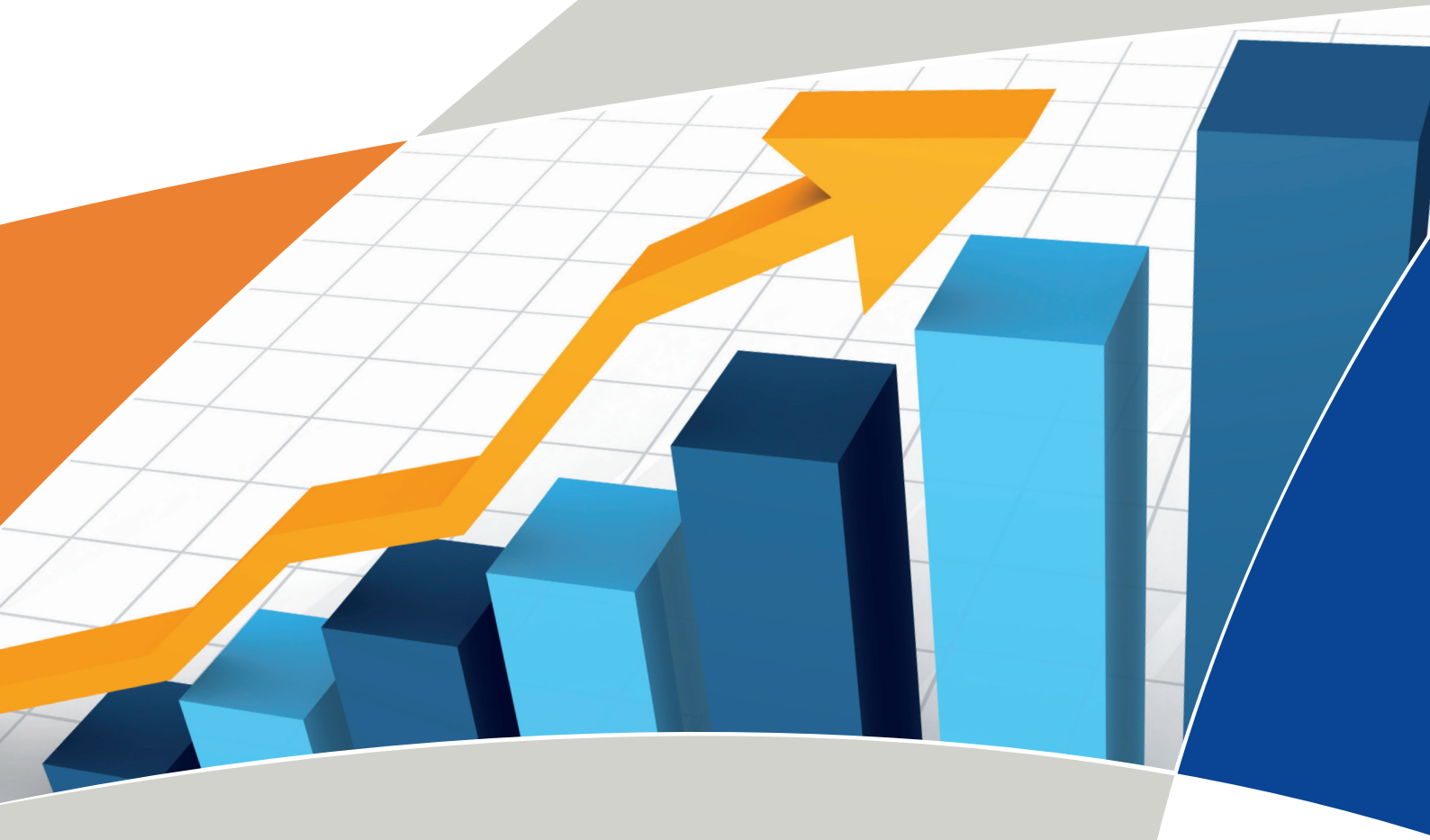
European Innovation Progress Report 2009



European Commission
Enterprise and Industry

PRO INNO EUROPE
INNO POLICY TRENDCHART

European Innovation Progress Report 2009

European Commission
Enterprise and Industry Directorate-General

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ISBN 978-92-79-15513-0
ISSN 1830-7752
doi: 10.2769/52531

European Innovation Progress Report 2009

Foreword

The present report was prepared by Lena Tsipouri (University of Athens, Greece) and Alasdair Reid (Technopolis Group, Belgium). Chapter 1 was written by Katrin Männik and Ruta Rannala, Chapter 2 by Lena Tsipouri, Chapter 3 by Alasdair Reid and Miriam Ruiz Yaniz, and Chapter 4 by Miriam Ruiz Yaniz, Ruta Rannala, Nelly Bruno and Sirin Elci.

This European-level report is based on the work of the TrendChart policy monitoring network of national correspondents to whom recognition is due.

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Acronyms

ANR: French Research Agency
BAP: TechnoPartner Business Angel Programme
BERD: Business Expenditures in Research & Development
BTYKL: Supreme Council of Science and Technology
CDTI: Centre for the Development of Industrial Technology
CEKI: Committee for Economy, Knowledge and Innovation
CENIT: National Strategic Consortia for Technical Research
CFP(s): call(s) for proposals
CKBS: Commission for the Knowledge-based Society
CSIC: Spanish National Research Council
CTI: Commission for Technology and Information Policy
DESMI: Research Promotion Foundation's Framework Programme for Research, Technological Development and Innovation
DfES: Department for Education and Skills
DTI: Department for Trade and Industry
EERP: European Economic Recovery Plan
EFI: Expert Commission Research and Innovation
EIPR: European Innovation Progress Report
EIS: European Innovation Scoreboard
ELY Centres: Centres for Economic Development, Transport and the Environment
ERA: European Research Area
ERDF: European Regional Development Fund
ERP: Economic Recovery Plan
ESI: Economic Sentiment Indicator\
EVD: Netherlands Foreign Trade Agency
EZ: Ministry of Economic Affairs
FDI: foreign direct investment
FES: Fund for the Enhancement of the Economic Structure
FP6: Sixth Framework Programme
FP7: Seventh Framework Programme
GCNELPT: Gabinete do Coordenador Nacional da Estratégia de Lisboa e do Plano Tecnológico (Office of the National Coordinator for the Lisbon Strategy and the Technological Plan)
HEIs: higher education institution
IA: innovation agency
ICT: information and communication technologies
IDA: Irish Development Authority
IP: Innovation Platform
IPR: intellectual property rights
IWT: Flemish Agency for Innovation by Science and Technology
K&I: Knowledge & Innovation
KPI: Agency for Research Fund Management and Research Exploitation
LIDA: Latvian Investment and Development Agency
MCYT: Ministry of Science and Technology
MICINN: Ministry of Science and Innovation
MITYC: Ministry of Industry, Tourism and Trade
NADSME: National Agency for Development of Small and Medium Enterprises
NDP(s): National Development Plan(s)
NESTA: National Endowment for Science, Technology and the Arts
NIS: National Innovation System
NRP: National Reform Plan
NRTO: National Research and Technology Office
NWO: Netherlands Organisation for Scientific Research
OCW: Ministry of Education, Culture and Science
OECD: Organisation for Economic Cooperation and Development
OMC: open method of coordination
OPs: operation programmes

OSEO: French SME support agency
PE: private equity
R&D: research & development
RDAs: regional development agencies
RIA: regional innovation agencies
RPE: performance measurement and evaluation
RTD: research and technological development
RTDI: research, technological development and innovation
S&T: science & technology
SARIO: State Agency for Development of Investment and Trade
SF: Structural Fund(s)
SHOK: Strategisen huippuosaamisen keskittymät (Strategic Centres for Science, Technology and Innovation)
SIEA: Slovak Innovation and Energy Agency
SII: Summary Innovation Index
Sitra: Finnish National Fund for Research and Development
SKE: TechnoPartner Knowledge Exploitation Subsidy
SMEs: small and medium-sized enterprises
STI: science, technology and innovation
STPC: Science and Technology Council
TARP: Troubled Asset Relief Program
TC: TrendChart
Tekes: Finnish Funding Agency for Technology and Innovation
TSB: Technology Strategy Board
TTPK: Science and Technology Policy Council
VAMOS: Value Added Mobile Solutions
VC: venture capital
VINDI: Impact Framework and Indicators for Science, Technology and Innovation
VTT: Technical Research Centre of Finland

Introduction

The INNO-Policy TrendChart has been running since January 2000. It currently tracks innovation policy developments in all 27 European Union (EU-27) Member States, plus Iceland, Norway, Switzerland, Croatia, Turkey, Israel, Brazil, Canada, China, Japan, USA and India.

Improving understanding of how governments, in partnership with stakeholders, design and deliver innovation policy and the extent to which public policy responds effectively to specific challenges inherent in national innovation systems (NIS) is at the core of the INNO Policy TrendChart exercise. In addition TrendChart country correspondents contribute to the research and innovation support measures inventory jointly managed by the TrendChart and ERAWATCH services.

The current report marks a decade of activity during which time the context for innovation policy in Europe, and globally, has changed considerably from the dot.com bubble to the financial crisis, from 15 EU Member States to 27, from the aim enshrined in the 2000 Lisbon Agenda to make Europe the most competitive economy in the world by 2010 to the new emerging policy agenda that will require a radically change of the way business is done to reduce resource and energy intensity in response to the threat of environmental disaster by 2020.

This year's *European Innovation Progress Report* (EIPR) is based as in previous years on the work of the national experts ('country correspondents') who are at the heart of the TrendChart policy monitoring system. The report is based on both the annual country reports for 2009 and the on-going monitoring of innovation policy measures for each country collected and published in the European Inventory of Research and Innovation Policy Measures (available at http://www.proinno-europe.eu).

The report begins by examining the effects of the 2008-09 financial crisis on innovation strategies and policies in the EU-27 and associated and candidate countries. Chapter 2 takes an in-depth look at the patterns and trends in governance of innovation policy. Chapter 3 provides the first in-depth analysis of public budgets for innovation based on the budgetary data collected for over 1000 innovation policy measures by the country correspondents. Finally, Chapter 4 examines the trends in innovation policy in five countries (representative of the EIS country groups plus Turkey as an EU candidate country) over the last decade in order to chart the way in which innovation policy has progressed.

As a new decade opens, the Inno-Policy TrendChart will need to 'practice as we have preached' and be ready to evolve and change to reflect the new political priorities and new understanding of the drivers of innovation in our societies and economies. The longevity of the project, the expertise that has been built up, the interest from and interaction with national policy makers and the commitment of the network of country correspondents makes the TrendChart a unique policy analysis tool at European level. The TrendChart consortium partners thank all the people who have contributed over the last decade to the development of the methods and the accumulated base of knowledge.

Prof Lena Tsipouri,

University of Athens

Alasdair Reid

Technopolis Group

Brussels, January 2010

1 The impact of the global financial crisis on national innovation performance and policies.

1.1 Creative destruction or sustained slump? Analysing the effects of the financial crisis on innovation.

1.1.1 Can innovation assist economic recovery?

The global financial crisis of 2008 and 2009 hit the industrialised world, including the EU-27, hard in economic terms. Credit shortages and falls in property prices and stock markets reinforced a slump in business and consumer confidence that fell to unprecedented lows. Since its trough in March 2009, the Economic Sentiment Indicator (ESI) had improved for 9 consecutive months (by December 2009 to 92.0 (+4.1 points) in the EU and to 91.3 (+2.5) in the euro area), though it still remains below its long-term average ([1]). Moreover, the slowdown also spread to the emerging economies that are important trade partners of the EU, with a negative effect on exports. Economic forecasts for 2010 and 2011 confirm that financial market conditions remain fragile and recovery still some way off in many EU countries.

Availability of (public and private) finance and investment is an essential part of the innovation process. Available research on private equity (PE) activity suggests that PE firms changed their focus during the crisis from financing new deals to supporting the companies in their portfolio through the recession. The most active regions in investment in 2009 were the UK and Ireland (28%), followed by Belgium and the Netherlands (15%). Fund-raising reached EUR 69 billion in 2009 but fell sharply through 2009 with only EUR 6 billion raised in the first 9 months of the year ([2]). Although detailed data is not available yet on venture capital (VC) (and notably the early-stage and seed capital vital for the creation and growth of innovative firms), anecdotal evidence suggests that fund-raising has largely dried up. In terms of foreign direct investment (FDI), with 39% of global FDI inflows (in 2008), Europe remained the number one destination for international investment but was clearly hit by the crisis, receiving smaller investment projects in fewer locations. Five years of sustained inward investment growth came to an end, and the decrease in FDI in turn had a severe impact on job creation (a 16% decline in total from 2007). Indeed, the negative FDI trend has hit central and eastern European (CEE) countries more severely (inward FDI projects fell by 5% and job creation by as much as 26%) (E&Y, 2009([3])).

From the public policy perspective, national and international observers called on government to include a strong element of support for innovation in their 'crisis packages'. The OECD (2009) argued that innovation is a key instrument to boost productivity and sustainable growth and that strong innovation performance is more important than ever. Hence, stimulus packages should be designed in a way that supports innovation, including the following means: investment in broadband infrastructure; research and development (R&D) in green technologies; and innovation of education and training systems ([4]).

Similar calls for boosting support to innovation were made at national levels. In the UK, for instance, the National Endowment for Science, Technology and the Arts (NESTA) published a short report, entitled *Demanding growth* in March 2009. The report's authors noted that recessionary pressures on companies were encouraging retrenchment. Innovation spending is often seen as an unnecessary 'luxury' in such circumstances, with companies looking to cut costs. Hence, the private sector alone may not be able to maintain a high rate of innovation. They argued that it is wiser to adopt a demand-led approach, by identifying areas likely to cross traditional industry sectors and combine many

[1] See http://ec.europa.eu/economy_finance/db_indicators/surveys/index_en.htm (consulted on 7 January 2010).
[2] *2009 EVCA Buyout Report*, 1 December 2009. Available at http://www.evca.eu online.
[3] Reinventing European growth. Ernst & Young's 2009 European attractiveness survey.
[4] OECD (2009) *OECD Strategic Response to the Financial and Economic Crisis*.

technologies, where there is strong evidence of future demand as a result of customer preferences, societal trends, or major regulatory shifts. Where indicators of high future demand and strong existing national capabilities co-exist, government action is likely to have the highest impact.

The Finnish experience at the beginning of the 1990s is often cited as an example of how policy can be designed to 'innovate out of the crisis'. Yet, while the Finnish example is relevant, the context of the 2008-09 crisis is significantly different with a much wider global downturn in credit, trade and investment, making an export-led growth strategy difficult. There is therefore a relatively broad consensus that suggests the need for a wider coordinated response to supporting innovation during the period of financial and economic uncertainty ([5]). Hence, business as usual in the sense of simply increasing or maintaining public support for specific direct/indirect innovation support measures is unlikely to be sufficient. The need to re-orientate economic activity by identifying and boosting new 'engines of prosperity' (low-carbon technologies, etc.) based on a more sustainable model (financially and in terms of resource intensity) is required.

In this context, the EU's heads of state and government agreed on the need for a coordinated response to the negative impacts of the financial markets meltdown and credit crunch. In December 2008, **the European Economic Recovery Plan (EERP**) ([6]), was adopted with the following strategic aims.

- 'Swiftly stimulate demand and boost consumer confidence;
- Lessen the human cost of the economic downturn and its impact on the most vulnerable. Action can be taken to help stem the loss of jobs; and then to help people return rapidly to the labour market, rather than face long-term unemployment;
- Help Europe to prepare to take advantage when growth returns so that the European economy is in tune with the demands of competitiveness and the needs of the future, as outlined in the Lisbon Strategy for Growth and Jobs. That means pursuing the necessary structural reforms, supporting innovation, and building a knowledge economy;
- Speed up the shift towards a low carbon economy…'

The implementation of the EERP is in the hands of the governments of the Member States, which, depending on the situation and particular problems, decide on the scope of interventions and support, and draw up national recovery plans ([7]). A July 2009 report from the European Commission on the plans ([8]) concluded that the EU's response to the crisis is broadly adequate. The measures being pursued under Member States' recovery plans are for the most part in line with the principles and guidelines set out in the EERP. However, investment support, while including a substantial element on energy efficiency, does not seem to represent a significant push toward the low-carbon economy. The report includes a more detailed review of the contribution of the Member States' ERP to productive investment including R&D and innovation. New or accelerated spending on public investments forms a significant share (about a third or EUR 65 billion) of fiscal stimuli in line with the EERP (0.32% of EU gross domestic product (GDP) in 2009 and 0.20% in 2010; respectively EUR 32 billion for physical infrastructure, EUR 20 billion for energy efficiency and EUR 5 billion for R&D. The report identified a total of 37 measures taken in 18 Member States, of which 11 measures were expected to have 'high short-term effectiveness' (in Sweden, Germany, France, Spain, the Netherlands, Austria, Ireland and Finland). However, only three measures related to R&D investment were expected to tackle climate change and energy issues efficiently, and only four measures had potential for lifting structural bottlenecks to investment. Most worryingly, the Directorate-General for Economic and Financial Affairs

[5] European Commission, DG ECFIN, Impact of the current economic and financial crisis on potential output, Occasional Papers No. 49 / June 2009.

[6] Communication from the Commission to the European Council: a European Economic Recovery Plan. Brussels, 26.11.2008, COM(2008) 800 final.

[7] In the part of the budgetary and fiscal policies, the Council Regulation (EC) No 1466/97 on the strengthening of budgetary surveillance and the surveillance and coordination of economic policies is applicable, as in 2009, the Commission assessed the Stability and Convergence Programmes of the Members States in the light of the EERP. See more at http://ec.europa.eu/economy_finance/thematic_articles/article13960_en.htm online.

[8] European Commission, DG ECFIN (2009), The EU's response to support the real economy during the economic crisis: an overview of Member States' recovery measures, European Economy Occasional Papers No 51.

(DG ECFIN) report concluded that while 'on the public side, there are relatively few indications of rolling back of existing R&D programmes; these are concentrated in countries with balance of payment crises. The additional public support as part of the Recovery plans amounts to approximately €5 billion over 2009-2010. In sum, however, this suggests that overall R&D and innovation outlays are set to decline during the crisis'.

This section of the EIPR 2009 seeks to shed more light on this question of how much and how effectively the EU-27 Member States have invested in innovation as an instrument of economic recovery.

1.1.2 Analytical framework

This chapter focuses on the actions taken in support of the third strategic aim of the EERP, support to innovation and building a knowledge economy at Member State level. The analysis is based on the findings of the **TrendChart Country reports for 2009**. A summary table of the data extracted from the reports can be found in Appendix 1).

Particular emphasis is given to analysing the impact of the crisis on innovation and the extent to which the national recovery plans focus on measures (including innovation spending, labour market measures, internationalisation, etc.) likely to boost innovation. To complement the country reports, it is instructive to cross-reference the impact of the crisis at enterprise level, as identified in the ***Innobarometer 2009*** **report** ([9]).

In a first step, four areas ([10]) where the impacts of the financial crisis are likely to have occurred are delineated.

1) **Social and economic framework conditions**: takes into account the depth of the crisis and economic recession per country, highlighting the financial situation, labour market trends, etc.
2) **Innovation policy framework**: changes in public policies influencing innovation, other factors boosting innovation and identified emerging opportunities for innovation at country level.
3) **Spending on innovation**: spending trends and effects on specific sectors and business activities.
4) **Internationalisation of innovation**: trends in FDI, trade, geographic focus, scope of activities.

Hypothetically, the response to the impact of the crisis on innovation in different countries should correlate with their innovation performance, general investment capacities, and maturity in political and strategic planning. In practical terms, countries were grouped using the classification of the European Innovation Scoreboard (EIS) based on the Summary Innovation Index (SII). The EIS 2009 allocates the EU Member States and the associated/candidate countries into four groups:

- Denmark, Finland, Germany, Sweden, Switzerland and the UK, the **innovation leaders**;
- Austria, Belgium, Cyprus, Estonia, France, Iceland, Ireland, Luxembourg and the Netherlands, and Slovenia, **the innovation followers**;
- the Czech Republic, Greece, Hungary, Italy, Lithuania, Malta, Norway, Poland, Portugal, Slovakia and Spain, the **moderate innovators** ([11]);
- Bulgaria, Latvia, Romania, Croatia and Turkey, the **catching-up countries**.

From the EIS studies (EIS 2008), it is known that the innovation leaders and the innovation followers have the smallest variance in their performance across the different dimensions. Equally, the analysis in the governance section of the report tends to confirm that the higher performers in innovation also have the best capacity to formulate policies. Hence, hypothetically, these countries, at least on the governance and sectoral levels, should be better prepared to tackle unexpected financial shocks by applying a comprehensive set of compensating measures/counteractions.

[9] Conducted by the Gallup Organisation at the request of the Directorate-General for Enterprise and Industry (DG ENTR). See Inno Metric.

[10] These domains should not be mistaken with the EIS dimensions, as the domains are multidimensional, i.e. the EIS dimensions could appear in the different domains.

[11] Cyprus, Estonia and Iceland were classified as moderate innovators in EIS 2008.

1.2 The effects of the financial crisis on national innovation systems

The analysis in this section is largely based on the section on the crisis and innovation in the 2009 country reports. Details for each domain and issue can be found in a summary table in Appendix 1.

1.2.1 Effects of the crisis on innovation performance and activity

The current **financial** uncertainty appears (with few exceptions) in all four groups of countries, from the relatively moderate or manageable effects as reported for Germany, Sweden, the Czech Republic, Denmark and Bulgaria to the highly negative situations in Latvia, and especially Iceland, where the entire financial sector collapsed in 2008. Only a few countries (Austria, Croatia, Luxembourg and Switzerland), did not report evidence of the direct impact of the financial crisis on innovation spending.

A common theme across the TrendChart country reports was that companies and entire sectors experienced a **decline in demand,** both in domestic and global markets, likely to affect recovery of entire sectors. Due to reduced means of commercial banks to supply enterprises with bank loans and credit, the most common immediate effects of the financial crisis reported are capital and liquidity problems for operation and investments, followed by bankruptcies and liquidations.

Problems with access to **external private funding** are common to all sectors across Europe, but at least in some countries, this situation is mitigated by the improved access to public financing (reported in Ireland, Norway and Sweden) and/or their own financial reserves (in Germany, Norway and Switzerland). Particularly in Germany and Switzerland, the reports' authors imply that due to the traditional conservatism with respect to financing and leveraging in these countries, business investments, including innovation investments, have been dependent on external sources only to a limited extent. Some national industries suffer additionally from the contraction of the VC market (e.g. for (information and communication technologies) ICT and biotechnology in Austria) or decreased FDI (ICT in Ireland, Bulgaria, Slovakia and Poland).

One consequence of the credit shortage is that the **financing of innovation** and related educational and R&D activities has become more difficult. The policy approach of Member States to **this challenge** is varied but spans a spectrum between two extremes: a forward-looking and proactive approach; and a short-term survival or defensive approach. In the present study, these two response patterns were identified at all levels from central government policy (see more in the next subsection) to corporate strategies, across all investigated domains.

In particular, the gap between proactive, long-term and the defensive corporate strategies is found to be lowest in countries classified as 'Innovation leaders' (*Innobarometer 2009*, confirmed by Danish and Finnish country reports). Considering individual countries, cuts in innovation expenditure is a typical response of defensive corporate strategies dominating in the 'catching-up' countries: Greece (44% of companies), Lithuania and Latvia (both 42%), relatively widespread in Romania (33% vs 9%, planning an increase), Ireland (31% vs 10%) and Poland (28% vs 7%) (*Innobarometer 2009*). However, finding Ireland (an 'Innovation follower') in this grouping is more unexpected. The best ratio of the forward-looking companies (vs. defensive) is seen in Switzerland (17% vs 9%), Malta (16% vs 15%) and Finland (16% vs 14%). This a worrying feature indicating a potential increase in the 'cohesion gap' in the future between leaders and catching-up countries.

According to the TrendChart country reports, the negative effects in industrially developed countries have been concentrated mostly in the **export-oriented manufacturing sectors** with a traditionally strong innovation and R&D performance, such as the automotive industry (reported by Austria, Belgium, Germany, the Czech Republic, France, Italy, Luxemburg, Romania, Slovakia, Sweden, Switzerland and Norway), machinery and equipment (Germany, Finland, France, Italy and Poland), engineering (Finland, France and Ireland), electronic equipment and software (Ireland and Austria) and chemicals (Belgium, Germany, France and Poland).

In this respect, businesses in some countries (the UK, Germany and Ireland) have concerns that the consequence might be **falling innovation expenditures** while others (Finland, Denmark and Norway) seem to be more committed to the forward-looking business strategies, and attempt to retain or increase their innovation-related expenditures. Despite such concerns, it seems that expenditures on innovation and R&D have not necessarily fallen in these industries, e.g. German industrial groups

(automotive, electronics and chemicals) reported higher R&D expenditures for the first quarter of 2009 compared to 2008, which a good example of long-term business strategies (German report).

There are a few **positive exceptions in high-tech manufacturing sectors** such as in the Finnish ICT sector or the pharmaceuticals and biotechnology sectors in Hungary and Ireland where virtually no crisis impacts are reported. Similarly, 18% of Swedish innovative small to medium-sized enterprises (SMEs) surveyed in June 2009 ([12]) reported that the impact of the crisis was positive; 19% reported a negative impact and the majority (63%) felt that the crisis had no significant impact.

Some **service and utility sectors** such as energy, credit, insurance and telecommunications also seem to have suffered no negative impacts at all and their innovation budgets have been only slightly adjusted or even increased (as was reported in Austria, Germany, Italy and Finland, for instance).

The TC findings correlate well with the *Innobarometer 2009* survey results, which explored the direct effects on companies of the economic downturn. In the survey, innovation spending was forecast to decrease in 2009 more often in the low-tech (and medium-low-tech) manufacturing sector (14%). This may lead to a more rapid restructuring of the economy but may also deepen the consequences of the crisis.

The consequences of the crisis clearly **depend on the size of the companies**: in multinational and large companies, the core issue would seem to be the cost optimisation and the adjustment of the production portfolio (e.g. switch to cheaper or less energy-consuming models in the automotive industry, German report), rather than the availability of credit. The latter is more important for SMEs and establishment of new start-ups, and there are plenty of examples of this negative impact across all country groups.

In conclusion, a negative impact on innovation activities is reported more often for the manufacturing sectors (particularly traditional medium-high innovators like automobile, machinery and equipment) than for the service sectors. This may be partly due to the well-known difficulties in measuring innovation in the service sector. Equally, larger companies appear less vulnerable than SMEs (due to the strong planning and internal resources, and financial credibility). The domestically oriented companies and service companies experience the downturn later and the impacts on innovation activities in the high-tech sectors like ICT and biotechnology are less obvious, or may just be postponed ([13]).

Due to the crisis, the **employment rate** has declined across Europe. Businesses have basically adopted two types of responses: immediate staff reductions or forward-looking, careful optimisation of personnel-related costs. In the latter case, companies are actively looking for **temporary employment arrangements** instead of or besides firing, such as temporary lay-offs and improvement of efficiency (see country reports for Finland, Denmark and the Netherlands), in order to be in position to reply swiftly if demand picks up. The large Swedish firms that perform the major share of R&D indicate that they aim to retain R&D staff with key competences, but in many cases they try to reassign R&D staff to shorter-term activities with more a immediate payoff instead (Swedish country report).

Company-level actions are encouraged and supported by state programmes on re-qualification and other job-related training and special part-time unemployment benefit schemes, introduced for instance in the Netherlands, the Czech Republic and Portugal. An interesting measure adopted in the Netherlands is the state financing of secondments at public research institutes and universities schemes in order to retain private sector researchers who are at risk of losing their jobs.

In small countries like Estonia, Latvia and Iceland, the country reports highlight a serious **risk of brain-drain** if the crisis drags on. Unfortunately, no effective labour market measures are in place and none are reported as a response to the crisis. Certain other, **country-specific human resource problems** have also come to the fore due to the current recession and require urgent solutions (see the report for Cyprus, Greece and the UK).

[12] VINNOVA Rapport VR 2009:18 'En undersökning av innovativa företags syn på strategiskt utvecklingsarbete i spåret av lågkonjunkturen' (*An investigation of innovative firms' views on strategic development, in view of the economic crisis*).

[13] For a further discussion and general trends on the topic, see *The Innobarometer 2009*, conducted by The Gallup Organisation upon the request of DG Enterprise, and *2009 EU Industrial R&D Investment Scoreboard,* European Commission Joint Research Centre Institute for Prospective Technological Studies.

1.2.2 Strategic policy initiatives to support innovation in the crisis

In this section, the analysis highlights certain country-group specific examples in order to benchmark the **prevailing approaches** and the **national initiatives,** as identified in the 2009 TrendChart Country Reports. The analysis considers both the scope and timing of the interventions with a focus on innovation support compared with the objectives of the EERP, as well as the strategic approach (behaviour) to the crisis impact. The countries broadly fall under four general patterns.

Firstly, the Nordic and top performing countries have clearly adopted a proactive and preventive approach. The Finnish Government had already agreed on a comprehensive stimulus package in January 2009. A specific part of the stimulus package concerns education, research and (job-related) training. Moreover, on the long-term R&D and innovation policy planning level, the renewed **national innovation strategy** was elaborated in 2007-08 (approved by the Council of State in October 2008) and further, the Ministry of Education and Ministry of Employment and the Economy assigned a comprehensive **evaluation of the NIS** ([14]) – with one of the tasks being 'to identify the current and future challenges' of the system (the evaluation report was published in October 2009). The public response to the financial crisis is well in line with the guidelines set out in the national innovation strategy and evaluation results (even if the launch of the latter initiative was unrelated to the current crisis).

The anti-crisis package of the Swiss government is another example of the **preventive measures** aiming to avoid the potential impact of the crisis on innovation. It includes additional expenditures on research and innovation activities, and innovation policy promotion. The main focus of the support is to sustain the R&D and innovation capacity of Swiss companies, by introducing **three extra measures** (from the 2009 budget year). Similarly, Norway launched its various stimulation activities from January 2009, focusing on innovation support in trade and industry.

The second group of countries have less extensive (in terms of innovation support) but still timely (i.e. started in early 2009) recovery plans. The main emphasis of the national government action is on stabilisation of the financial system (state guarantee schemes, financial support to local governments, special credit support to SMEs or the key industries, etc.), but general stabilisation plans are also supplemented by new measures dealing with the most acute setbacks.

For instance, the only new immediate innovation policy initiatives, reported in the Swedish country report, is the establishment of a **new state-owned risk capital company** focused, not surprisingly, on the motor vehicle industry. Coincidently, a **new law on research** was launched in Sweden in 2008, providing resources for commercialisation of university research. It is argued in the Swedish report that the relatively modest direct response of the government is a result of the positive effect of national monetary policy ([15]).

The Czech government created the ad hoc National Economic Council at the beginning of January 2009 with the task of analysing the risks and potential impacts of the global financial crisis and of proposing measures to reduce or eliminate the crisis impacts. The set of proposed measures is varied, and includes labour market support, tax relief, and a clear commitment **to not reduce public investments** in research, development and innovation (RDI) (Czech report).

The French Government launched a Recovery Plan in February 2009, which included the creation of a special ministry (see the governance section of this report) with **additional investments** to be channelled, inter alia, to **higher education and research.** A number of priority **high- or medium-high-tech sectors** were prioritised in the recovery plan**:** automotive, eco-technologies, nanotechnologies.

In Italy at the end of 2008, the government announced the adoption of several measures to sustain the national economy. The Italian report notes that the current crisis has not led to cuts in public R&D expenditure and business support, and that additional support is available for **research centres and**

[14] The evaluation has produced a Policy Report, a more extensive Full Report along with several background studies. See more on the http://www.tem.fi/index.phtml?l=en&s=3161 online.

[15] Sweden is not a Euro-zone country. In the current crisis, the floating exchange rate of the krona (SEK) is seen to be a 'financial brake', softening impacts abroad.

universities to strengthen research in the fields of production, energy saving, nuclear energy and environmental protection.

The third group of countries has been much less responsive and has taken, often, delayed action to deal with the effects of the crisis on innovation. In some cases, the scope of support activities is relatively wide but essentially defensive in nature, as seen for instance in Hungary and Portugal. The Portuguese response to the crisis, approved by the Council of Ministers in December 2008, is the Investment and Employment Initiative ([16]). This strategy includes an enhanced set of measures focused on the reinforcement of public investment, modernisation of schools and technological infrastructures (Broadband – New Generation Networks), direct support to the economy through fiscal measures, incentives for SMEs and exports, support for employment and for the adoption of renewable energies. The Investment and Employment Initiative represents an additional stimulus to the economy of EUR 2 180 million (about 1.25% of GDP), of which EUR 1 300 million (0.8% of GDP) are directly financed through the government budget. However, the Portuguese 2009 Country Report argues that, 'in spite of these measures, the analysis of the original 2009 budget suggests that, at first, the Government did not fully anticipate the magnitude of the crisis impact' and that 'the analysis of the anti-crisis measures shows, however, that innovation has not been a major concern in the design of the anti-crisis programme'. Rather, an important objective of the programme was to provide mechanisms that might play a temporary countervailing effect against the vicissitudes of the international demand slump for cars. Equally, in Hungary, the crisis management programme (only approved in May 2009) focused primarily on defensive actions like cost-cutting, short-term job protection and retaining foreign investors' confidence, even if the programme also declares that research, technological development and innovation (RTDI) activities are important.

On the whole, these countries have introduced only a few, if any, additional innovation policy measures and these generally with a delay. They have, rather, chosen to reinforce implementation of existing policy measures. An example is the increase in state budget allocations to the programme Innovative Activities in Enterprises in the case of Slovakia. In Estonia, a considerable share of funding (between 15% and 50% of the specific measures) is shifted (it is claimed only temporally) from innovation and R&D schemes to export promotion through the state guarantees for company loans, especially for export support ([17]). The Commission's own 2009 report on national ERP confirms this focus on measures already in the planning pipeline and argues that more than one third of the measures are derived from the 2008 National Reform Plan (NRP) and nearly a further 30% of the measures are 'frontloading' of planned projects (notably in the Structural Fund (SF) programmes).

Finally, the fourth group of countries (e.g. Latvia, Lithuania and Romania), while facing huge negative impacts and most likely to suffer the most over time, do not have fully adequate recovery plans for innovation ([18]). Instead of stimulation of innovation activities, these countries are counting on financial re-allocation between the national support measures and/or introducing only general fiscal measures – loan and deposit guarantees, special bonds to raise liquidity, etc. The Latvian mid-term recovery plan of the economy (only drafted in July 2009)**,** highlights the need to replace the current economic model that is rooted in cheap labour with one based on knowledge and innovation. The plan underlines the necessity to promote competitiveness, increase productivity and high value added production in order to achieve its goals. At the same time, the Latvian state budget (2008) introduced a cut for R&D expenditures by 40% and additional tax increases. It seems fair to question how government expects businesses to meet innovation goals under such financial pressure.

To sum up, four groups of countries can be identified in terms of the type and speed of response as regards supporting innovation during the financial crisis.

- **Proactive and forward-looking**: a policy response dealing with not only the present but also potential or future challenges to innovation-led recovery, across several domains: Finland, Germany, Luxemburg, the Netherlands, Norway and Switzerland.

[16] See http://www.portugal.gov.pt/pt/Documentos/Governo/PCM/Apres_IIE.pdf online.
[17] Estonian Country Report, cit. Tammiste (2009).
[18] Based on the findings and evidence from the TC Country Reports.

- **Adequate and timely**: a timely intervention but with a stronger focus on general economic support than in the first group: Belgium, Cyprus ([19]), the Czech Republic, Denmark([20]), France, Ireland, Italy, Luxemburg, Malta, Poland, Spain, Sweden and the UK.
- **Defensive**: often delayed response (i.e. initiated only in mid-2009 or later), mostly focused on general economic support measures but with a few additional innovation-specific initiatives or reinforcement of pre-existing measures: Austria, Bulgaria, Croatia ([21]), Estonia, Greece, Hungary ([22]), Portugal ([23]), Slovakia and Turkey ([24]).
- **Inadequate:** delayed, defensive, focused only on general economic support measures, no innovation-specific initiatives: Iceland, Latvia, Lithuania, Romania and Slovenia.

1.2.3 Conclusions

The effects of the crisis on innovation have been felt by individuals, businesses and communities across Europe since 2008; however, not all countries are equal in terms of the preparations or capacity to deal with it. This appears to be especially true as concerns public policies to prevent or mitigate a reduction in innovation activities and expenditures in the business sector, or initiate new, innovation-boosting measures. A clear strategic distinction is apparent in the business sector between two opposing reactions, a forward-looking proactive versus a defensive, reactive approach: this is also visible at policy level across different countries. The scope and comprehensiveness of governments' response is variable, and unfortunately, in some cases, clearly inadequate to meet the challenges of the crisis. In terms of timing, the responses to the crisis impacts in certain countries have been prompt or even preventive, while in others, indecisive or delayed.

A first main finding is that **innovation leaders and followers have in general acted in a proactive or timely manner**, whereas moderate innovators and catching up countries have tended to adopt a defensive approach or failed to take adequate action. This finding tends to corroborate the conclusion of the European Commission's own review of national ERP which argued that the crisis may widen the R&D gap between 'innovation leaders', 'moderate innovators' and 'catching-up' countries ([25]). The Commission suggests that the latter countries facing budgetary restrictions that want to avoid a further widening of the innovation gap should focus on strengthening framework conditions (competition, skills and education, intellectual property rights (IPR), etc.). However, as highlighted in last year's EIPR, these countries do not focus policy efforts more on framework conditions than more advanced countries.

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[19] In Cyprus, government expenditures on research and innovation for the current period are significantly higher than those for the previous periods (For 2008 and 2009 they were EUR 70 million, compared with EUR 17 million in 2006), while the budget for the Research Promotion Foundation's Framework Programme for Research, Technological Development and Innovation (DESMI) 2009-2010 is expected to reach EUR 50 million. The country report claims no negative effects of the crisis, and provides no information about new measures, except the increased budget.

[20] The authors have certain doubts in positioning Denmark as an 'Adequate' responding country group as it provides no information about the stimulus measures in the TrendChart country report 2009. Still, as it refers to comprehensive national studies on the crisis impacts on economy, including innovation spending, it is appropriate to assume that these reports have been used as input to the national recovery plan. Denmark's position is confirmed by the view of the Commission assessment (of the national Stability and Convergence Programme, February 2009), who found that the planned measures are in line with the EERP and identify the required structural reform measures to achieve its budgetary targets in the later years of the programme.

[21] The Croatian report claims that there is no evidence of the financial crisis on country level, so one could argue that the lack of a stimulus package is an adequate response.

[22] Positioned here mainly due to the delay of the national recovery plans, taking account of the scope of the plan – it could be classified 'Adequate'.

[23] The Portuguese government.

[24] Some elements of the national recovery plan in Turkey started in the second half of 2009, which may reflect the delay of the crisis impacts, not the delay of the recovery actions.

[25] According to the 2009 DG ECFIN review of national ERP: virtually all innovation leaders (Germany, Sweden, Finland and the UK) and five out of six innovation followers (Austria, Belgium, France, Ireland and the Netherlands) are implementing additional R&D measures. In contrast, three moderate innovators and three catching-up countries (some of them with major financial challenges) have not announced any measures.

A second finding is that not only the scope but also **the timing of the initiatives** is important, i.e. how promptly governments (compared with their initial commitment expressed to the EERP) have introduced their recovery measures and stimulus packages, particularly on direct innovation support. This finding on the importance of rapid implementation and follow-up of plans is paralleled by findings on the effectiveness of governance systems in the current report. Again, it is worrying that none of the countries classed as 'moderate innovator' and 'catching-up' countries that count on SF support were planning to use the increased flexibility to increase the share of R&D resources ([26]). These countries, which depend on the SFs to finance R&D and innovation, may also be at a disadvantage when it comes to reacting appropriately to a crisis, due to higher levels of bureaucracy.

In the most coherent national recovery plans, the crisis is seen as an additional booster of new industrial technologies, communication (national broadband) and health services, environmental and energy saving innovations, and low-carbon technologies, and the respective support measures are introduced. Meanwhile, the crisis' impact on international collaboration as a potential booster of innovation is unclear, since country data is limited, and is mostly focused on the FDI and trade issues (see Appendix 1). The Danish report does refer to survey results of the business community who feel that the crisis will lead to a decrease in their international collaboration on R&D.

The hypothesis that countries with greater maturity in innovation governance and implementation have been more responsive and committed to their strategic, long-term goals in innovation spending and policy measures is largely confirmed (with exception of Austria, Iceland, and to some extent, Denmark). Indeed, the countries with the most advanced and adequate recovery plans on innovation are mostly the innovation leaders and followers. However, several other countries not belonging to the top performers group have shown commitment to long-term investment and development goals, boosted by diversified economic, particularly industrial structures (especially in the case of the Czech Republic, Norway and Italy), the size of the economy (Poland and Spain) and the national financial position (Norway).

Small countries like Malta and Cyprus (the latter has recently been re-positioned from the moderate innovators group to the innovation followers) illustrate the importance of political commitment to build a knowledge-based economy and raise public expenditure on innovation.

In closing, it should be kept in mind that the present conclusions are drawn from country reports covering a limited time period (mid-2008 to mid-2009) and that it is certainly too early to draw any definite conclusions about effectiveness and efficiency of the introduced policy measures, or estimations about innovation performance following the crisis. However, it seems correct to assume that the effective recovery of national innovation activities after the crisis requires a clear commitment and timely intervention on the part of national governments. Such interventions should both draw on best practice in other countries, and identify the areas of strategic long-term national interests where stakeholders or market demand is likely to drive innovation-based development.

[26] DG ECFIN (2009), ibid.

2 Innovation Governance

2.1 Introduction

More than 40 years ago, Alexander Gerschenkron pointed out that technological catch-up, although potentially highly lucrative, is an extremely challenging venture (Gerschenkron, 1962). Based on a study of the performance of a number of European countries relative to the leading country at the time – Great Britain – he concluded that to succeed in technological catch-up, less advanced countries had to develop what he called 'new institutional instruments', as seen in organisations capable of identifying the most promising future options and mustering the necessary resources for exploiting these opportunities. Decades later, correlation studies argue that 'countries that succeed in developing and sustaining strong innovation capabilities and ***well-functioning systems of governance*** do well economically while those that fail tend to fall behind' (Fagerberg & Srholec, 2008). All this is in line with the theory stipulating in general that governance 'consists of a multitude of actors: politicians who seek political support from various groups, bureaucrats, technocrats and so on. There are often divisions within each of these groups, and it is rare that any individual or group is unconstrained in its decision making or implementation actions. Conflicts of interest, administrative difficulties and the interpretation of bureaucrats' own ineffectiveness as a consequence of insufficient resources and policies at their command' (Krueger, 1990) shape the evolution of organisations and their interaction.

Monitoring innovation governance in the EU Member States over the past 10 years has taught us a few important lessons along these lines.

1. *Innovation governance is path-dependent*. As a consequence, changes are slow and evolutionary. Governments face a number of challenges when it comes to formulating or reviewing their innovation policies. Policies are shaped by a combination of commitments, inertia, new knowledge and responses to changes. Hence, in order to design and implement efficient and effective policies, policymakers need to be in a position to identify the path dependencies that are inherent features of their own system, learn from others and meet new challenges. Governance is about the formal and informal processes of decision making and implementation by actors at different levels. Innovation governance then deals with the decision making processes affecting the enabling environment and implementation of innovation in space (local, regional, national and transnational).
2. There is not a single *best practice* model of innovation governance. Good governance includes certain common elements and a conceptual framework has been developed using the notion of the 'policy cycle' (OECD, Monit): coordination, priority setting, stakeholder involvement, implementation and evaluation leading to better coordination and priority setting in the next period are its constituent elements. This policy cycle is usually independent of the general economic cycle and follows a multi-annual development rationale (e.g. related to the Lisbon Agenda or the SF programming period). The formal elements of the innovation policy cycle are increasingly incorporated into the governance models of the Member States. Coordination is mentioned everywhere, social partners and broader stakeholders' consultations are becoming routine, implementation mechanisms have been put in place and evaluations are being recognised as important, and increasing.
3. *Top performance is not a coincidence*. The most competitive Member States respect good governance and this leads to effective policies enabling the business sector to thrive. Neither top performance nor significant progress in innovation should be considered as a coincidence; both are the result of good governance, stable and flexible at the same time.
4. Although the principles of good governance are broadly accepted and most Member States demonstrate an effort to increasingly respect them, there is *only modest progress and catch-up* between the EIS groups, leaving the question open as to *whether the progress observed is sufficient.* Hence, ***the challenge is to go a step further.*** After successful efforts to adopt the right rhetoric and set appropriate formal mechanisms, it is more obvious than ever that the devil is in the detail: looking into individual elements of implementation may reveal additional issues to focus upon.

***This is the target of the 2009 synthesis*:** As changes are slow and the main lessons were already captured in previous reports, the aim is not only to identify what is happening in innovation governance in the Member States, but try to draw lessons on how to become more ambitious, change gear and adopt more challenging monitoring methodology, which will help shed light on how to further improve performance and offer more knowledge on how to both catch up and forge ahead. The use of Richard Nelson's analysis of new methodologies and monitoring indicators is needed to answer the question: 'What are the needed institutions that enable economic progress?' (Nelson, 2008).

2.2 Some methodological remarks

This report builds on lessons from the past, input from other studies, analysis of the 2009 PRO INNO TrendChart annual country reports and a *pilot questionnaire* testing whether more in-depth governance monitoring makes sense.

Lessons from the past 10 years show that in terms of ***organisational set-up*** there are very different models. However, although not confirmed by each and every case, it seems that separating design and implementation of policies helps effectiveness and a certain scale of integration helps efficiency.

Coordination is imperative for systems to work. It takes different forms, either hierarchical or inter-organisational with more or less powerful committees and consultative bodies acting as bridges between different ministries and agencies. Coordination can be more or less ambitious, ranging from a simple transparency exercise to efforts to avoid duplication, and ultimately to complex coordination, such as parallel development of infrastructure and skills, common long-term visions of different organisation and complementary activities. Based on past quantitative scoring, top performers and innovation followers were leading in terms of their effort to coordinate and, in total, coordination has improved for all countries. Needless to say, some systems remain a great deal more fragmented than others.

Stakeholder involvement is recognised as a determinant of success in any governance system, be it public or corporate. As such, it is fully embraced by innovation agencies, at least in terms of rhetoric. However, in reality the degree of involvement differs considerably and from two points of view as it is a two-way process. Partly, policymakers are reluctant, worry or are sometimes simply too busy to organise the necessary consultation processes. By the same token, however, stakeholders themselves often act as lobbyists without investing the necessary resources to produce evidence allowing them to corroborate their position and influence consensus building. Involvement can be institutionalised or ad hoc, deep or shallow, but the essential lesson is that building up effective stakeholder involvement is a shared responsibility of both the administration and the stakeholders. Formal consultations are increasingly launched in all EU Member States, but their effectiveness and utilisation for building up trust and reducing transaction costs vary. In both cases, internal coordination in the public sector and involvement of actors beyond the administration sometimes operate informally quite well. This is especially so in the case of smaller Member States.

An evidence-based approach to informed agenda setting and policy adjustments is relatively weak in many EU countries. Evaluations, benchmarking, foresight studies, etc. are not as frequent and generalised as might be expected. One argument may be that there is reluctance to spend scarce resources on intelligence gathering, another that there is an inherent reluctance to be evaluated and a third is a belief that internal knowledge is sufficient. Based on past scoring, 'Openness of the process of designing innovation policy measures', 'Quality of inputs to policy making (application of evidence-based techniques, use of evaluation results)' and 'Regularity and transparency of policy monitoring and review processes' have improved over the years for both the European average and for individual countries. Similarly, evaluation practices demonstrate a clear, if not very significant improvement, for both the average European score and for practically all countries. Correspondents systematically raised their annual scores on the evaluation culture and the transparency of results of evaluations.

Trans-European learning takes place at various levels, but only 'formal mechanisms for policy learning (studies, observatories, study visits, joint events with other countries, etc.)' are significant.

There is no evidence, as discussed below, that all these elements need to function well for innovation governance to be effective. In some countries, coordination is informal and the results are excellent; in others, formal coordination is the cornerstone of success. Transnational learning may be explicit or implicit. Evidence-based, inclusive priority setting, effective implementation mechanisms and flexibility

for improvements and redesign are elements that constitute prerequisites of good innovation governance. The issues related to this interaction of the different elements of the policy cycle are analysed in Section 2.3.

Monitoring is based on robust indicators and, when this is not possible or too expensive, on individual or panel appraisals. Such 'subjective rating' of the various governance elements was used in past EIPRs but has since been dropped. Testing the potential for more robust indicators, a pilot exercise was carried out with the TrendChart network to test the possibility and usefulness of quantitative indicators and whether they allow for more in-depth comparison of governance. A short questionnaire was distributed to the country correspondents with simple questions on the schemes, frequency of changes, and human resources dedicated to innovation policy and other detailed information. This exercise was used to trigger some new thinking.

- It proved that going into details is a challenging task, but worth pursuing because it acts as an anatomy of the broader picture, which may conceal both efficacies and inefficiencies.
- However, because innovation governance is complex and multifaceted, an exercise going into further detail needs a conceptual agreement of what constitutes good governance before gathering and interpreting indicators.

In addition to the main lessons drawn from the TrendChart, governance has become more important as an issue related to EU innovation policies and two closely related papers funded are used as further inputs to this synthesis (Cunningham et al. 2009; Hjelt et al. 2008).

As a result, this year's reporting is differentiated from that of the past in the sense that it does not include appraisals of individual elements of governance. It synthesises the results from the national reports in Section 2.3, using the policy cycle model, but tries to raise a number of issues and explores how these should be tackled in a more ambitious monitoring exercise. Then, in Section 2.4, an effort is made to go deeper into the creation of a more detailed conceptual framework of what constitutes good innovation governance and how it could be better measured/monitored, raising the question of whether it would make sense to develop a European Innovation Governance Scoreboard in the future.

2.3 Issues arising from the national innovation policy progress reports

This section synthesises the aspects of innovation governance based primarily on the TrendChart national reports. It is subdivided into stocktaking of the organisational set-up and then the policy cycle, namely priority setting, which is directly linked to consultation, implementation/delivery and, finally, investment in evidence creation, helping to improve the organisational set-up and priorities.

2.3.1 The organisational set-up

This section summarises findings of the evolution and the 2009 changes of innovation governance in the Member States in the form of key issues related to the organisational set-up and coordination. The trends are not necessarily convergent, nor has the crisis triggered similar patterns of reaction.

The main actors of innovation governance were shaped in most Member States in the last decade; changes are mostly incremental now and derive from the need to adapt to new challenges. In a minority of cases, institutional evaluations are undertaken and lead to more radical redesign in an effort to improve the overall system performance. However, the organisational set-up is far from derived from systemic optimisation. As identified by Hjelt at al. (2008), 'since the established institutions are generally regarded as incapable of delivering results quickly enough, temporary "bypasses" (e.g. interdepartmental structures, "outboard motors", new ways of agenda-setting) are created to overcome traditional institutional inertia. Often, these temporary instruments turn into semi-permanent institutions and become part of the governance problem itself. There are generally two ways out. The most radical yet painful measure is to reform the original institutions. Next-best is to introduce more coordination and policy coherence in the system (thus including both the old and the new structures'.

In the 'new' Member States, the systems are younger and less established. Accession to the EU, the process followed by the SFs and the open method of coordination (OMC) of the Lisbon Agenda are significant drivers of their structures. However, there are significant delays and divergences between rhetoric and declarations and actual organisational set-up.

The following key issues emerge; they constitute important directions for further study but do not present a clear and convergent pattern – it is important to look deeper into these changes and how they are perceived/addressed in Member States, in order to arrive at a conceptual framework that will allow a more detailed study of governance.

- Trade-offs between continuity/stability and adaptation in the main elements of the system: Changes in the main bodies are not frequent. Most top performing countries have more stable structures than others. Finland and Germany are among the countries with very stable systems: In Finland, the prominent role of Tekes, since its foundation in 1983, advocates the merits of continuity and scale. While there have been adaptations in the Finnish system, the major components demonstrate significant stability. By and large, the system of innovation governance in Germany is stable and oriented towards consistent continuation of well-established and efficient governance structures. Counter-evidence comes from the UK with frequent changes, sometimes of a fairly radical nature and occasionally back and forth in elements of governance. However, new organisations may reflect a change of priorities, as in the case of the UK's shift to innovation for services from manufacturing. In the decade, Denmark had one major change to adapt to globalisation challenges. Likewise in innovation followers, such as in Flanders where the policy domains 'economy' and 'science, innovation and technology policy' that were integrated by the previous government and brought under one minister have been separated again. Such palinodes are encountered in certain cases, raising questions about the value of the previous change. Austria is another interesting example of a country with a strong evaluation system, which bases changes on institutional evaluations. The country had two system evaluations in five years: the first institutional evaluation led to changes being implemented, but it seems that these did not significantly affect performance; the second evaluation has now generated a further process of discussion on optimal structures.

> *For conceptualising good governance, it can be suggested that stability is important; while changes may be needed, they should not be too frequent and when introduced they need to be well founded, rapid and effective*.

- Delays, indecision and abolishing agreed changes before implementing them are a serious problem. In an effort to design an 'optimal' set-up, governments announce changes that are then delayed and occasionally abolished even after being entrenched in law. The difference in the organisational set-up seems to lie more in the way changes are implemented than in the design of the system itself. Often, moderate innovators and catching-up countries recognise the need for adaptation and system redesign but inertia and vested interests (reactions from the status quo) delay or even cancel decisions. The time elapsing between designing and implementing major new governance schemes may do more harm than good. In Cyprus, a well-designed coordination scheme was announced in 2006 and implementation started in 2009, yet the system is still not fully operational. Similarly, in Lithuania a model imitating Vinnova or Tekes has been announced but no decision has been taken yet. In Hungary, following a series of reorganisations of the governance system, a new science, technology and innovation (STI) policymaking structure was launched in March 2009 by government decree. Yet, while the previous coordinating bodies ceased to exist with immediate effect, none of the envisaged new ones have been established; a crisis management cabinet took office in May 2009 and has not followed up on these tasks since then. In Greece, the law on the merger of research organisations was delayed and then cancelled by the newly elected government. Laws, ministerial decrees or even clear commitments, which are withdrawn, undermine the credibility of the system.

An additional element to conceptualise good governance includes a need to take into consideration the time between decision and implementation and to observe the number of announcements/laws abolished before being implemented.

- Clarity of the system and its coordination is a prerequisite for success. Responsibility for innovation governance is shared by different actors; however, in top performing countries it is also coordinated. A dual ministerial role (except in some small countries), some kind of inter-ministerial coordination and advisory bodies are now present everywhere, whereas in most (but not all top performing) Member States, policy design and implementation are separated. In many cases, the two ministries are supported by two supervised agencies distinguishing research and innovation. Denmark is an exception as the main responsibility for both research and innovation is placed within a single ministry and there is no separation between policy design and policy implementation. Other ministries may participate in activities in this area but the coordination responsibility as well as the main part of policy design and implementation lie within the authority of the Ministry of Science. The Netherlands and Ireland are cases of particular interest in terms of efforts to improve coordination. In the Irish system, the Cabinet sub-committee on Science, Technology and Innovation is the top coordination and policymaking committee for innovation in the Irish Government and it sets the work programme of the Chief Scientist. It is chaired by the Minister for the Department of Enterprise, Trade and Employment. In addition, there is the Inter-Departmental Committee on Science, Technology and Innovation and a new Innovation Taskforce established by the Prime Minister to advise the government on its strategy for positioning Ireland as an international innovation hub. Similarly, in the Netherlands strong emphasis is placed on coordination. The most prominent change since 2007 has been the establishment of an interdepartmental 'Knowledge & Innovation' (K&I) programme department in which all relevant ministries collaborate on joint issues in innovation policy. In 2008, the K&I department published a long-term strategy to guide investments in knowledge and innovation.

- A number of new Member States (and to some extent southern Europe) are finding it challenging to ensure clarity and coordination. In the Czech Republic, a systematic review of policy led to the design of a new governance system with a single coordination body for R&D and innovation and the establishment of a Technology Agency. In Slovakia, one body for coordination of the science and technology (S&T) and innovation policy is the Commission for the Knowledge-based Society (CKBS). The body was established in December 2006 and is headed by the Deputy Prime Minister for the Knowledge-Based Society. In Latvia, a new modified interministerial steering group for coordinating implementation of the plan of measures for business environment improvement was approved by the prime minister in January 2008. In Bulgaria, there is still no clear centre responsible for innovation policy but progress is registered in the set-up of the main nodes of the system distinguishing between policy formulation and implementation. In Portugal and Greece, coordination takes a more formal role driven by the demand of the SFs and the need to comply with the open method of coordination. Progress is recorded in Portugal with the creation of GCNELPT, the national structure responsible for the governance and co-ordination of the Lisbon Strategy and the Technological Plan. In Italy, since 2006, the Department for EU Policies, through a technical committee called CIACE, has been appointed by the government to give political direction to the Lisbon Strategy and has been in charge of drafting the National Reform Program 2006-2008.

  Coordination does not necessarily need to take a permanent form. Alternative models can be studied, as in the case of Slovenia, where, in terms of efficient and friendly delivery, one of the major improvements over the last two years is the organisation of a special one-day event by the Slovenian Entrepreneurial Fund, called Entrepreneurial Slovenia. The representatives of all government agencies providing support to R&D, innovation and entrepreneurship present their annual programmes, call announcements and other specific plans to the business community.

For the conceptualisation of good governance, it seems that the formal structure and type of coordinating committees are irrelevant. Good governance needs effective coordination and this can be measured by the density and depth of linkages, the frequency and type of discussions within coordination bodies represented by the agendas, the quality of the dialogue and its results.

- One particular direction of change is the need to make governance leaner and clearer for beneficiaries. Beneficiaries complain that the structure of innovation policy is becoming so complex that they do not have an overview of the regulatory framework and the incentives they can get. The innovation followers are taking initiatives in this direction: in the Walloon region in Belgium, changes aim at clarifying the landscape of intermediaries through plans to progressively merge the recently created Economic Stimulation Agency and the Technology Promotion Agency. In the Netherlands, three implementation organisations of the Ministry of Economic Affairs (SenterNovem, Netherlands Patent Office and the Netherlands Foreign Trade Agency (EVD)) are being brought together in one implementation organisation – which fits with the horizontal policy objective to reduce the number of front offices for firms and citizens. In the UK, the number of instruments was repackaged to include only a few instruments with sub-programmes.

  Other countries identify the weakness of lack of clarity and see it as linked to the lack of unambiguous coordination. In France, a leaner national set-up is envisaged, but regional organisations are an exception to the rule. The evolution of the delivery process of the French innovation policy is also reflected by an increasing number of actors at local and regional level. Numerous actors have emerged the last 10 to 15 years, with the most recent being the Regional Innovation Agencies (RIAs). In the Czech Republic, the fragmentation of responsibilities for innovation policy at national level results in disagreement between or duplicity of measures striving to attain the same target. This has led to discussions for changes in governance that have already been partly implemented.

The layers and clarity of governance (to both the administration and beneficiaries) in particular, as far as support agencies are concerned, are a matter for measuring good governance.

- Agencification is an increasing trend in most countries. In some high-performing countries like France, Sweden and Finland, one very strong agency takes responsibility for the implementation of innovation policy. In Sweden, ministries are small and the role of Vinnova, the Innovation Agency, is central. In the UK and Spain there are more agencies with a different public image. The UK has the Technology Strategy Board (TSB) that promotes technological development. In late 2006, it was announced that the TSB was to become an executive non-departmental public body, an agency at arm's length from direct government control, in a sense, a 'research council' for industry. This occurred in July 2007. The UK also has other agencies operating at central level with different missions. Spain has also adopted the model of agencies, often at regional level, in line with the federal structure of the country. A particularly interesting case is Germany, where there are more than 20 'programme managing organisations' serving both federal and state ministries. Many of them have developed out of public research bodies (especially from the large governmental research centres), and many of the managers of these organisations have an academic or even a research background in the thematic area for which they are responsible. As all direct public support for R&D and innovation activities in enterprises is project-based and administered by programme managing organisations, policymakers and other staff at the ministries are typically not directly involved in any kind of programme or project administration.

  Among the moderate innovators and the catching-up countries, there is a trend towards creating implementation agencies. In Poland, the commitment to separate policymaking from implementation is considered a positive step towards better governance. Since 2000, a governmental agency known as the Polish Agency for Enterprises Development has been

responsible for the implementation of economic development programmes, supporting the innovation and research activities of SMEs, regional development, export promotion, development of human capital and application of new technologies. The Slovak Innovation and Energy Agency (SIEA) was created in 2007. Innovation and R&D policy measures are also implemented by the State Agency for Development of Investment and Trade (SARIO), the National Agency for Development of Small and Medium Enterprises (NADSME) and the SFs Agency of the Ministry of Education. In Slovenia, each of the ministries has executive agencies through which most of the policy measures are executed. The Slovenian Technology Agency and the Public Agency for Promotion of Entrepreneurship and Foreign Investment are the most important agents. The key responsibility for innovation governance in Latvia is still shared by the Ministry of Economics and the Ministry of Education and Science. However, during the reporting period, some notable structural changes have taken place both within the ministries and the implementing agencies guided by a certain redistribution of the functions of policy design and implementation. Changes within the legal base in 2007-08 gave the Lithuanian Science Council (to the Ministry of Education and Science) the status of a permanently functioning agency, responsible for competitive funding of research programmes.

To conceptualise what agencies contribute to good governance, one needs to go into more detail. The dual existence of ministries and agencies is insufficient: the resources they need compared to the budget they manage, the speed of their decision making and the quality of their implementation need to be addressed. An additional case of interest is to study to what extent competing agencies, as in the German system, may be more effective than single agencies.

- Special cases/topics call for special organisations. While there is continuity in the innovation policy, there are points in time where political commitments to change the country's development model are made. Ireland and Denmark needed new organisations to help implement new ambitious targets: Denmark concerning its globalisation strategy and Ireland to be positioned as an international innovation hub. In the latter case, in July 2009, the Prime Minister established a new Taskforce, chaired by the Secretary General of the Prime Minister's Office, on positioning Ireland as an international innovation hub. This is an important recognition at the highest level in government of the importance of innovation in the future of the Irish economy. In Latvia, transnational coordination is seen as a crucial means for achieving progress, so the Ministry of Economics led an economic cooperation taskforce of the Council of Baltic Sea countries during the Latvian presidency (from 1 July 2007 through to 30 June 2008), focused, inter alia, on the priority area of innovation.

- Increasing interaction and coordination is needed as innovation policy becomes a cornerstone of economic development. Initially, coordination took place between innovation and science on the one hand and innovation and the business sector on the other. The dominant 'two-ministry' co-responsibility resulted from this. As the role of human capital became central, the 'Knowledge Triangle' emerged, with the Ministry of Education being integrated with S&T,. Education, science, research and business (regardless of whether the ministry is named for industry, enterprise or development) now share responsibilities in two or three portfolios and in many different combinations of hierarchies. Sectoral policies (defence, health, agriculture, etc.) were often dealt with independently by the competent ministries. Now, in the new emerging green, social market economy, energy, environmental protection, natural resources and health care in an ageing society are starting to play an increasingly important role. Research, commercialisation, the important role of policy for procurement of innovation and lead markets are important elements of the agenda and create new challenges for coordination. In the Netherlands, for instance, relatively large investments are made via investment impulses from the Fund for the Enhancement of the Economic Structure, which is supported by revenues from the exploitation of natural gas reserves in the Dutch soil. Until recently, these investments had not been guided by a coordinated national strategy for innovation. The decision making process of the allocation of these investments has not been sufficiently transparent and open. The cabinet is advised by the interdepartmental Committee

for Economy, Knowledge and Innovation (CEKI), which is in turn advised by a so-called Committee of 'Wise Men'. In the selection processes, departmental interests have a tendency to overshadow national interests. As a result, significant investments have been made outside the regular research and innovation policy framework.

When conceptualising good governance, one needs to increasingly address coordination with sectoral ministries, the way they implement horizontal aspects of policy and sectoral budgets devoted to innovation in the public sector or specific new challenges and the role of procurement of innovation, technology platforms and lead markets. Regardless of whether the model is inclusive, centralised or decentralised, its mode of coordination needs to be explicit. This topic is becoming more important given the need to address 'societal challenges' through innovation.

- The geographical dimension is not discussed in detail as it is a matter of the national political governance in each country. Federal countries, like Germany, Spain and Austria have a much higher degree of decentralisation than others. The point is not which degree of decentralisation is envisaged, but rather whether regional capacities are adequate. In the UK over recent years, a process of decentralisation has taken place under which responsibility for certain elements of the innovation policy mix has been devolved to the Scottish Government and its agencies, the devolved administrations in Wales and Northern Ireland, and the Regional Development Agencies (RDAs) in England. In England, however, much of the public support for the R&D policy mix remains under national level control, while in Scotland, Wales and Northern Ireland, the devolved authorities have control over a much wider range of policies influencing innovation (from business support to higher education funding).

Regionalisation and coordination: the crux of the matter is how good governance is in each region and how well it is coordinated with the national level, not the formal structure per se.

2.3.2 Priority setting

Independently of the structure of governance, the efficiency, effectiveness and impact of innovation policy depends on the way priorities are set and implemented. It is conventional wisdom (OECD, Monit project, 2005) that priority setting needs to be informed and inclusive, derived from good and timely intelligence gathering after taking stakeholders' views into consideration, reconciling them to the extent that it is possible and taking responsibility for decisions when it is not possible. This ideal type is not encountered often. However, in practice, and as argued in earlier studies, it is often an 'inner circle of STI officials' that set the agenda; this is quite big in most countries and is an important quality of the innovation governance system (Hjelt at al., 2008).

2.3.2.1 Priority setting process within the administration

The following key issues result from priority setting in the Member States and are suggested as a basis for more ambitious innovation policy monitoring.

- Policy documents constitute a good basis of priority setting, but practices differ. The number of policy documents differs significantly between Member States, as derived from the TrendChart policy documents database. Some of the innovation leaders and innovation followers have many documents that directly or indirectly affect innovation policy. The UK government has produced a series of innovation policy documents over the last decade that set out the main objectives of the country's innovation policy. The government published its first *Annual Report for the Science & Innovation Investment Framework 2004-14* in July 2005 and subsequently further annual report updates were produced in 2006, 2007, and the latest one in 2008. The merit of the UK system is that important policy documents are often

produced under joint authorship by more than one department or agency. However, in practice, it can be questioned if the large number of policy documents produced helps or hinders monitoring (in the sense that targets become masked by new policy documents). Ireland has a similarly rich basis of documented priorities. Estonia also has a large number of documents. Belgium publishes a relatively large number of documents due to the federalised governance structure, and the monitoring of their implementation has improved over the last decade. New Member States like the Czech Republic, Estonia and Romania also have a culture of strategy production, but with widely differing results underlining the importance of the quality (e.g. Estonia) against the quantity of documents.

Indeed, innovation leaders such as the Nordic countries, do not adopt a formal document-based priority reflection. The first Danish plan covering all public innovation initiatives in one and the same document was *Innovation Denmark 2007-10*. A single overarching document works well in many countries. In Finland, where innovation has not emerged on the policy agenda overnight, there is one major policy document. The national innovation strategy has been revised to guide the well-established framework of a demand- and user-based innovation policy, the latest revision highlighting the role of competition and market demand for innovation in an open world. Similarly, in France one major change to highlight for the period 2008 to 2009 is the development of a National Research and Innovation Strategy that provides an overview of the state of play and policies implemented. Priorities are very clear and limited.

To conceptualise good governance it is suggested that the number of documents is irrelevant; other aspects matter: quality; coherence if more documents are created; but most importantly, the degree of influence of such documents on concrete policy decisions.

- <u>All countries have at least one document including innovation policy priorities</u>. The adoption of policy documents that explicitly set up priorities and help coordinate policy for effective implementation has become common practice in all EU Member States. All have, at least, an annually updated National Reform Plan (NRP) that responds to the need to set specific targets regarding research, innovation and competitiveness. These plans are of differing quality, some of them being more detailed and forward looking, others reflecting a reluctance to commit the government to pursue ambitious performance indicators.

  The priorities in the new Member States are mostly identified in the SF programming context: Slovakia adopted an innovations strategy for the first time for its SF operation programmes (OPs); Bulgaria is building up infrastructure (research organisations, incubators and innovation centres) as a priority at this stage. The Czech Republic had a *National Innovation Policy* (2005-10), a document prepared independently of its obligations to the EU, with 48 targets, where R&D was seen as a source for innovation and not a target. Monitoring the progress of these targets led to a reform of the system in the Czech Republic and a National Policy of Research, Development and Innovation 2009-15. The SF OPs are used to implement the policy. Southern and central and eastern European countries also have National Development Plans (NDPs) and OPs, where it is mandatory to link their regional support to the Lisbon Agenda. Reporting to the Scientific and Technical Research Committee of the European Council (CREST) on the OMC (Borras et al., 2009) indicates that the NDPs and the NRPs may not always be well aligned, reflecting different points of time, different ministerial responsibilities and last but not least, deficient coordination.

- <u>Overlapping priorities, time horizons and priorities shared between ministries</u>. A major problem of priority setting is that of eliminating certain sectors and reaching agreement between ministries.

  As an example of a coordinated approach, in the UK, in order to set the agenda, a consultation document *Science & innovation: working towards a 10-year investment framework* was released with the 2004 budget. This drew on a series of existing reviews and analyses across the existing policy mix, including the *Lambert Review of Business-University*

Collaboration, the Government's science strategy *Investing in Innovation*, Robert's *Review of the Supply of Scientists and Engineers*, the (former) *DTI Innovation Report*, an Office of Science and Technology consultation on the sustainability of university research and a consultation by the Higher Education Funding Council for England and UK funding bodies on research assessment (Policy Mix Study).

However, even countries with highly effective structures face problems reconciling priorities. For instance, in the Netherlands the rather strict division of labour and the differences in approach have created (coordination) problems for effective policy design. The Ministry of Education, Culture and Science (OCW), for instance, was not actively involved in the definition of the 'key areas' (a cornerstone of the Ministry of Economic Affairs' (EZ's) programmatic package) and did not incorporate these prioritised areas in its policies, nor did it align its research priorities with EZ's innovation priorities. OCW 'outsourced' priority setting to an agency (NWO), which selected its own research themes (and eventually did not get sufficient (additional) funding from OCW to fully develop the thematic programmes). Another example is the lack of coordination between OCW's Strategic Agenda for Higher Education, Research and Science Policy and EZ's innovation strategy. Ideally, the Netherlands should have a more integrated approach in policy design toward the knowledge triangle (education, research and innovation). The current cabinet (2007-11) has made a first step towards enhancing coordination by establishing the interdepartmental K&I programme department. K&I, however, cannot be expected to provide the whole answer to resolving the coordination weaknesses in the Dutch innovation governance system. K&I also works closely with the Innovation Platform, another coordinating/advisory body, especially on the development of societal innovation agendas.

Priorities based on specific documents have different time horizons. Italy put emphasis on industry through the Industria 2015 programme adopted in 2006. Latvia and Lithuania have a large number of documents with a horizon of 2030.

The number and clarity of priorities differs in the various policy documents. In some cases, priorities have technological content; in other cases this is broader and accompanied by specific actions rather than priorities. Ireland relies heavily on evidence for the adoption of priorities and, given the size of the country, it has impressive persistence on the selection of priorities. Malta also has a narrow set of priorities. In Germany, research and innovation policy form a single policy area, and R&D and innovation are always regarded as two aspects of one and the same process of creating and applying new knowledge and new technology. There are 17 priority fields included in a high-tech strategy document (published in 2006). In Hungary an STI Policy Strategy, adopted in 2007, was followed by a detailed Action Plan including 100 specific actions to be taken by relevant organisations with deadlines and budgets, revised and with reduced ambitions in 2009.

The number and type of document each country adopts as well as how many and what type of priorities each one includes are path dependent and do not constitute an indicator of good or bad governance. What matters is that there is at least one document setting priorities, and if there are more, that the documents have transversal validity, that they are streamlined if necessary from different ministries or points of view so that they do not undermine one another. Coordination of document production is one of the crucial elements of good inter-ministerial/interagency coordination.

- Priority setting needs resources. Policy cannot be effective unless the necessary resources have been invested in it. These require a minimum number of people with adequate skills, premises and tools as well as resources to launch studies and surveys. Top-performing countries have not only the skills but also the tradition of investing resources in evidence creation. It seems that in many countries, where the innovation system is in the process of being shaped now, in times of scarcity, there is a philosophy of limiting resources. Other countries attribute the inadequate performance to lacking resources. As an indicative example, in Bulgaria local authorities are not prioritising enough innovative activities of the enterprises on their territory. This is so because they lack both adequate skills and resources

and adequately set responsibilities measured against the local budget. In Slovenia, besides the complicated procedures, one of the handicaps of the ministries/agencies in delivery of the support measures is also limited human resources. This became especially obvious in the cases of measures where co-financing from the SFs is applied. There is a need to simplify procedures and improve competence in the public administration.

When trying to conceptualise good governance, the challenge is not to produce many documents but to invest in the quality and timely implementation of these documents.

2.3.2.2 Stakeholder involvement

Ideally before, or sometimes after, the formal policy document launching, a stakeholder consultation is organised. When TrendChart monitoring started, some Member States lacked this tradition but over the years some kind of involvement has been organised everywhere. However, the role and contribution of this process needs further investigation because consultations are not an end in themselves. They may improve/enrich, have a neutral effect on or even degrade an initial policy proposal. The process is one issue, the content and result a different issue. In terms of process, the European countries now have a well-established tradition. In terms of content, the following are of the essence.

- Consultation has to be inclusive and not (intentionally or otherwise) favour any particular stakeholders just because they are better represented or better prepared to give advice. Big and small businesses, sectoral organisations, research and higher education institutions (HEIs), venture capitalists, local authorities and researchers' associations are the main partners to be involved, but civil society should not be excluded. Inclusive consultations are facilitated by electronic means. However, it should be clear that certain groups are more concerned than others.

  There is no recipe on how to make consultations more inclusive. There are certain models that can be studied as elements of progress but again it is the content and not the process that counts. The UK is a country where consultation is mandatory. An example is the *Innovation Nation* White Paper, where the government consulted with interested parties and published a prospectus for New Partnerships for Innovation. Similarly, when drawing up the Innovation Investment Framework, the UK government engaged in an extensive in-depth system-wide review in which it consulted extensively with key stakeholders. These included the scientific community, businesses, charities and regional and devolved administrations as well as international contacts. Around 200 contributions were received from a wide range of individuals and organisations. Denmark is another model to learn from. Innovation policy is characterised by a strong stakeholder involvement in the policy formulation and a tradition of consensus. There is broad interaction with all key stakeholders and partnerships are increasingly put on the agenda. This strength is rooted in the social cohesion and the mode of innovation of the Danish society rather than in the specific innovation governance model.

  Some ideas on how to improve stakeholder involvement can be drawn from national reports. In Ireland, the social partners (business and trade unions) provide ideas and inputs through the ongoing partnership talks between government, business and trade unions. In Cyprus, where there has been no tradition of consultation, a Web-based public dialogue was organised on new calls for proposals. The draft of the call for the new FP 2009-10 was posted on the website of the organisation and the research community was invited to submit its comments and remarks on the content of the call electronically. This Web-based dialogue is expected to better reflect the research community's opinion so as to adjust the research and innovation policy to real needs. In the new, more ambitious policy of France, stakeholder involvement has become an important component and part of the overall policy process. Consultation is an input to the target of revising the innovation strategy every four years.

- Consultation makes sense only if the stakeholders themselves are well prepared and justify their position with evidence. In countries with an established tradition in consultation, the social partners invest in intelligence to formulate their own positions. When policies are new and formulated top-down, stakeholders tend often to defend generic positions of the respective professions without investing in intelligence for specific policy priorities or without constructive proposals facilitating future-oriented policies. If stakeholders are not adequately prepared, decisions are taken *en petit comité*. Thus, consultation becomes an alibi rather than an exercise adding value to the original policy proposal. The general impression, however, is that certain groups are increasingly investing in justifying their positions, even in moderate innovators and catching-up countries. In Italy and Spain, the employers' federations are preparing their own documents. A recent report, prepared by the Polish confederation of Private Employers and known as the Black List of Barriers, has highlighted several barriers associated with the implementation of the EU SFs.

- Consultation is effective if it reconciles different positions into a better policy document. The consensus building process is one where policymakers balance recommendations for change and strike balances between conflicting interests. As suggested in the Policy Mix study: 'Strong stakeholder involvement in one respect can be seen as a strength of innovation governance, but in another respect it bears some threat as it often contributes to the preservation of existing measures due to a strong position of those stakeholders in policy debates who benefit most from established policy measures. This may lead to stakeholder lock-in.'

A concept of good governance would include stakeholder involvement in the form of active and documented consultation. Although the process is important and not to be neglected, details referring to the time offered for consultation, the participation rate, the justification of the opinions expressed, the relative power of individual or collective representations and the difference between the document proposed for consultation and the final policy document adopted are indicative parameters upon which the system can be judged.

2.3.3 The delivery process

Progress in terms of coordination, setting priorities and consultation has been significant. All strategic documents identify very similar objectives: increased competitiveness in the knowledge-based economy. No matter how good the priorities and coordination, governments need to deliver coherent policies. The issues that matter are the type of measures adopted, their articulation and the quality of their implementation, which determine the achievements and impacts of policies. Good governance is not about achieving the right organisational set-up but about convincing actors to change behaviours and mobilise resources in favour of innovation. The enforcement of the rules, the speed and reliability of support mechanisms, the set-up of an effective monitoring procedure and the flexibility for corrective action, when needed, are crucial elements of trust building so that incentives can play their catalytic role. Only reliable implementation leads companies to reinforce their propensity to innovate and respond to new market challenges. Excellent governance schemes and top priorities are useless if implemented poorly, inadequately or too late. In other words, the devil lies in the detail and the moderate innovators and catching-up countries suffer more at the implementation stage than elsewhere.

While good organisational set-up, scale, continuity and flexibility are important ingredients for good implementation, they are not sufficient. The delivery process eventually, and to a large extent, depends on the details of implementation. New public management principles help set up the right framework for innovation policy delivery. In the real world, certain dimensions appear to set the trend and they merit a more detailed analysis, below.

- *Effective implementation is a matter of the system as a whole but also of individual organisations/agencies*. It is good to have all aspects of the policy cycle functioning well. In general, top-performing countries have good governance design and effective implementation. Centralised (or more than one in bigger countries) agencies with significant resources function well. Finland's Tekes, since its founding in 1983, has held a central position in the formulation and implementation of technology and innovation policy. It is a principal government-financing and expert organisation for research, technological development and innovation, and its role is seen as a main ingredient of Finnish success. Continuity and scale are the elements that are at the roots of the good management by Tekes. In Germany, as mentioned above, agencies compete with each other for the implementation of federal programmes. In some countries, decentralisation efforts and smaller-scale management are considered as a good way to improve delivery. In this spirit, Sweden has recently gone about setting up innovation offices in a number of HEIs.

  There are cases where implementation is better than design, and vice versa. The following examples indicate that good delivery can improve performance, even if the overall appraisal of the system suggests that significant improvements are still needed. While there has been some criticism on the Austrian organisational set-up and its changes, the process of delivery in the country could be regarded as effective as it enables a broad range of firms, universities and research institutions to participate in diverse innovation programmes. Several major reform initiatives have not altered their structures to the desired extent, but have improved the delivery of direct innovation promotion through the agencies. The Latvian Investment and Development Agency was acknowledged to be one of the top-performing investment promotion intermediaries worldwide according to the *Global Investment Promotion Benchmarking 2009* study (World Bank Group, 2009), despite weaknesses in the national performance. The case of Cyprus is also interesting because although the country has been traditionally weak in priority setting, implementation is systematic. Timing is good, rules are clear, transparency of the process has improved considerably to reach satisfactory levels and there is sufficient flexibility. Implementation is easier for research than for innovation policy. Cyprus demonstrates the case very clearly. There is a clear and well-operating mechanism through which research policy is delivered but this is less so for innovation policy. There is still no clear division of responsibilities between different policy units where delivery of innovation policy is concerned.

- *Lean menus are considered a way to improve implementation*. Many countries tend to reduce the number of instruments as a means of better delivery. Implementation is made easier, if policymakers have a smaller number of instruments to deal with. The process of implementation/ delivery of innovation policy in France is undergoing a process of clarification and simplification. The Flemish approach to the simplification of policies has benefited from recent changes in governance, with the overlap between agencies leading to a merger. As a consequence, several instruments are now more easily accessible to all stakeholders. On the other end of the spectrum, the Policy Mix study identified a weakness in Danish implementation, arguing that 350 very different initiatives that function alongside each other indicate a fundamental uncertainty with regard to what works (Hjelt et al., 2008). These 350 initiatives that directly relate to innovation have now been reorganised under nine main categories, giving a better overview and coherence. An interesting feature in the Latvian set-up is 'the commitment to reduce the number of public R&D priorities to provide more resources to relevant research fields'. Similarly in Hungary, the number of STI policy schemes seems be too high, and thus some schemes tend to overlap and hold back effective delivery.

- *Flexibility has to be included in implementation*. Priority setting is taking place at short intervals of time and implementation rules are set based on these priorities. However, implementation may need to be amended more often than strategy. Good implementation takes place when there is sufficient flexibility without unjustified and frequent changes in the rules of the game. The Danish and Czech examples demonstrate the need to complement/amend a plan halfway through its reference period.

- *Tested management tools can improve delivery, when used adequately*. Managerial techniques and information technologies are available and amply used. Transparency (the US Troubled Asset Relief Program (TARP) is one model) and accountability are basic rules of the game and these are often not followed for various reasons ranging from inertia to fear of responsibility. Internal organisation, training of employees, process reengineering, systematic demand monitoring, quantified targets and performance indicators, the treatment of failures and similar detailed instruments need to be addressed explicitly. Such instruments are not studied in detail because acquiring such data is cumbersome and comparability is particularly hard when qualitative aspects differ (e.g. the time for evaluation differs depending on the complexity and subscription of the applications). As a consequence, few good practices are reported. One comes from a German central database managed by the Federal Ministry of Economics and Technology that contains all policy measures from virtually all policy areas (including R&D and innovation policy). The database, called 'Förderdatenbank' ('Promotion Data Base'), contains measures from both the federal and the state level as well as EU measures.
- *Good implementation needs resources*. All the above-mentioned ideas cannot materialise without significant investments in human and physical capital. Finland makes the point: the relative importance (as measured by staff and operational budget) of Tekes in government innovation policy has been growing steadily during the last five years. Notwithstanding this, the administration has not grown as fast as the funding programmes. Another example in France is the National Research Agency (ANR); its staff has increased from about 60 to 80 full time equivalents (FTEs) between 2007 and 2008; meanwhile, the budget of the French SME-supporting agency (OSEO) agency has been dramatically increased. In Ireland, when the growth in research funding for the third-level sector increased rapidly in the early 2000s, Enterprise Ireland and the Irish Development Authority (IDA) had to recruit people with the skills to interface between their company clients and the third-level sector. The UK's policy mix has evolved over time and in many cases seems to respond rapidly to perceived challenges, albeit within the confines of budgetary, structural and contextual imperatives. One reason why the UK policy mix responds rapidly to perceived challenges is that a number of structures are in place to orchestrate policy formulation, implementation and evaluation activities across the innovation system as a whole (Policy Mix study).

  This tends to be overlooked and, in times of crisis in particular, resources tend to diminish both for incentives and for their management. In Latvia, hindering factors in the process of delivery are being invoked by budgetary cuts and other developments in light of the economic crisis. Similarly in Luxembourg, regarding the development of the clusters in IT and aerospace, the main barrier to their faster development is a lack of human resources.

To conceptualise good governance, it is not enough to have the right set-up and processes. The appraisal of the system needs to go deeper, into details of implementation: to identify overlapping measures and the number of different subsidy schemes; assess the trust of beneficiaries in the main agencies through surveys; check what type of databases exist and how they are used; benchmark response times, time for evaluation, time between evaluation and payment of subsidies; assess simplicity of papers in the form of number of documents or time to collect them; how many times on average applications are returned to beneficiaries and similar indicators are important to mirror the effectiveness of delivery and build up the reputation/trust of ministries or agencies.

2.3.4 Creating the evidence needed (evaluation, benchmarking) and learning

Good policy is evidence based, but gathering intelligence and creating evidence has several difficulties: it triggers costs and hence needs resources; it requires skills; it may produce inconvenient truths; it may even contradict conventional wisdom and lead to unknown paths. Hence, inertia often leads to the rejection of evidence creation and even if there is determination to invest in intelligence and evaluation, balances are needed: how much evidence, what type of evidence and how much it

can cost are concrete questions. Programme evaluations, institutional and system evaluations, thematic assessments, benchmarking and transnational learning are the most frequently encountered tools for creating evidence leading to policy improvement.

The European Commission supports performance measuring through scoreboards, like the EIS and the Lisbon indicators. Other international organisations, such as the OECD, are also collecting and publishing comparable data. Member States are involved in this process in three ways:

1. Collecting data for quantitative indicators for national use or international benchmarking exercises; not all Member States invest the necessary resources to produce what is needed and gaps are frequently identified in particular in the moderate innovators and catching-up countries.
2. Using the standard data as measures of policy efficiency and effectiveness; again the utilisation of indicators is not sufficiently widespread.
3. Investing in additional, context-specific studies complementing quantitative indicators with qualitative assessments.

Over the years, Member States have benefited from the European and Organisation for Economic Cooperation and Development (OECD) exercises of innovation policy monitoring, but the top performers go well beyond that.

- Ideally, a well-embedded evaluation culture in a country helps build up evidence. When such a culture exists, organisations tend to invest in gathering intelligence, studying and evaluating as an integral part of their activities without having to justify the necessary budgets. Germany is a country where an evaluation culture was built into the system rapidly in the last decade. The High-tech Strategy is subject to continuous monitoring and evaluation. A first progress report was published in October 2007. A second report on the progress made was published in May 2009 under the title *Research and Innovation for Germany*. This report is at the same time the federal government's response to the report *Research and Innovation* by the newly established Commission which produced reviews on German research and innovation performance and policy in 2008 and 2009 (see below). The federal government draws a highly positive conclusion from the first three years of the High-tech Strategy, as investment in R&D could be raised substantially both in the public and in the enterprise sector. In 2008, a new expert committee called the Expert Commission Research and Innovation (EFI) presented its first review, followed by a second review in 2009. Another important document for innovation policy is the regular *Federal Report on Research and Innovation*, the most recent edition of which was published in May 2008. This report summarises the main objectives and activities of both the federal government and the state governments in the area of research and innovation policy and contains a wealth of information on programmes, institutions and initiatives, including a lengthy but highly valuable statistical annex. In Denmark, the advisory and funding system has been at the centre of a thorough evaluation process during the last year. The final evaluation was published in late June 2009, and it is anticipated to lead to a restructuring of the research counselling system with a more uni-directional coordination of the system. Policymakers in Denmark have the culture to 'listen to the criticism' and, in doing this, it shows that the innovation policy system is directed at the search for next practice (denoting the experimental character of policy).

- Formal rules can constitute the basis for building up a new culture. In Ireland, all the support measures are subject to periodic evaluation and in general they have been found to be useful to industry, practical and reasonably well administered. The smaller schemes tend to be reviewed as part of the overall industrial programme rather than reviewed as individual schemes. Evaluations seem to be undertaken less frequently than one would desire. Besides, the evaluation reports are not made easily available to the public and as such there is no public or political debate on their outcomes. This would be a useful result of the evaluation. In this respect, transparency could be improved, e.g. by reporting more results in the organisation's annual reports.

Certain moderate innovators and catching-up countries are also trying to embed an evaluation culture, which will lead to evidence-based policy. The new National Policy of Research, Development and Innovation of the Czech Republic for 2009-15 includes systematic evaluation and assessment as a component of the strategic management of the national policy. An important condition for increasing efficiency of public support of R&D is the systematic evaluation of R&D results produced by individual research organisations. While some providers have been carrying out a systematic evaluation of publicly funded research in the Czech Republic in various forms since 1993, the allocation of funds is not yet adequately tied up with the *ex post* evaluation of the results of research work. According to the National Policy of RDI 2009-15, a new methodology for evaluation of research results should be created that will take into account new components of evaluation, e.g. training of graduate students (PhD students) and education in R&D management, dissemination of R&D results, technology transfer and IPR management, etc. The new methodology should make a basis for allocating institutional support for R&D.

- Dedicated schemes or units can prove very useful and build a new culture. In Flanders, the Monitoring and Analysis (M&A) Unit of the Flemish Agency for Innovation by Science and Technology (IWT), established in 2005, carries out analyses in support of policymaking. Support points for policy-relevant research have been established at universities in the region in order to exploit knowledge relevant for policymaking (Policy Mix Study). A recent trend in the last decade has been the utilisation of external intelligence in research, technology and development (RTD) policy making in the region of Vienna. Several background studies have been commissioned, either for specific target groups (e.g. the creative industries, life sciences and biotech, etc.) or for general strategic advice. The evaluation of RTDI policy and its effects is still a recent phenomenon but is growing rapidly in significance (Zinöcker et al., 2007). In Finland at the parliamentary level, a special Committee for the Future evaluates and assesses ongoing processes and trends in society including issues related to innovation. The committee has focused especially on information society issues and assessing wider societal impacts of technological development.

  Using the Court of Auditors for evidence creation is an alternative that has a merit, in the sense of not needing to use additional resources, but may also have some drawbacks, since the audits would serve two different purposes. A national external audit of LIDA (Latvian Investment and Development Agency) was carried out in the framework of an assessment of the operation of the Ministry of Economics. The National Audit Office of Estonia has not directed any serious criticism against Enterprise Estonia or innovation policy measures in general since 2004, when a report highlighted the fact that surprisingly few support measures produced targeted outcomes. In Hungary, a report by the State Audit Office, appraising the use of the Research and Technological Innovation Fund, included similar results to the OECD review of Hungarian STI policy.

- More complex and sophisticated tools are needed than simple programme evaluations and quantitative benchmarking. International standard indicators inevitably address common denominators of relevance for all countries and fail to capture individual characteristics. Investing in the design, collection and interpretation of idiosyncratic evidence, which is tailored to the needs of each country/region is the national/regional responsibility. At the heart of the Index is a wider and more complete measure of how much the UK invests in innovation, and what the benefits of this are to national productivity. This headline indicator is supported by two complementary tools: a company-level measure of innovation, which can be used as a measure of the innovation activity of individual sectors; and an assessment of how favourable a climate the UK is for innovation based upon available internationally comparable data. The UK, the Netherlands and most Nordic countries invest in their own benchmark studies using selected reference countries for benchmarks. In the UK, the Innovation Index is the ambitious, most recent effort to monitor innovation policy. It measures a broad range of innovative activity, from the R&D that lies behind innovative technologies to the service design and organisational innovations that power the UK's service industries. By linking investment in

innovation clearly to productivity improvement, it underscores the central importance of innovation to economic growth ([27]). The National Research and Innovation Strategy in France was based on extensive evidence for forecasting. Broader assessments are also very helpful A major success element for Finland is a strategic policy review, drawn up by the Science and Technology Policy Council every third year since 1987, that has been one of the major policy documents defining the framework and goals for STI policy in Finland. The Council has in its successive reviews evaluated the development of STI policy and presented guidelines for its future development.

- The exploitation of the intelligence gathering needs to be well defined. In Austria, despite the development of an evaluation culture, there is no culture of ending programmes.

- Resources are important, but small countries can afford them. Ireland relies heavily on an evidence basis for the adoption of priorities and, given the size of the country, it shows an impressive persistence on the selection of priorities.

  Despite the good knowledge of what constitutes good practice, the TC database indicates scarce evaluations and assessments of the results and outcomes of the measures. More work is needed in this direction and this is compatible with the INNO APPRAISAL conclusions that the overall analysis and assessment based on the survey of evaluation reports should take greater consideration of the contexts and characteristics of policymakers and policy formulation practices. Many countries rely on modest strategic intelligence available to the drafting teams of the OPs and the particular measures increase the experimental character of the schemes. Long lead-time for the evaluation of applications discourages the beneficiaries to pursue the objectives initially set, sometimes also under varying circumstances. Poor monitoring of the projects, focused mainly on financial management, is partly due to the large number of projects and partly to the lack of time and skills by the monitoring body.

Good governance includes regular reporting, investment in intelligence gathering (a rule of thumb of 3% is sometimes mentioned), coordinated utilisation of all international benchmarks (EU, OECD and beyond), benchmarking and institutional assessments of individual organisations (research and innovation agencies).

2.4 Improving innovation governance for better innovation policy

The above synthesis of the country reports was used to make the point that while processes improve constantly, performance is not following. A year before 2010, Europe was not the most competitive economy. Apparently there is a need to go deeper into content and make innovation policy more ambitious. To do this, Member States and regions need to address the efficiency of their processes rather than the processes themselves. The issues discussed above are deconstructed and reconstructed in a discussion of whether it is possible to monitor innovation governance more adequately.

The conceptualisation of implementation means that one has to go deep into operational indicators. This is fully consistent with the findings of the Policy Mix study, indicating that in the absence of a clear and transparent set of indicators or verifiable goals which inform on progress towards achieving the defined objectives, the value of strategies may be decreased and may fail to be more than rhetorical statements. It is also in line with the announced preparations for new OECD recommendations for STI policies.

[27] NESTA (2009): *The Innovation Index, Measuring the UK's investment in innovation and its effects*.

2.4.1 Principles

The basic principles of good governance are well known: transparency, accountability, coherence, inclusiveness, continuity and flexibility lead to good and timely delivery. In the real world, however, it is difficult to design and implement governance schemes based on principles, no matter how good and tested these principles are. Good governance emerges (by design or fortune) from complex interactions and has an evolutionary character. The organisational set-up, formal and informal rules in every country are path dependent and changes in behaviours are difficult. New organisations are often established without abolishing existing ones, which tend to be rigid. Hence, structures become more complex and more coordination is needed.

It is important to intervene in order to improve the organisational set-up and processes and as demonstrated by many examples this may be done successfully. However, changes cannot be imposed overnight. They constitute a social process; hence, their success depends on the way they are embedded in the old environment. Lack of (human and physical) resources and resistance to change are the usual reasons why well-designed and appropriate changes in governance do not succeed in generating a positive reaction in the economy. Organisational set-ups and processes can be changed but it takes more to change the efficiency and content of innovation policy.

The monitoring exercises envisaging the improvement of innovation governance in the EU and the OECD have in the last decade decomposed governance into stages of a policy cycle:

- priority setting and coordination;
- policy delivery (implementation);
- evaluation and evidence creation as feedback to priority setting.

These stages are analysed above and visible progress in their processes is identified; however, in some countries the same processes operate more effectively than in others. The top-performing countries have built up a culture of effective governance and in that sense their performance is not a coincidence. Others may have formal priority documents and stakeholder involvement but still implement policies without taking evaluation results into serious consideration. In some countries, the policy cycle is reversed: innovation policy starts with implementation, skips evidence production and priority setting follows.

After 10 years of monitoring innovation governance, it seems important to go beyond processes and measure the content of governance. However, measuring alone is not enough: benchmarking based on quantitative evidence only may be misleading and needs qualitative interpretation to be fully understood. This becomes even more important as innovation policy interacts increasingly with sectoral policies and touches on areas like foreign trade and FDI. New societal challenges, linked to energy and the environment, as well as demographic trends, require new forms of policy intervention (with demand-led initiatives on top), new types of organisations and new ways of managing them. This requires more evidence to be able to design innovation policy effectively.

2.4.2 Can good governance be measured?

Many efforts have been made to benchmark good governance with indicators. These may be robust and based on evidence or take the form of subjective ratings. Both have advantages and disadvantages and their combination is usually the best compromise. Measuring governance systems refers both to the physical units of the system (funds spent, people employed) and to behavioural routines (the soft elements of the system, indicating processes and their content).

Monitoring processes is easier than monitoring their content and results but, because it is easier, one tends to almost exclusively monitor processes only. Going deeper into the way these processes are implemented needs significantly more resources and often also subjective appraisals, subject to misinterpretations and reaction; while processes are easy to measure, they do not reflect the achievement (or not) of targeted results.

The discussion of the indicators below aggregates the issues discussed above using in some cases evidence from the short pilot questionnaire to the country correspondents. It is not suggested that all these indicators need to be collected but that the climate is maturing for a discussion in this direction.

Robust quantitative indicators complemented with subjective individual or panel rating can help reveal the hidden elements of good and bad practices.

2.4.2.1 Analysing governance: an indicator framework

The various elements discussed in the previous sections can be used to break down governance into a subset of issues where content rather than process is monitored.

1. Continuity, stability and adaptability can be measured by the extent and frequency of changes. The quantitative rating by the country correspondents proves that changes are not frequent in most countries (most of the changes appear to be found in the innovation followers). Relevant questions need to be asked further to better assess the need and utility of change: Is the number of organisations constantly increasing or are certain organisations inoperative? Is the rationale behind change a new challenge or an effort to increase efficiency?
2. Delays and indecision are easier to measure but significant efforts are needed to capture and standardise them. These issues only make sense if compared internationally, but to compare them means to differentiate between types and reasons of delays. Not only does this translate into additional costs for the creation of new methodologies and evidence gathering, it is also very likely to face reluctance on the side of policymakers unwilling to reveal data or invest the time for the necessary data mining.
3. Clarity of measures for the beneficiaries can be measured with the number of operating measures, their structure, the targets of measures and their potential overlaps, the target beneficiaries, the average budget of programmes and standard deviation (assuming that both large and small budgets are necessary to address specific areas), the regularity of calls, etc. Comprehensive databases of all national and regional measures (using the German model) can help the systematic creation of indicators for this topic.
4. Ministerial responsibility, advice and coordination are currently addressed with the description of the system and the existence (or not) of formal coordination mechanisms. Coordination is not a target per se; it is only a means of improving quality and coherence of policies. Coherence implies more than coordination of responsibilities; it encompasses efficiency, effectiveness and impact. As pointed out by many countries, informal coordination occasionally proves very effective even in innovation leaders. Hence, coordination should not be measured by the existence of formal mechanisms but by the number of co-responsibility conflicts resolved. This can be measured by studying agendas of inter-organisational meetings, the issues that arise and the time required to forge shared views and take decisions. In a short pilot test, the country correspondents were asked to present formal coordination and subjectively assess the coherence of policies: there was no strong correlation between the existence of formal coordination mechanisms and coherence of policies (as appraised by individual correspondents). This applies to interactions with 'other' policies as well. The role of policy advice by specialised organisations or advisers is also a matter of content: are advisory bodies producing significant inputs for policymaking? Can they be counted? Where are they incorporated?
5. Priority setting cannot be measured by counting documents. The TrendChart database suggests that the number of documents prepared by each Member State is independent of its innovation performance. The indicators to be used should refer to the quality, realism and coherence of documents, studying the extent to which a new document complements or contradicts existing ones and identifying *ex post* how and when policies have complied with the specific documents. This type of performance can over a few years build trust between policymakers and the business community.
6. Consultation takes place in all Member States but a lot more evidence is needed to monitor the content of stakeholder involvement and identify whether such an involvement makes sense or not. The real issues about consultation refer to how binding the opinions expressed are, whether civil society is also treated as a stakeholder, how seriously the stakeholders themselves take their involvement and whether they invest in evidence to justify their positions. Do they invest in informed opinion or are they following a generic lobbying policy? Ultimately, do policymakers take their positions seriously? The various stakeholders' groups need to be listed and checked as to whether they are all represented. There is a major danger

of neglecting the views of stakeholders who are not organised into lobbies. Once the checklist for consultation is established, one can also assess the contribution of each stakeholder in terms of the quality of proposals/interventions, their originality and justification. Finally the effectiveness of the consultation process can be rated by measuring the requests for changes to the original documents and the number of changes adopted.

7. Good implementation needs resources. Human resources are an important input for good delivery. In the quick test, the number of civil servants and agency employees in national and regional innovation policies appeared to differ significantly between countries with similar profiles. While it is not suggested that more policymakers lead to better policies or vice versa, there is an interest in benchmarking the number of people and their qualifications for managing innovation policies of similar budgetary and regulatory interventions. Clear task assignments and job descriptions are areas that are common in well-functioning organisations and can be monitored to identify whether they exist and if they are respected. Similarly, good implementation needs financial resources, both for carrying out operations but also for systematically monitoring and creating the necessary evidence for improving delivery. Evaluations, benchmarking, horizontal studies, foresight activities, technical assistance, etc. cost money. The share of funds used for evidence creation is an important indication, which has to be complemented with the utilisation of these results.
8. Good delivery is a matter of the system as a whole but also of individual organisations/agencies. Delivery needs to be monitored with input and output indicators. Time intervals elapse inevitably between announcement and implementation, between decision to fund and funds disbursed, etc. but the process has to be speedy and reliable. Policy delivery (like coordination) is typically a case where robust indicators are insufficient and panel ratings are needed to contribute to a better monitoring process. For such ratings, issues need to be specified like 'are databases developed and used?', 'is the reputation of the organisations involved good?', 'do project officers contribute with quality comments?', or 'do audits provide value added?'
9. Evaluation is another area where simply counting is misleading. Although the number of programmes evaluated is a good proxy of how seriously a country invests in policymaking, it is the quality and use of the evaluations that counts. Evaluation contributes to better governance if it is relevant and timely and policymakers respect evaluation results. One broad evaluation, transparent in its findings for all stakeholders and used as a timely input for policy improvements constitutes better policy than a large number of individual evaluations with limited circulation not used for follow up decisions. Monitoring indicators are then the funds earmarked for evaluations (a rule of thumb of 3% of programme budgets is sometimes mentioned), the evaluations accomplished on time to be used as inputs for future policy measures, and the number of programmes or organisations reformed as a result of evaluations. A panel rating of the evaluation culture is a necessary complement of quantitative measures.

2.4.2.2 Towards a European Innovation Governance Scoreboard

Developing a system to monitor/rate the content and quality of governance will require significantly more resources, commitment, new methodologies and the willingness of the whole policy community to cooperate. It is argued that such an exercise would lead to a more ambitious programme of governance improvements, as the decomposition can reveal weaknesses hidden from aggregation and open up the black box of the transformation of policy inputs to innovation outputs. Ideally, all the decomposed indicators could be aggregated into a synthetic innovation governance indicator. However, organisational set-up, priority setting, consultation, delivery and evidence basis are so tightly interwoven that it is difficult to aggregate indicators. Some of the problems found in policy delivery have their roots in the very process of policy design and evaluation. In other cases, delivery is better than would be expected from the previous stages of the cycle.

Overall governance ratings are developed and published in various countries and by international organisations. Mostly international benchmarks rely on very aggregate measures, which hide aggregation mistakes. In some countries (e.g. the UK's performance monitoring system of public service agreements, or the new NESTA indicators) an effort is made to go in this direction. The OECD

has also announced the need to monitor more detailed indicators for S&T performance. Looking at the above-mentioned indicators it is clear that they request a significant effort, starting with a methodological agreement and then going into systematic evidence gathering in all interested countries. It is unlikely that EU initiatives would succeed unless the Member States have a clear interest in cooperating. However, a pilot might be worthwhile, in particular for the moderate innovators and catching-up countries that struggle to improve the processes fostering the creation of better governance cultures and institutions.

Difficulties to quantify should, however, not discourage governance monitoring. An alternative to the list of in-depth indicators would be a list of processes/targets for self or panel assessments. This approach has been tested for the Enterprise Charter between the EU and the Euro-Mediterranean Partnership countries. Instead of measuring concrete indicators, the charter was decomposed in dimensions and policy instruments. Policymakers are asked to position their country at levels ranging from 1 to 5, depending on how good/mature the specific set of measures is and how it operates. The target is to move from 1 to 5 over a period of progress monitoring.

Measuring alone will never be sufficiently accurate. It can form a sound basis for creating a story behind governance and creating the evidence needed to understand what goes wrong within the policy black box. It is important that on the road to the EU 2020 strategy for a new sustainable social market economy, which re-emphasises the role of knowledge for the European development model, new attempts to monitor in a more ambitious way are tested. While the OMC methods relies on a few, agreed performance indicators, at the Member State (and in certain cases the regional) level, it is important to monitor the details. National commitment can only be effective if details are given the attention they merit. Effective governance is even more important than in the past, as budgetary margins for manoeuvre are reduced, due to the deficits triggered by the crisis. The role of the EU should be to foster the creation of scenarios for better national innovation governance.

3 Public funding for innovation policy: are innovation policies tailored to national innovation systems?

This chapter analyses the mix of public funding for STI, with a particular emphasis on public support for innovation. The aim is to extend and deepen the analysis carried out in the EIPR 2008 on the priorities of national innovation policies. In particular, the aim here is to examine the extent to which the various Member States with different levels of development of their economies and innovation systems adopt innovation policies adapted to the specific 'system failures' that weaken innovation performance and the challenges they create for policy.

3.1 The TrendChart database as a complement to statistical sources on public funding of STI

The analysis is based on the research and innovation support measures inventory jointly managed by the Inno-Policy TrendChart and ERAWATCH services. A support measure is considered to be any activity designed to explicitly influence business innovation or elements of the innovation system that mobilises financial resources (direct/indirect subsidies, grants to innovation support organisations, etc.), raises awareness about innovation or supports 'governance' processes (see Chapter 2). Each measure identified by the network of national correspondents as being relevant for the inventory is described in a structured template that includes key information on the measure ranging from the objective and rationale (why the measure was launched), through the types of beneficiary, the stage of the innovation process supported and, where possible, evidence on impact. The network of correspondents was asked to collect as detailed information as possible on the overall funding for each measure. During the period between 2008 and 2009, a concerted effort was made to complete the data on budgets for as many of the measures as possible.

In 2007, the TrendChart policy categorisation was updated for the second time since the launch in 1999 (a first overhaul occurred in 2004) in order to allow for the development of the joint monitoring service with ERAWATCH. The 2007 categorisation grouped policy priorities into five main groups:

1) Governance and horizontal research and innovation policies;
2) Research and Technologies;
3) Human Resources (education and skills);
4) Enterprises;
5) Market and innovation culture.

Each of these broad groups of types of policy is then sub-divided into number of more specific priorities allow for a relatively detailed analysis of the priorities national governments are pursuing when launching measures. Country correspondents are asked to classify each support measure according to the specific policy priorities, with at least one main priority and up to three secondary ones. The priorities selected can help to guide users on the website interested in examining the existing range of measures in favour of say, industry-academic cooperation, corporate R&D tax measures, support for innovative start-ups, etc.

Of course, a number of official statistics on public spending in favour of 'R&D' are based on the OECD/Eurostat manuals for STI statistics. Gross domestic expenditure on R&D (GERD) is broken down by source of performance and funding including by government (GOVERD); while the Government Budget for R&D (GBAORD) ([28]) allows an understanding of the orientation/targeting of

[28] GBAORD refer to budget provisions, not to actual expenditure, i.e. GBAORD measures government support for R&D using data collected from budgets. GBAORD is a way of measuring government support to R&D and is often expressed as a percentage of GDP.

government budget appropriations or outlays for R&D ([29]). These official statistics are used widely to analyse and understand trends in funding and performance of 'R&D' but offer relatively little insight into the targeting of the public effort towards specific innovation 'market' or 'system failures'.

The TrendChart approach does not duplicate 'official' data but rather aims to provide complementary information at two levels. In the first instance, users interested in learning about and transferring the experience of specific measures from country to country should be able to find key information such as budgetary data to give them insight into the scale, funding process, etc. Secondly, it is clearly of interest from the point of view of policy analysis and monitoring policy trends to know not only 'how many measures' are targeting say clusters, but how much money is being spent in support of clusters (and does whether this spending differs according to type of cluster, for instance.).

A second advantage of the TrendChart approach over 'official statistics' is that it is provides insight in a broader category of measures than those that will be captured by GOVERD or GBAORD statistics. The data collected by the TrendChart network reflects a diversity of approaches to innovation policy and a much broader range of public intervention than the 'official statistics' on R&D expenditure.

Using the budgetary data from the TrendChart database, an estimated budget for each measure for the year 2008 is derived. The estimate was calculated by taking the average amount spread across the period for which data was available (using either the overall or yearly budgets, depending on what information had been completed by the country correspondent).

In order to provide a reality check for these estimates, the total average annual budget for all measures per country was compared with the official statistics. The TrendChart-ERAWATCH database aggregate budgetary information per country, in general, corresponds to a lower share of GDP in 2008 than either official GOVERD or GBAORD figures. However, this is to be expected, since by and large, the database contains competitive bidding or tendering programmes and does not include the large chunks of funding channelled through institutional type funding (for universities, public research centres, etc.), research infrastructure funding, etc. Indeed, the database is more representative of those measures targeting enterprises (so-called state aid) than other forms of intervention. In this respect, it should be noted that it proved very difficult to obtain data on indirect (e.g. corporate R&D tax credits) forms of subsidy.

3.2 The focus of EU-27 Member States innovation policies

Innovation policy is a term that is often poorly defined and understood to mean many things by different stakeholders within and across the Member States (and within European institutions). This is in spite of almost two decades of development of policy (the first efforts to rationalise and develop innovation policy as something separate from science policy or 'industrial policy') beginning roughly from the early nineties. A number of differing approaches (not necessarily mutually exclusive but often intertwined in policy documents) include those viewing innovation policy as:

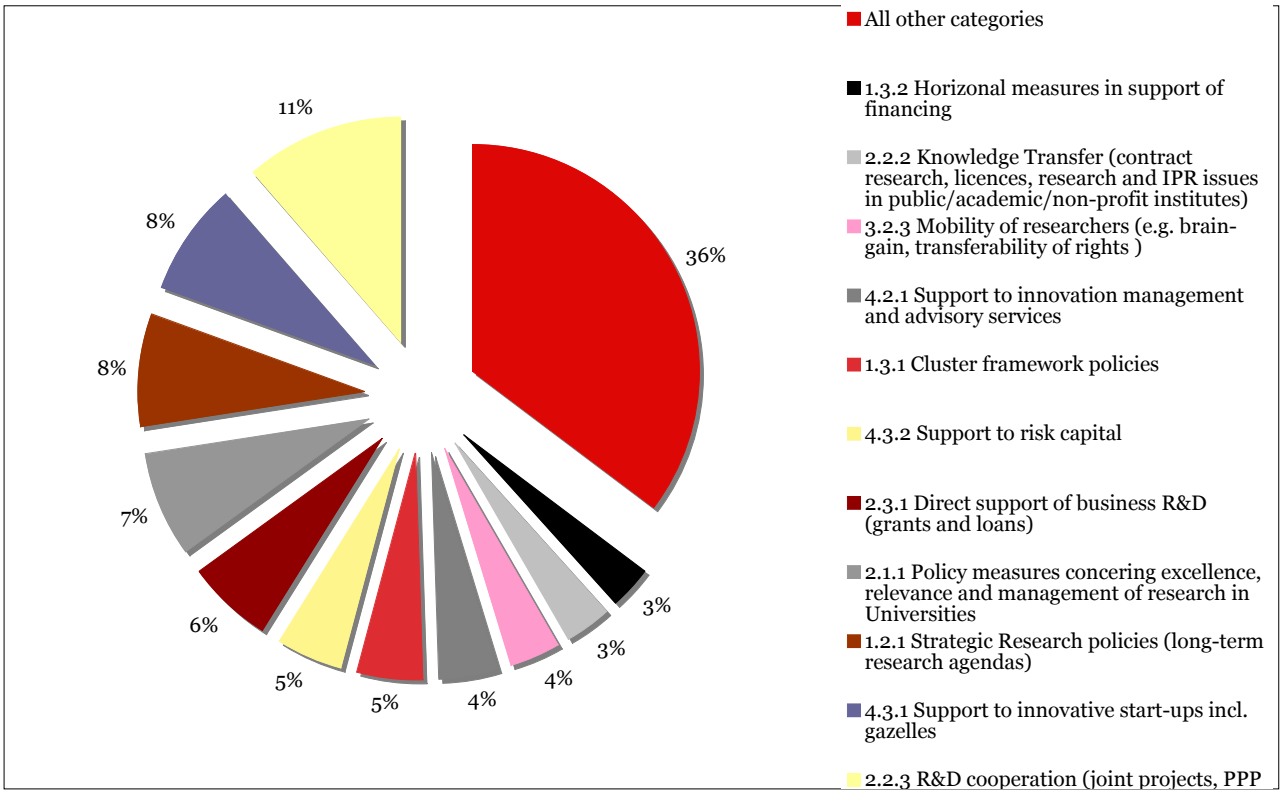
- an extension of science policy seeking to foster the socioeconomic applications of publicly funded research. This is still the implicit slant of many 'innovation policy' documents in the Member States;
- a tool to boost business competitiveness: 'a set of policy actions to raise the quantity and efficiency of innovation activities whereby innovation activities refer to the creation, adaptation and adoption of new or improved products, processes or services' (Cowan & Van de Paal, 2000);
- a form of new 'industrial policy': 'a process whereby the state and private sectors jointly arrive at a diagnosis about the sources of blockage in new economic activities and propose solutions to them' (Rodrik 2005);

[29] GBAORD data are based on information obtained from central government statistics and are broken down by socio-economic objective in accordance with the nomenclature for the analysis and comparison of scientific programs and budgets (NABS).

- a means to stimulate increased and more efficient demand for innovative products and services: user-driven innovation, standardisation, pre-competitive public procurement, lead-markets, public sector innovation, etc. (Edler 2009).

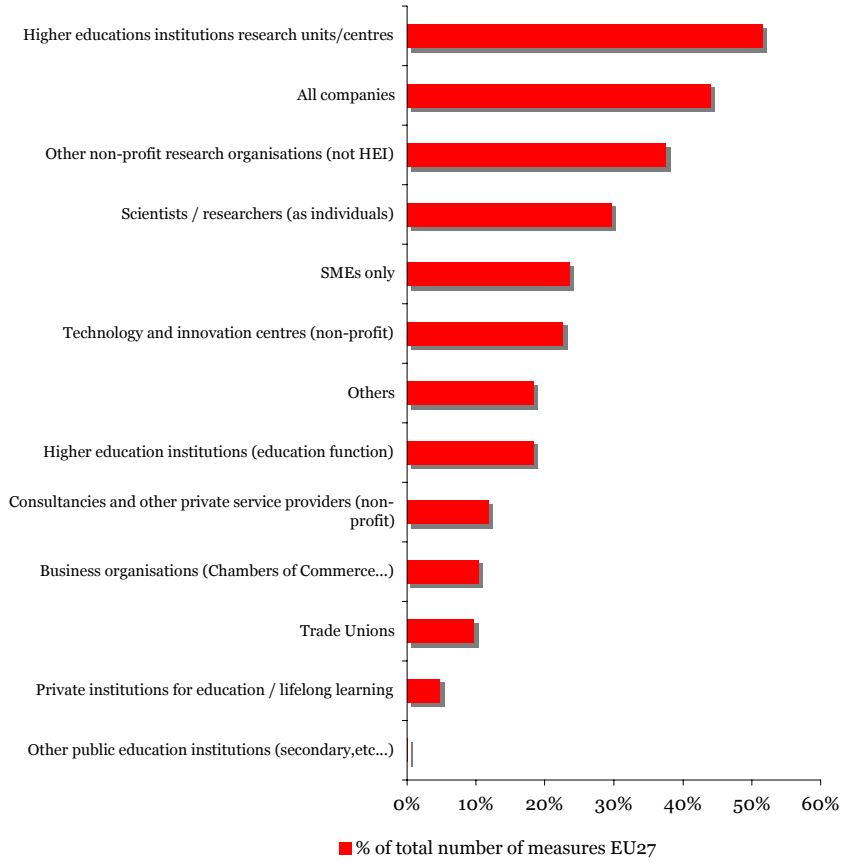
Recently, innovation policy has been given a new role in contributing to tackling 'societal challenges' from the financial crisis to poverty through ageing to climate change (OECD 2009, EC 2009). Rather than enter into a discussion, at this stage, about the relative merits of these differing approaches, it is more instructive to consider the available evidence on the scale (financial means, number of policy measures, etc.) and scope (coverage of different policy priorities) in the EU-27 Member States.

Figure 1: Top 10 priorities of national innovation policy 2009 (measure count)



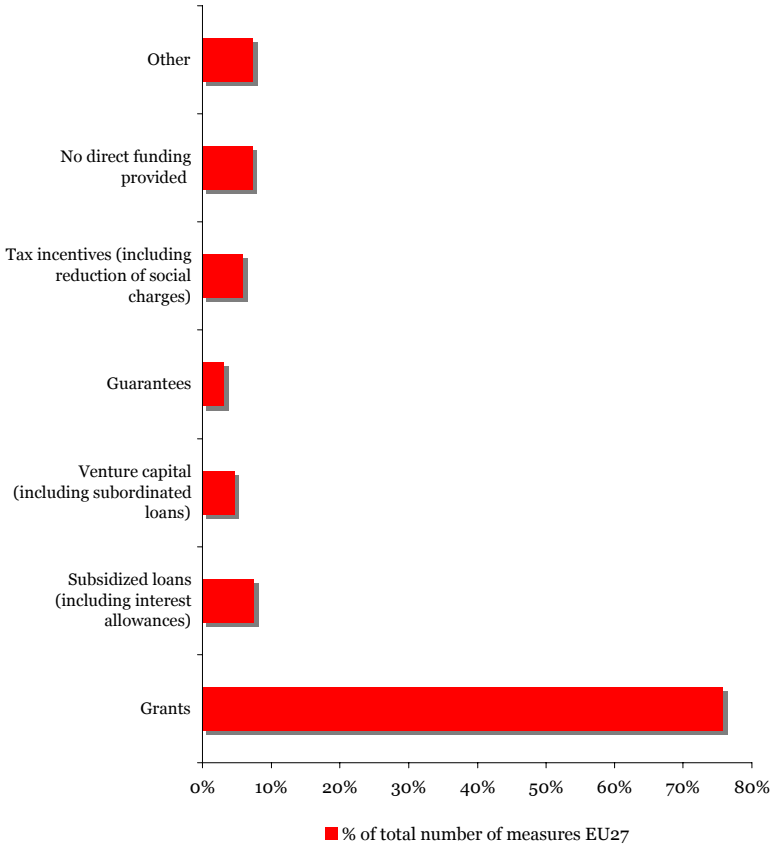
Source: TrendChart support measure database, analysis Technopolis, n=840

Figure 2: Targets of innovation support measures (EU-27, 2009)



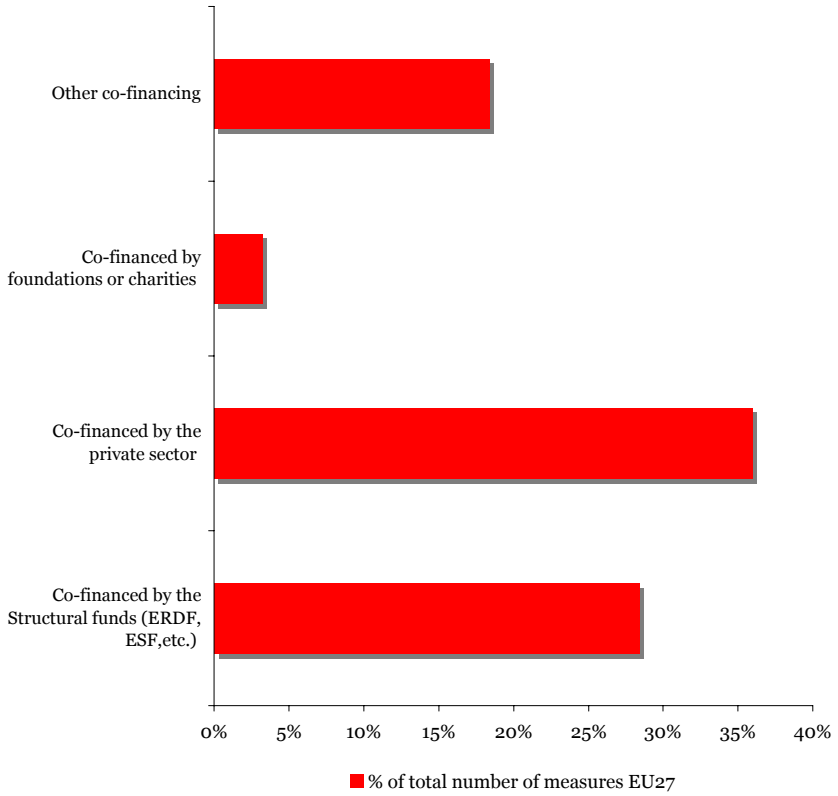
Source: TrendChart database of support measures (data downloaded on 7 October 2009); analysis Technopolis Group. N=959

Figure 3: Sources of funding of innovation support measures 2009



Source: TrendChart database of support measures (data downloaded on 7 October 2009); analysis Technopolis Group. N=959

Figure 4: Sources of co-financing of support measures in EU-27

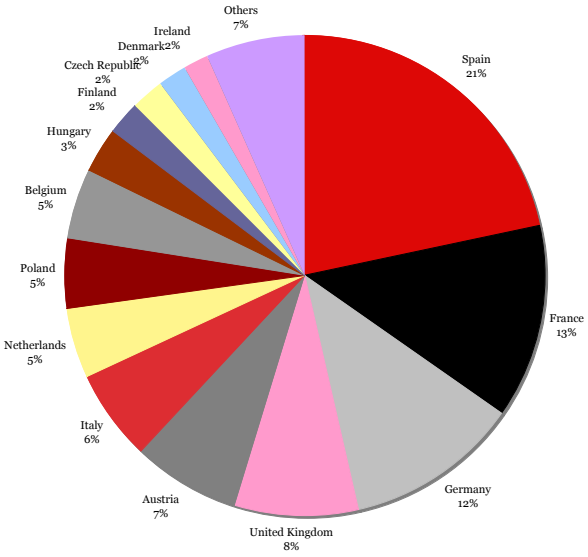


Source: TrendChart database of support measures (data downloaded on 7 October 2009); analysis Technopolis Group. N=959

Figures 1 to 4 summarise evidence from the TrendChart support measure database on the priorities (in terms of number of measures targeting different priorities), targets and types of funding and sources co-financing. They underline that:

- policy priorities remain focused on traditional direct funding type schemes even if newer forms of innovation support begin to appear amongst the policy mix;
- higher education/public research organisations are targeted as often as enterprises and measures aimed exclusively at SMEs (as opposed to all companies) are not a majority;
- in terms of the aspects of innovation, the focus remains largely on the industrial R&D development and commercialisation phases and the diffusion of technologies rather than the legal/regulatory environment, design, etc.;
- in terms of financing, the vast majority of measures apply grants/loans (direct) support and that the SFs are an important instrument in this context.

Figure 5: Funding of national research and innovation policy measures 2008



Source: TrendChart support measure database, analysis Technopolis, n=EUR 24.7b

Figure summarises the breakdown of funding in the TrendChart-ERAWATCH support measure database as of mid-2009. The data refers to average funding calculated for each Member State with 2008 as the reference year. The total average budget calculated for 25 EU Member States (excluding Bulgaria and Romania for data availability reasons) stood at EUR 24.7 billion in 2008. The share of funding by Member State, calculated in Figure , should be considered as indicative and a margin of error certainly needs to be applied. Certain countries are broadly speaking over-estimated (e.g. Spain due to the inclusion of broader information society programmes) or under-estimated (e.g. Sweden due to difficulties with identifying budgets for specific measures, or Greece due to the changeover between SF periods). However, the order and scale of funding (compared to the GDP) of most Member States in the analysis conforms to what could be expected with the four largest Member States leading and some of the known 'big spenders' on a relative scale following (e.g. Austria).

Hence the figure of EUR 24.7 billion should be considered as a first broad guess-estimate of the innovation-related spend of the EU Member States. The actual funding allocated to 'pure innovation' policy measures is hence significantly less. As an example, the 2009 German TrendChart report

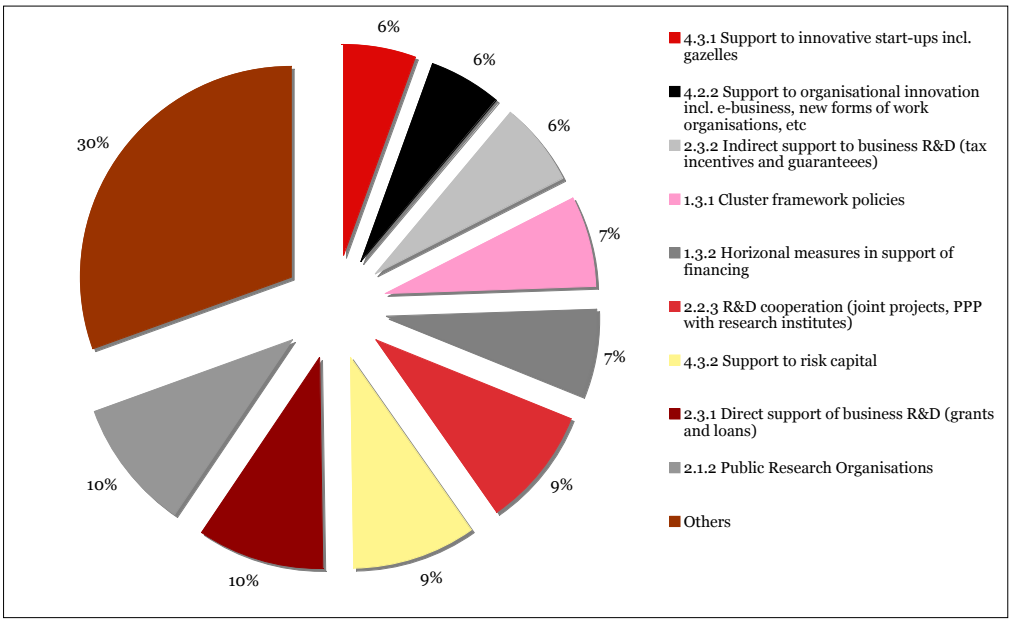
estimated that 'innovation financing programmes' were approximately only 10% of total expenditure on 'R&D and innovation programmes' (EUR 340 million/EUR 3 720 million in 2008).

Equally, the importance of fiscal (tax/social security) subsidies varies. In a number of countries, these are increasingly important: Austria (from EUR 227 million to EUR 340 million for the period from 2005 to 2008), Belgium (volume unclear), and France (40% of RTDI support to enterprises). Equally, in many others tax measures do not exist, are only marginal measures with little impact (e.g. Poland) or are reported as ineffective (e.g. Greece and Hungary)

Information contained in the 2009 TrendChart reports on budgetary trends suggests that in most of the EU-27 Member States there has been a boost in 'STI' funding over the last five years and in some cases this is as much as four- to five-fold increase in annual funding terms. This increase is in part due to the expected SF effect in 'new Member States' since 2004, but there also significant increases in 'leaders-followers' (using EIS groupings). Non-European countries report similar a trend but budget data remains imprecise (although the effect in the US of the stabilisation package is evident).

However, the effects of the financial crisis appear to create a risk of a re-opening of a funding gap between leaders and 'catching up' countries that is being closed to some extent. The TrendChart reports for 2009 highlight increased budgets in leading EU-27 countries (e.g. Finland and Sweden) in response to the crisis and large budgets cuts in some 'rising stars': notably, Ireland and Spain. An expected stabilisation effect of the multiannual SFs programming effort does not appear to have totally spared R&D and innovation funding from cuts in all EU-27 Member States.

Figure 6: Share of funding of national support measures by category 2008



Source: TrendChart support measure database, analysis Technopolis, n=EUR 24.7b

The prioritisation of Member States innovation policies changes significantly when budget data is taken into account. Ten types of support measures account for approximately 70% of funding with:

- direct support (grants and loans) for R&D and funding of R&D cooperation policies for about 16%; and indirect support (tax) measuring about 6% (this figure is significantly under-estimated due to difficulties in compiling data on national corporate R&D tax measures);
- cluster policies accounting for about 7% of funding identified;
- VC and related support to innovative start-ups accounting for another 15% underlining the importance given in many Member States to this area;

- support for organisational innovation isbeing relatively high at 6% but this is often due to measures in support of ICT diffusion, for instance, rather than direct support for innovation management of enterprises.

Again these figures should be taken as broad averages and indicative with a margin of error. However, it is noticeable that new forms of support such as demand side measures, human resource measures or service innovation are of minor importance (falling into the 'others' category). Equally, there is little evidence of a shift of funding efforts towards areas such as eco-innovation or 'user-driven' or 'societal driven' innovation even if some countries have developed new initiatives in the last few years in this direction.

3.3 Comparative roles of EU and national innovation policy instruments

The evidence presented in Section 3.2 can be considered as a background against which the relative merits and focus of different possible instruments at EU level can be assessed. The table below attempts to summarise current policy and funding focuses of the EU and Member State policies with a view to developing a more complete 'synergies and gaps' analysis in the final report of the impact assessment.

Figure 7: Comparative focus of EU and national policy initiatives

	EU innovation instruments	**Member States innovation policies**
Governance and horizontal innovation measures	Some support for foresight, policy planning, etc. through the Seventh Framework Programme (FP7), SFs. Pro-Inno Europe policy analysis but no direct funding of Member State cooperation. Strong focus on cluster policy and strategic research initiatives. Emerging theme on horizontal linkages between policies.	Selected Member States have invested more in governance and policy analysis, but often weak capacities Strong focus on cluster type initiatives and strategic research programmes (platforms, etc.) Limited effort towards horizontal linkages between policies.
Research and technologies (direct and indirect funding)	Main effort to direct funding of RTOs and enterprises via FP7 projects. SFs supporting research infrastructure and direct funding schemes.	Strong emphasis on direct funding of R&D projects including in cooperation between higher education research and business Cooperation and cluster policies. Indirect (tax) measures prevalent but lack of evidence on scale and impact.
Human resources for innovation	Limited focus at EU level through a few specific initiatives. Main focus via FP7 on researchers mobility, etc. rather than broader support to HR for 'innovation'.	Identified as major bottleneck for innovation but links to education and training policies weak. Growing number of measures but financial scale of measures really focused on 'innovation' are limited
Enterprise innovation (including non-technological start-ups, VC, etc.)	Major budgetary effort in favour of risk capital through EIF, ERDF, etc. Support of Enterprise Europe Network. Policy learning/development through innovation cooperation measures including on service innovation.	Strong focus on start-ups notably through 'infrastructure' and intermediary networks. Support to risk capital growing but seed and early stage still weak. Limited and sporadic effort to re-focus measures to support service innovation.
Markets and demand side initiatives (including IPR)	Focus on areas such as lead markets, standardisation, IPR, public procurement, etc. Limited funding of policy learning networks (Inno-Actions, etc.).	Some focus in policy documents on demand side but national level effort (funding) for such types of measures remains limited and sporadic. IPR support networks exist but effectiveness not clear. Public procurement for innovation underdeveloped. Limited efforts to undertake regulatory impact assessments.

3.4 Summary of main trends in new innovation support measures, 2008-09

Highlighting countries where there has been a lot of activity over 12 months in terms of new measures is not a significant indicator of policy progress, as several countries have long-term programmes e.g. Germany and its policy cycle at federal level or the SF programming period, notably, relevant in new Member States where innovation and R&D measures are financed to a great extent by the SF.

Modification and continuation of existing measures

Some countries launched few new initiatives, or even did not introduce any new measures. However, the lack of new measures in a specified year does not mean that the country has been inactive in innovation and R&D policies. Moreover, some existing measures turned out to be so effective that there was no need to create new incentives. This is the case in Germany, the largest innovator and R&D performer in the EU, where only one new measure has been created recently. The R&D and innovation policy in Germany tends to be rather stable in terms of instruments and programmes, while many changes take place within individual measures. If considering exclusively the number of new measures, it would definitely underestimate the real dynamics in innovation policy. In some countries the existing measures have been modified, i.e. widened, deepened or simplified, and still implemented. This is the case in particular in Estonia, France, Slovakia, as well as Portugal, where the national innovation policy was significantly modified in 2007, so that the focus was placed on implementation in the last year.

Innovation and R&D funds as direct response to the economic downturn

As the EU economy has been hit strongly by the economic crisis, some countries launched special measures to alleviate the negative effects of the economic downturn. There is a strong belief that investing in innovation and R&D is crucial to overcome the crisis. The measures mainly aim at facilitating access to funding for SMEs, guaranteeing employment for highly skilled R&D personnel as well as keeping the commenced strategic R&D projects in progress: Strategic Investment Fund for SMEs in France, Enterprise Finance Guarantee and Economic Challenge Investment Fund in the UK, Knowledge Workers Scheme and Secondment of private researchers to public R&D organisations in the Netherlands, special programme to ease the consequences of the crisis in Spain, as well as Guarantee Fund for micro-crediting for SMEs in Bulgaria.

Policy trends framed in the SF programming period

In several new Member States (catching-up countries) as well as Greece and Portugal, the policy trends and cycles are closely bound to the SFs Programming Period. In these countries (the Czech Republic, Hungary, Latvia, Lithuania, Malta, Poland, etc.) the main financial source for supporting innovation are the SF Operational Programmes. They cover a wide range of innovation and R&D activities. The measures introduced during the period between 2008 and 2009 are the ones created at the beginning of the programming period. New calls and further rounds are now ongoing in most countries.

Cooperation between private and public R&D sectors

Cooperation between private enterprises and public research organisations has been recognised as crucial particularly in Cyprus, Germany, Belgium, Austria, Greece, Spain, Hungary and Slovenia. The fostering of linkages as well as private-public partnership were translated in specific new policy measures.

Start-ups and funding to SMEs

To meet financial challenges in young enterprises and SMEs, special programmes have been launched in Ireland (support for gazelles), Hungary, Greece, Bulgaria, Italy, Latvia, Malta, Slovenia and Spain.

Specific sectoral programmes

In some countries, new programmes dedicated to specific sectors have been launched. Finland launched a programme supporting innovation in social and health care, Ireland supports innovation in manufacturing, Italy developed a programme to support innovation in the energy sector, and in Germany a new programme, Innovation Alliances in key industries, has been launched. Further examples can me found in Malta (innovation support to ICT, renewable energy and biotechnology)

and Spain (programmes for aeronautical sector, vehicle and traffic safety programme as well as initiatives for environment and health).

Tax reductions

Few countries introduced new tax incentives and reductions as measures to support innovation and R&D. In France, a second, simplified round of the Research Tax Credit started aimed at private R&D expenditures and in Malta, the R&D tax credit scheme was introduced. In addition, Italy introduced tax exemption for start-up companies as well as special reduction in income tax to attract Italian researchers living abroad; this measure is expected to counteract the brain-drain problem, which is posing a serious threat in the Italian R&D system.

Innovation vouchers

Another identified trend is the introduction of innovation voucher ([30]) to increase the demand for R&D solutions. This kind of innovation measures has been implemented in Belgium, Estonia, Greece, Portugal and Slovenia. It targets mainly the purchasing power of SMEs vis-à-vis innovation related service providers.

[30] See also http://www.europe-innova.eu/c/document_library/get_file?folderId=122731&name=DLFE-6403.pdf online.

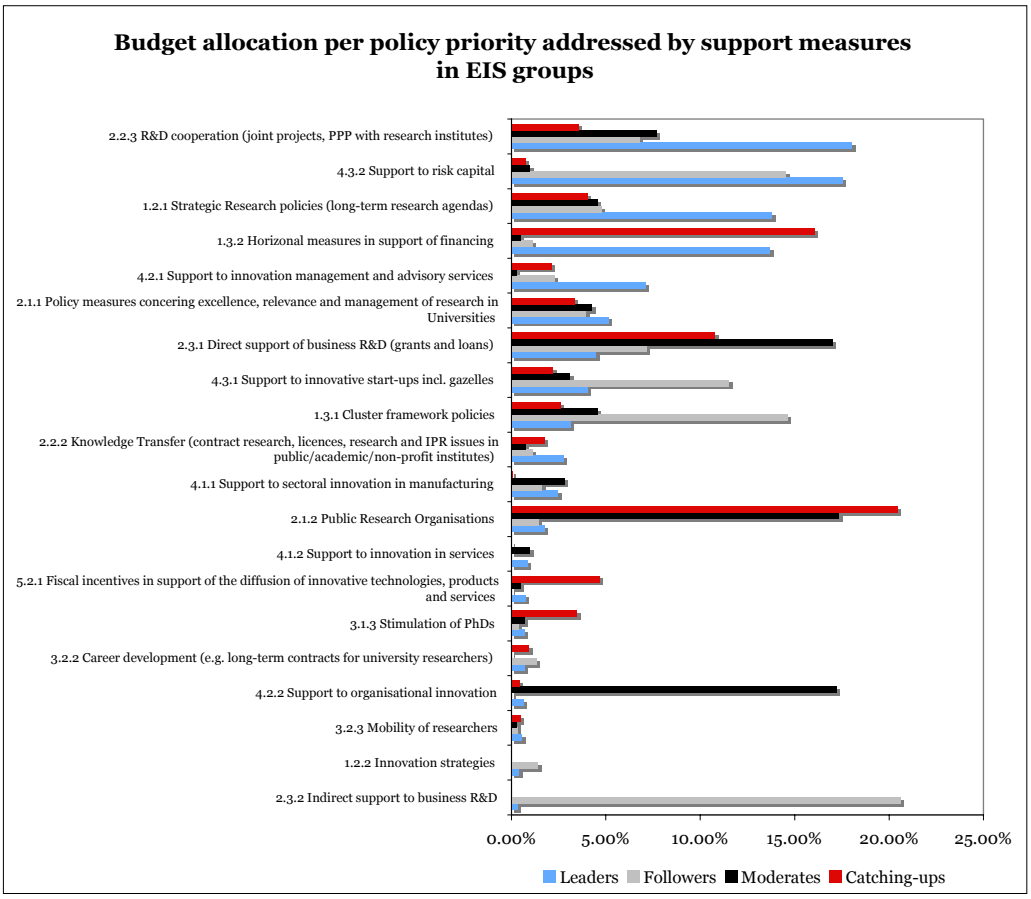
4 A decade of innovation policy: back-tracking the TrendChart

This final chapter of the EIPR report examines representative cases of national innovation policy trends over 'the Noughties' (from 2000 through 2009). Based on the 2008 EIS, a 'representative' EU Member State was selected for each of the four groups (leaders, followers, moderates and catching-up): Finland, the Netherlands, Spain and Hungary; Turkey, a second catching up country, was selected to represent the candidate countries. Each country review considers trends in innovation performance policy and governance systems over the decade, highlighting lessons learned and future challenges.

4.1 Differentiated innovation policies: evidence from budgetary figures

This first section analyses the patterns of funding taking into account the budgetary allocation to the most relevant policy priorities in the EU-27, Croatia, Iceland, Norway, Switzerland and Turkey. Looking at the aggregate picture, R&D cooperation is the key policy priority for all EIS groups, especially for the leaders, where more than 18% of the budget is allocated to measures to improve R&D cooperation between public/academic/not-for-profit sector research institutions and enterprises. This priority is followed by support to risk capital in innovation leaders and followers, the trend within the moderate and catching-up groups differs considerably, being the second most important policy priority public research organisations and direct support of business R&D, including grants and loans.

Figure 8: Budget per policy priority and by type of support measures (EIS groups)



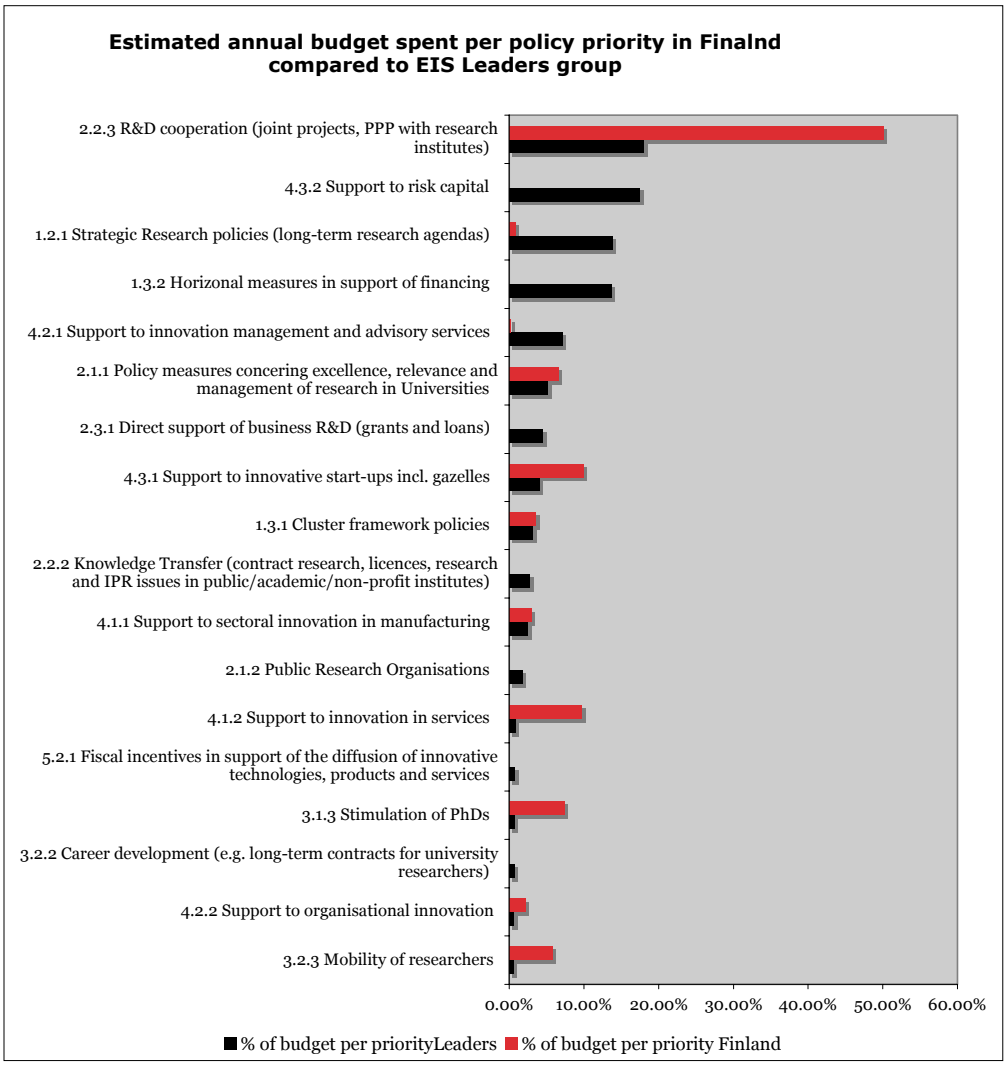
Source: TrendChart support measure database, analysis Technopolis, n=EUR 25.97b

Innovation leaders concentrate 18% of all policy measures on R&D cooperation. The Finnish case is particularly, interesting (see Figure 9) as 50% of the total average annual budget is allocated to fostering cooperation in the IT sector through measures such as Value Added Mobile Solutions (VAMOS), supporting R&D in wireless technology. This measure is given important support from

Tekes with mandatory private co-funding and fosters not only R&D cooperation amongst different actors (e.g. research units at universities or public research institutes, companies) but also facilitates utilisation of international expertise and market prospects.

Finland behaves slightly different in other policy areas compared to the leaders group, where the share of budget allocation to 'support to risk capital', 'strategic research policies' or 'horizontal measures in support of financing' is rather balanced (between 13% and 17%); Finland allocates an important amount of money to supporting innovative start-ups (9.9%) and to innovation in services (9.7%). Compared to other innovation leaders, Finland pays particular attention to mobilising researchers (5.8% versus 0.57% on average for the leaders) and stimulation of PhDs (7.4% vs. 0.7%).

Figure 9: Innovation Leaders and the Finnish case



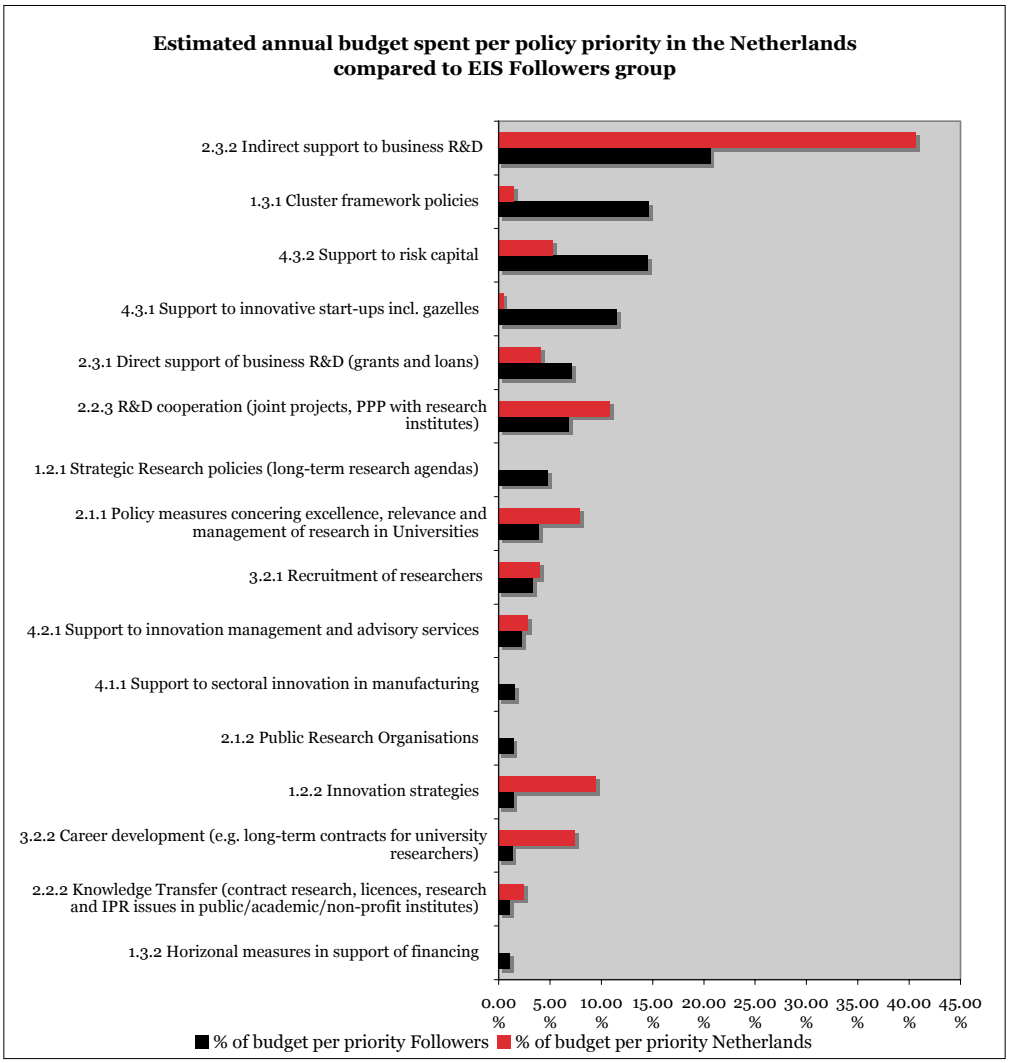
Source: TrendChart support measure database, analysis Technopolis, n=EUR 25.97b

Another interesting feature of innovation leaders is the higher share of priorities related to science policy and overall, they concentrate on a smaller number of STI policies. The picture emerging when analysing the group of followers differs from the leaders particularly due to the broader number of policy measures across which annual budgets are spread.

Figure 10 includes measures with at least 1% of representativity and shows followers, and especially the Netherlands, allocate an important amount of resources to indirect support to R&D, under the form of tax incentives and guarantees, with a single measure, the R&D (promotion) Act. Also particularly important are measures supporting risk capital and R&D cooperation with an allocation of 5% and 10% of the total annual budget respectively. On the other hand, support to innovative start-ups (0.4%)

and risk capital (5.3%) is surprisingly lower than in most innovation followers, where those kind of measure account for almost 17% of the total average annual budget. In the Netherlands, however, the innovation strategies (9.5%) and career development (7.4%) types of measures are more important than the followers' average (around 1.5%).

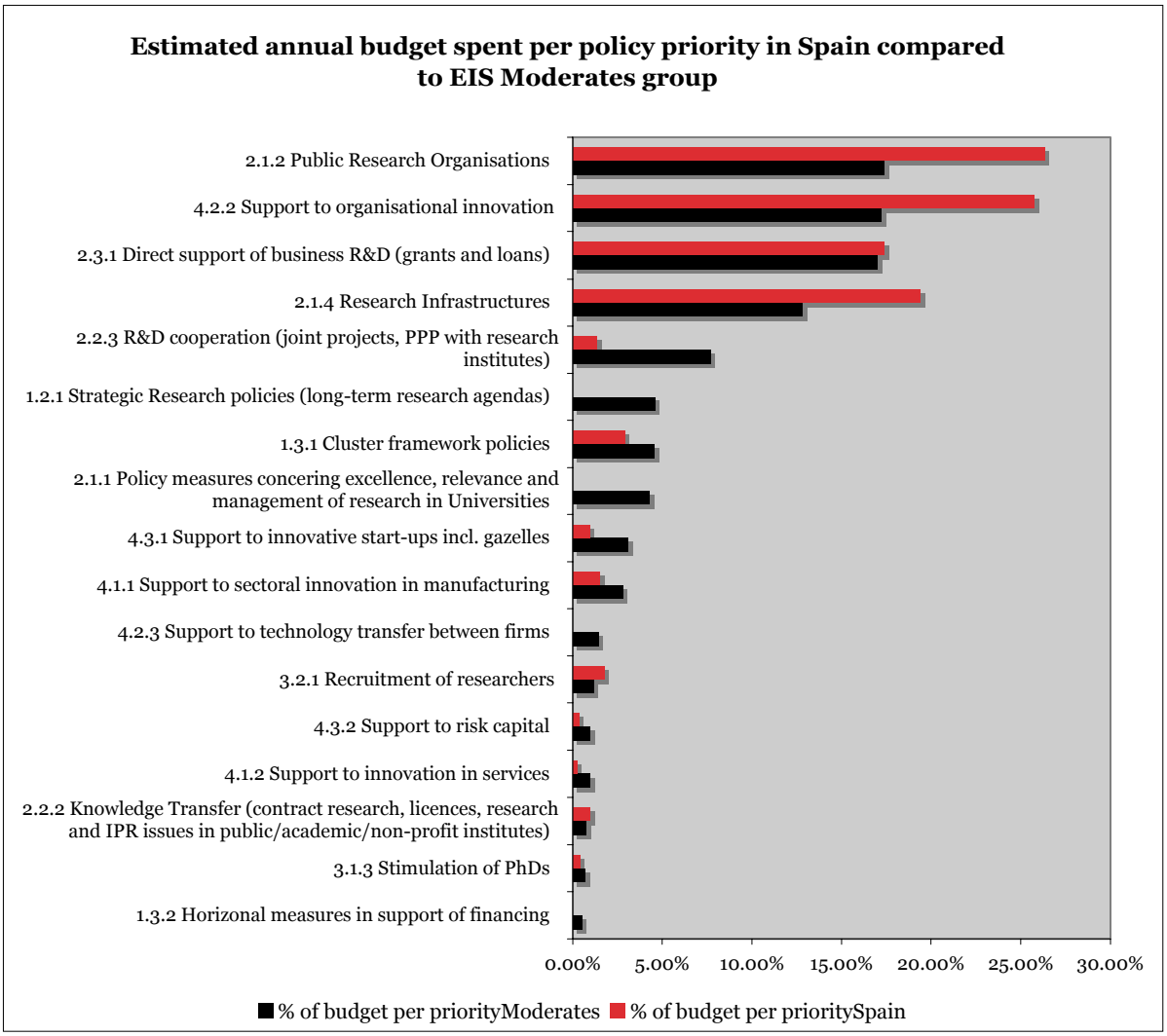
Figure 10: Innovation Followers and the Dutch case



Source: TrendChart support measure database, analysis Technopolis, n=EUR 25.97b

Measures supporting improved excellence, relevance and management of research in institutions, and support to organisational innovation are of particular importance within the moderate innovators, accounting for almost 35% of the total average budget. Analysing the funding of STI policies (using the TrendChart database), Spanish policy targets the highest percentage of funding to public research organisations and support to organisational innovation (see Figure). This result is somewhat surprising, but can be explained by the measures included in the National R&D&I Plan 2008-11. In particular, the national programme for applied research projects targets public research organisations, while, for instance, the 'sub-programme for non-oriented fundamental research projects' or the 'sub-programme of research activities CONSOLIDER INGENIO 2010', cover a wide range of support to PhD students, research project funding and research organisations that cannot easily be placed into a single policy category.

Figure 11: Moderate innovators: the Spanish case



Support to research infrastructures and direct support of business R&D are the second most important policy priorities, in line with challenges in the NIS. Spain invests slightly more than the average for moderate innovator countries in improving research infrastructure. The investments are made through three of the sub-programmes of the National R&D&Innovation Plan launched under the working line 'Scientific and technological infrastructure': the Sub-programme of the S&T infrastructure Project co-financed by the SF; the acquisition of S&T infrastructure in agri-food R&D centres dependent on the National Research Institute of Agriculture and the autonomous communities; and the scientific and technological actions in Science and Technology Parks (ACTEPARQ).

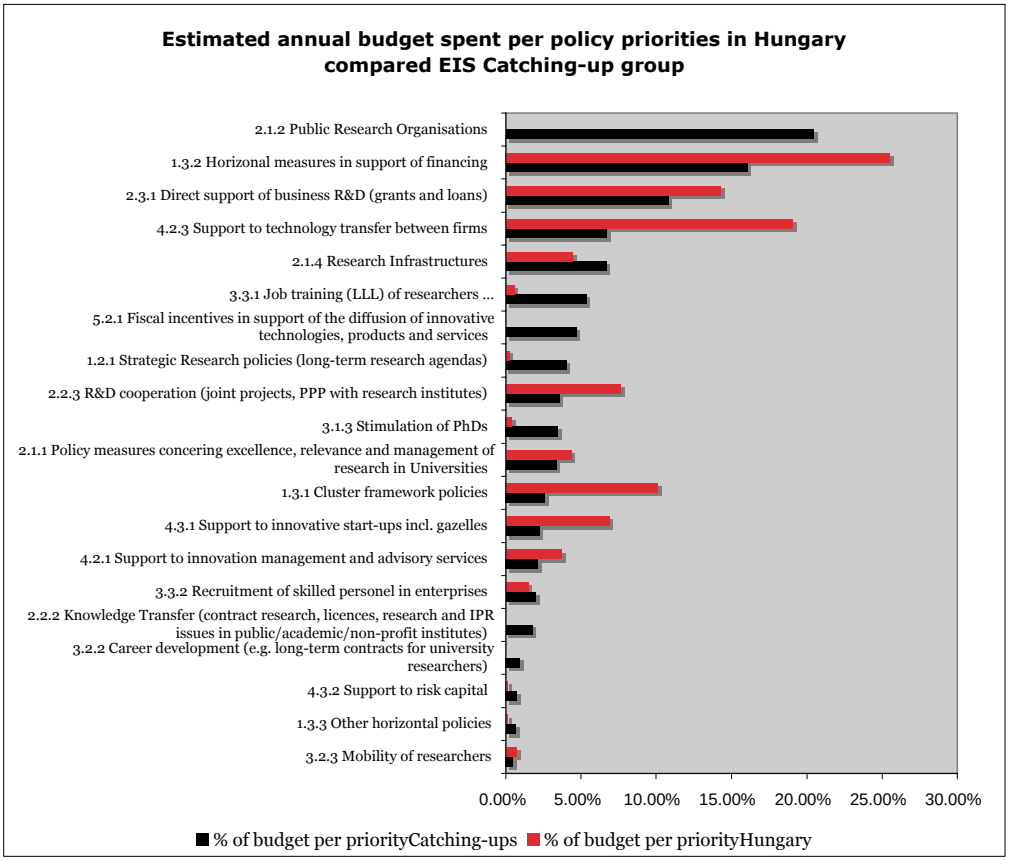
The budget allocated through CDTI Finance for R&D and innovation explains the high importance of direct support to business R&D (EUR 575 million represent more than 11% of the average annual budget for Spain). These kind of competitive interest-free loans and grants are the main mechanisms to support business R&D in Spain, and hence respond to a main challenge to improve longer-term competitiveness and productivity. Spain seems to be investing less in R&D cooperation type of measures than other moderates (1.4% in Spain versus 7.7% on average in the moderates group), a surprising fact given that studies consider this a weakness of the Spanish innovation system ([31]).

Finally, the catching-up group follows a similar trend to the moderates, with a clear focus on support to public research organisations and direct support of business R&D. Nevertheless, catching-up

[31] See for instance, 'R&D and innovation in Spain: Improving the policy mix'. An OECD and Spanish Foundation for Science and Technology (FECYT) report, 2007; or the TrendChart Report 2009 for Spain.

countries invest a much higher share of public funds in horizontal measures in support of financing than any other EIS group.

Figure 12: Catching-up countries and the Hungarian case



Source: TrendChart support measure database, analysis Technopolis, n=EUR 25.97b

The significant resource allocation to the horizontal measure in support of financing in Hungary is 'overestimated' from an innovation perspective due to the TrendChart database containing the total budget for the New Hungary Enterprise Promotion Loan Programme (HU_120) whereas only part of it is funding innovative companies and, within them, innovative activities. Therefore, these figures need to be read especially carefully. In Hungary, another important type of measure is that addressing cluster framework policies, with the Baross Gabor Regional Innovation Programmes (HU_124) and the support to accredited innovation clusters (HU_185) allocated 10% of the average funding in 2008.

4.2 An innovation leader: Finland

Since the 1980s, the advanced industrial countries have undergone a process of moving from a resource-based economy to a knowledge-based economy, associated with significant structural changes. In Finland, the change has been exceptionally rapid. The most **visible change in industrial structure** was the growth in the electronics industry during the 1990s (Nokia case) allied to a shift from traditional core sectors – the forest and metal industries – (but which still remain important).

One of the main factors behind this change was the economic crisis of the early 1990s. Recovery started promptly, as it was realised – both by policymakers and businesses – that the key factors for growth and future success are structural changes and innovation, based, inter alia, on high-level technological and business know-how. The structural change based on knowledge and know-how in Finnish economy has continued over the years and now involves areas of global interest: the biotechnology sector, ICT, energy technologies and knowledge-intensive services.

Another major influence on national innovation policies is the relatively **limited resources** at the disposal of the Finnish public sector, which has led to a shift in strategic and political thinking from input (resource)-driven (until the 1990s) to efficiency-driven development strategies. More specifically, from the beginning of the 1990s, a shift from a technology policy to a broader paradigm of innovation ([32]), led by the Finnish Science and Technology Policy Council (established in 1987), began. The need for a policy change was widely recognised and by 1993, the first innovation strategy ([33]) was formalised and the concept of a knowledge-based society was integrated into Finnish policy.

From 2000, Finnish R&D and innovation policies rapidly adjusted to the emerging challenges of globalisation and the role and tasks of the public sector in support of the national STI system were rethought ([34]) ([35]). In particular, the development of the NIS became based on improving core competences, on increasing openness in economy and in society, with a focus on strengthening education and the cooperation in the system. The functioning of the commodity and labour markets was also discussed in this broader context, with proposals for improvement.

The core policy areas in early 2000s requiring **integrated action** were formulated ([36]) as follows:

- public sector policies to boost innovation and research funding, with special attention paid to a coherent development of the support measures across all sectoral policies, and elaboration of the measures to identify and systematically develop new growth areas;
- development of knowledge and know-how, particularly in the national education system;
- utilisation of knowledge and know-how, particularly supporting the capacity of the business sector to innovate and raise productivity.

Account is taken on in an ongoing manner, in all policy and strategy papers, of innovation-related demand in education (knowledge creation), research, industrial development and internationalisation as the core domains of Finnish innovation policy. Hence, the policy process remains open and flexible to specific hot topics that emerge from time to time: e.g. at the end of 1990s, establishing cooperation and policy integration inside the country was an issue of a high importance whilst from the 2000s, the long-term labour market development (in relation to the educational policies) is at the forefront.

In 2001 and 2002, awareness-raising initiatives were launched (e.g. ProACT programme, special Web portals) to increase knowledge of society, business and R&D sectors in innovation as a driver of technological competitiveness and productivity, and, in a broader sense, the welfare of society.

The most **recent challenges of the Finnish innovation system** include the threats posed by further globalisation, the development of innovation environments and introduction in the broad-based innovation policy of demand-and user-driven innovation concepts. These were formulated in the 2008 Finnish National Innovation Strategy, and have been widely discussed in the 2009 evaluation of the NIS ([37]). As part of the implementation of the national innovation strategy, during the spring of 2009 the Ministry of Employment and the Economy outlined a policy framework for the central elements of demand- and user-driven innovation policy. Based on this policy framework, the ministry was expected to launch an action plan for demand- and user-driven innovation policy.

In line with the identification of new policy hot topics related to internationalisation and entrepreneurship, new support measures were introduced in 2008 and 2009 (e.g. Tekes programmes for young innovative growth-oriented companies in 2008 and the Serve - Pioneers of Service Business in 2009, SijoittajaExtra (InvestorExtra) online service-package for business angels by Veraventure Ltd, a subsidiary of Finnvera in 2008).

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[32] Katsaus 1990: Tiede- ja teknologiapolitiikan suuntaviivat 1990-luvulla. Tiede- ja teknologianeuvosto 1990 (Review 1990 – guidelines for sciences and technology policy in the 1990s. The Science and Technology Council, 1990). ISBN 951-47-4315-6.

[33] Tiedon ja osaamisen Suomi: Kehittämisstrategia. Tiede- ja teknologianeuvosto 1993. (Towards an innovative society – a development strategy for Finland. The Science and Technology Council, 1993). *ISBN 951-47-8466-9*

[34] The review 'The Challenge of Knowledge and Know-how'. The Science and Technology Policy Council. 2000

[35] Finland's competence, openness and renewability. The final report of the 'Finland in the Global Economy' project. Prime Minister's Office: Publications, 26/2004.

[36] The evaluation produced a policy report and a more extensive full report along with several background studies. See more at http://www.tem.fi/index.phtml?l=en&s=3161 online.

[37] The National Technology Agency, est. in 1983, http://www.tekes.fi online.

The recent evaluation of the Finnish innovation system recognised the continuous effort and financing on 'traditional' R&D activities, and facilitation of cooperation between research organisations and companies when allocating funding for R&D activities. One of the weaknesses of the system is its supply-based strategy, noted in the Evaluation of the Finnish NIS (2009). In addition, not all the aspects of the innovation process had been considered in the earlier policies, especially when it comes to commercialisation of inventions, acquiring risk capital and development of business competencies of SMEs (TC Country report for Finland 2009).

From this point of view, the 2008 **National Innovation Strategy** ([38]) can be considered an adequate step towards dealing with the full scope of tasks of Finnish innovation policy. Through the strategy, the government has significantly broadened the scope of intervention ([39]) and the strategy was approved by the Finnish Parliament, which, however, proposed that during the spring of 2010 the government present a report on the measures it intends to take in order to implement the innovation policy. In addition, parliament proposes that the required resources be set aside for the policy's implementation and R&D funding be raised to 4% of GDP, in line with the government programme.

Policy implementation and the respective **administrative/organisational structure** has been, to a great extent, developed in line with the changing needs of society and political frameworks – even the basic elements (especially in terms of policy elaboration and coordination) of the system have remained stable since the early 1980s. However, in retrospect, from 2007 onwards, Finland entered a new phase of development of innovation policy allied to a **reorganisation of the innovation governance structure**, through the establishment of the Ministry of Employment and Economy (in 2008). Compared to the previous periods, the new ministry has taken a more proactive stance in formulation of the policy and a more coherent policy approach within its governance area (TC Country report for Finland, 2009).

The structure of the present NIS is much more complex than at the beginning of the 2000 decade, and reflects the interests and development of the various stakeholders (both public and private, central and regional). The NIS evaluation report (2009) even concludes that it is 'excessively complex to both access and administrate'. However, possibly due to this complexity, collaboration between organisations is systematic through, for instance, **jointly elaborated support measures.** From 2000 to 2001, the inter-organisational collaboration between national agencies hasproduced a number of joint initiatives creating higher synergy between different policy instruments ([40]). Also, throughout the period since 2000, government and ministries have redefined the division of duties between public funding agencies and initiated organisational changes, such as in the period between 2003 and 2006 when the operations of Finnvera, Finnish Industry Investment Ltd, Sitra, Tekes, and the Technical Research Centre of Finland (VTT) were interlinked or the reform of the Enterprise Finland service system.

The **organisational evolution** is also visible at the level of the two most central organisations in the innovation system: the Science and Technology Policy Council and Tekes. The first, the central body for policy elaboration, was rebranded the Research and Innovation Council from 2009 to stress the increasing significance of horizontal innovation policy and know-how ([41]). The role of Tekes as the core implementation agency for financing R&D and innovation has been transformed (most significantly from the beginning of 2006), and now, besides funding technological innovations (its main role initially), it also supports service-related, design, business, and social innovations. Tekes also

[38] Aho, E. et al. Kansallisen innovaatiostrategia. 12.06.2008, Helsinki.

[39] The strategy includes 10 development guidelines: reinforcing the competence base broad-based innovation activity; internationalisation of the innovation environment and operating in a world without borders; strong and networked innovation centres; internationally competitive system of training and higher education; developing the Finnish environment to support growth businesses; strengthening demand and user orientation; central government's corporate steering and a systemic approach; resources for innovation activity. Government Communication on Finland's National Innovation Strategy to the Parliament. October 2008. See http://www.tem.fi/?l=en&s=2411 online.

[40] For instance, in 2001, the VC support measure PreSeed Finance was launched by Tekes and Sitra; in 2002, the web portal Yrityssuomi.fi (network services related to business development, growth, internationalisations) by Finnvera, Finpro, Sitra and the TE-Centres; in 2004, the YRKE project for business incubators by Sitra and TE-Centres; in 2007, the Finnish Innovation Centres by Finpro and Tekes; and, in 2009, the Vigo Accelerator programme for innovative start-ups by Tekes and Avera (a subsidiary of Finnvera).

[41] See http://www.minedu.fi/OPM/Tiede/tutkimus-_ja_innovaationeuvosto/TTN/julkaisut/Linjaus2008.html/?lang=en online.

maintains a strong international presence ([42]). In line with this broadening mandate, staff numbers as well as the operational budget have grown slightly from 2005 and 2006 but its capacity (i.e. the personnel) has certain limitations compared with the increased workload (TC Country report for Finland, 2009).

A similar organisational evolution occurred in Sitra, the Finnish National Fund for Research and Development, and other public service providers supporting innovation, e.g. Finpro ([43]), Finnvera and VTT ([44]). Created in the 1960s, Sitra has expanded its support activities from the original task of financing technical R&D to cover a range of research, educational and VC activities (seed finance, the financing of growth companies, investments in VC funds). In 2008, it again refocused its vision and strategy in line with the national innovation strategy.

Nevertheless, the 2009 evaluation of the Finnish NIS suggests that there is need to further streamline the support system and/or to develop more effective governance tools to administer it. Hence, it is likely that further organisational evolutions (even including mergers between structures) will be introduced in coming years.

The **regional dimension of innovation policy** has been a topic of public debate in Finland from the late 1990s, and R&D and innovation activities (via a strong presence of the national R&D and innovation organisations) are seen as an important tool to promote regional development. Institutionally, a major reform was the establishment of the regional Employment and Economic development centres (TE-centres), in the mid-1990s. Tekes supports the Finnish regions in conjunction with the TE-centres (by providing a technology advisory service). Another organisation of the national R&D and innovation system with a strong regional presence is VTT. Several instruments and broad-based programmes have been developed over the years to strengthen the regional dimension of innovation): the centre of expertise programme, the cohesion and productivity programme, the regional centre programme.

Nevertheless, the innovation support system at present is considered as overly focused on 'national' priorities and the implemented measures seem to be insufficient to diminish the competitiveness gap between Finnish regions (Evaluation of the NIS, 2009). The upcoming regional reform ([45]) will reorganise, inter alia, the existing regional state administrative bodies, and the TE-Centres will be reformed into the Centres for Economic Development, Transport and the Environment (ELY Centres), in order to tackle regional challenges in sustainable development and innovation.

The Finnish public policy institutions have systematically promoted the philosophy that **innovation support measures** should not be sector specific. Indeed, ideally, the public policy measures are intended to influence (positively) society as a whole. It is also important in terms of the country's international competitiveness to expand the **social dimension of innovation,** maintaining Finland's attraction in terms of business and jobs and as a living environment in general. The **set of measures** supporting innovation in Finland are elaborated in line with national policy topics, and planning and implementation of the public policies is remarkably coherent and effective – even there are some policy domains not performing as well as others (criticism has been directed, most often, at aspects like internationalisation and commercialisation, entrepreneurship activities and inward investment policy).

The most important initiative targeting Finnish organisations throughout the 2000s has been the Tekes **national technology programmes**, which have evolved into large, multiannual, sector and cluster-oriented technology programmes (in 2009, 30 such programmes were running). Moreover, two additional core policy measures, the Centre of Expertise Programme and the Cluster Programme promote inter-sectoral collaboration. In particular, the cluster approach was found to be useful as it supports both horizontal and vertical networking and collaboration. Without doubt, the innovation measures implemented over the years have positively developed the **collaboration and networking**

[42] In Brussels (Belgium), Bejing and Shanghai (China), Silicon Valley (US), Tokyo (Japan).

[43] From the 1970s to the 1980s, the Finnish Foreign Trade Association acted as a versatile export facilitator. In 1999, a direct successor, the Finpro agency, was set up with a much broader scope covering all aspects of internationalisation of Finnish companies.

[44] The role of the VTT (http://www.vtt.fi) in the implementation of innovation policy has been strengthened and in order to meet the emerging new challenges in the NIS, VTT substantially reorganised its structures and activities in 2005.

[45] From 01.01.2010.

culture, not only at public level, but also amongst beneficiaries and stakeholders, leading to more structured initiatives, such as the SHOKS ([46]) (see below).

The **internationalisation aspect of innovation** emerged visibly from 2003 ([47]) (and remains a focus of all later policy developments). The resources of the Academy of Finland and Tekes were increased at the same time to support the development of new growth fields, research-based innovation and innovation environments in support of international competitiveness. Not only business development but also the educational system (especially the university system) are critically assessed and internationally competitive universities are seen as cornerstone of the NIS. In 2004, **integrated strategic guidelines** were published to respond to the challenges associated with the globalisation of S&T, to expand research cooperation within the EU as part of the Lisbon strategy, and to strengthen Finnish knowledge through international scientific and technological cooperation ([48]). As a result of the guidelines, Finnish innovation centres have been established abroad ([49]).

In December 2009, the Research and Innovation Council adopted **a strategy on internationalisation of education, research and innovation**, setting the policy lines for the period 2010 from 2015, in order to respond to the global competition for knowledge and capital demands. A profound internationalisation of the domestic education, research and innovation environments is called for, and the national support organisations (Tekes, the Academy of Finland, Sitra, etc. and the network of Finland's foreign missions) are to jointly invest in coordinated promotion of international interaction.

As noted above, **education policies** have a central role in the innovation policy mix. In 2000-02, the focus was on the need to strengthen the educational system in terms of general standards and international compatibility. From 2003, the topic of adult education became increasingly important (e.g. the NOSTE programme). Due to this focus on comprehensive education policies, Finland has excelled in international innovation and competitiveness comparisons (see below). Still, the further development of the educational system is required (the Evaluation of the NIS, 2009, Strategy on the internationalisation of education, research and innovation for the period between 2010 2015, 2009), particularly with the focus on increasing quality of research and internationalisation of the national universities by their structural development, and reinforcement and clarification of the role of polytechnics.

Various **knowledge transfer** (particularly technology) measures have been introduced over the years (Centres of Expertise, Science Parks, etc.). Due to the evolution of business-academia partnership needs, in June 2006, the SHOKs were launched ([50]), to offer top research institutes and businesses a completely new mode of long-term cooperation in public-private partnership. The main goals are development of industry clusters and to create radical innovations (i.e. competitive in international terms). The research carried by the SHOKs aims to meet the needs of Finnish industry and society within a 5- to 10-year period. By 2009, six centres were operational (investing between EUR 40 and 60 million annually per centre) ([51]) both in traditional industries and emerging areas of new technologies and services.

There is wide evidence of a positive impact of Finnish public policies on innovation performance. Since the 1990s, Finland's innovation performance and innovation policies have been ranked high repeatedly in international comparisons (by the EIS ([52]), the OECD, the World Economic Forum's Global Competitiveness Reports, etc.). In the EIS 2008, Finland's performance was above or close to the EU-27 average in almost all indicators. Over the decade, since 2001, Finland has shown a steady

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46 SHOK is the acronym of the Finnish title: Strategisen huippuosaamisen keskittymät (Strategic Centres for Science, Technology and Innovation).

47 Knowledge, Innovation and Internationalisation. Science and Technology Policy Council of Finland, 2003. ISBN 951-53-2484-X.

48 Internationalisation of Finnish Science and Technology. Science and Technology Policy Council of Finland, 12 November 2004.

49 The first Finnish innovation centre, FinChi, was established in Shanghai, China, in 2005, and the second, FinNode, was opened in Silicon Valley, California in 2007.

50 Science, Technology, Innovation. Science and Technology Policy Council of Finland, 2006.

51 See http://www.tekes.fi/en/community/StrategicCentresforScienceTechnologyandInnovation/360/ online.

52 Finland is one of the most stable performers amongst the 'Innovation leaders', ranked 3rd by the SII in 2001, 2005, 2006, 2007, 2nd in 2002, 2004, 2008, and 1st in 2003.

growth in performance in the domains of human resources and creation of new knowledge ([53]). In short, Finland has developed a strong capacity in knowledge and know-how production and use, i.e. the innovation system in a wide sense, on a long-term basis. The smooth operation and development of the NIS is based on good cooperation between the main players in the public and private sectors.

There are many examples of this in different sectors, as presented above, but it is particularly true in the **political commitment to the research and innovation funding**. R&D expenditure has grown without interruption since the early 1990s, mainly due to business enterprises but, in recent years, also due to growing expenditure in the higher education sector. Nearly EUR 6.9 billion was spent on R&D in Finland in 2008, and in 2009 R&D expenditure is estimated to remain more or less at the level of 2008. Businesses (2008) accounted for 74% of R&D expenditure. The total public funding for R&D rose to EUR 1.9 billion in the 2009 budget (an increase on the previous year of 6% in nominal terms and 2% in real terms). Public funding of R&D as a share of GDP rose to 1.02% in 2009 (Statistics Finland).

The Finnish innovation system institutions deal effectively with two permanent, complicated tasks for any policy system: to identify future development areas and their needs, and to evaluate the impacts and effects of the policy measures. Evaluation, benchmarking, foresight ([54]) and other policy intelligence tools are used extensively and systematically by Finnish policy-makers in order to identify national development opportunities and constraints. International comparisons, evaluations, data and other information (from the OECD and the EU) are used extensively. In recent years Finland has also invested a lot in policy studies focusing on innovation processes, cooperation, internationalisation, policy delivery structures and schemes for innovation (TC Country report for Finland, 2007).

The most important input to the national policy elaboration are the strategic policy reviews, drawn up by the Research and Innovation Council, every third year since 1987, defining the strategic directions, structural framework and goals for research, technology and innovation policy ([55]). Periodically or occasionally, also the other organisations (Sitra, Tekes, VTT, Academy of Finland, etc.) publish their own foresight reports ([56]), policy papers and proposals. In general, policy design and delivery at national level is characterised by a high degree of **openness, public consultation, quality input, regularity and systematic coordination, and evidence-based decision making** (TrendChart Country report for Finland, 2007).

Impact assessment and **evaluation** are common practice at programmatic and organisational level. All publicly funded programmes of Tekes, VTT, the Academy of Science, etc. are subject to evaluation, and the organisations themselves are regularly assessed (both internally and externally) and audited in terms of their operational performance and development needs ([57]). There is also increasing public demand (identified in early 2000s) for **extending the evaluation** process to enhance the understanding of possible scientific and technological developments and their impacts on the wider economy and society, in order to use the evaluation findings in feasible and sustainable policy design.

Therefore, the government (or line ministries) have periodically commissioned international evaluations of the NIS ([58]) or of specific elements of policy (e.g. internationalisation ([59])). A 2003 NIS

[53] Particularly the indicators of public and business expenditures ratio per GDP, innovation expenditures ratio per sales, population with tertiary education, S&E graduates, and participation in lifelong learning.
[54] At the central level, the Government foresight network is an inter-ministerial forum for cooperation and exchange of information established under the Prime Minister's Office.
[55] See the list of publications at http://www.minedu.fi/OPM/Tiede/tutkimus-ja_innovaationeuvosto/TTN/julkaisut/index.html/?lang=en online.
[56] A well-known example is the FinnSight 2015 – Science and technology in Finland in the 2010s, a joint foresight project by the Academy of Finland and Tekes, carried out in 2005-06.
[57] Artimo K., Paulin J., Rytkölä T. report on VTT operations and organisation (VTT:n rakenteellisten ja toiminnallisten haasteiden arviointi), 2004, in Huttunen J. Sectoral research evaluation (Valtion sektoritutkimusjärjestelmän rakenteellinen ja toiminnallinen kehittäminen, selvitysmiesraportti); Sitra report 'Making Finland a leading country in innovation' (2005); Tekes report on Innovation activities impacts (Innovaatiotoiminnan vaikutukset. Osaamista, uudistumista, kasvua ja hyvinvointia) (2008).
[58] In 2003, the Ministry of Trade and Industry commissioned an international evaluation of the general conditions for innovation, with a particular emphasis on the implementation agencies (including Tekes).
[59] In 2006, the Prime Minister's Office commissioned the Secretariat of the Economic Council to analyse the challenges of internationalisation for Finland, to critically examine the appropriateness of Finland's economic

evaluation concludes that the system was working reasonably well with no obvious gaps. However, the report called for more attention to be paid to integrating user perspectives into innovation projects and to promoting entrepreneurship and entrepreneurial environments as a whole. More recently, as noted above, a widely discussed and complex evaluation was carried out in 2009. The international expert panel found that current system functions well, but is not doing enough to sustain performance or face ongoing challenges, particularly in terms of internationalisation and lack of entrepreneurship growth ([60]).

In terms of policy planning and evaluation tools, an effort to develop a commonly accepted **framework for impact analysis** was initiated by the Science and Technology Policy Council's 2007 statement on the assessment and forecasting of the effectiveness of STI. The need for this framework was reinforced by criticism of evaluation practices in a report by the National Audit Office in 2008 ([61]), that found that evaluations do 'not provide decision makers an opportunity to call R&D actors to account for the achievement of the objectives that have been set for them. This is due to numerous reasons. In spite of the key position of evaluations as a steering instrument in the state administration, neither R&D policy and administrative actors nor other actors in the state administration have been made expressly responsible for producing evaluation information concerning the achievement of objectives'. In response to this identified development need in policy intelligence, Tekes and the Academy of Finland started a project on the Impact Framework and Indicators for Science, Technology and Innovation (VINDI) (in 2008) ([62]).

To conclude this review of a decade of innovation policy, the most relevant last words are those the Finnish Parliament used, when approving the 2008 Government Strategy, to underline that even in an 'innovation leader', 'the current system is hampered by a plethora of programme, organisational and innovation policy tools, and the related, partial overlaps. Investments should therefore be judiciously directed, since the innovation policy must be capable of meeting both national and global challenges affecting Finland'.

4.3 An innovation follower: the Netherlands

In 2000, innovation was not a hotly debated policy issue in the Netherlands although some support instruments already existed. It was only seen as one element among broader issues such the position of the Netherlands in the knowledge economy and the performance as an information society. Hence, innovation policy was part of a broader industrial policy implemented by the Ministry of Economic Affairs (EZ). The main priority of the Dutch innovation system was to improve the interaction between public research and industry and provide public research organisations with more incentives to become more market oriented. The *Industry Letter* of 1999 described knowledge as a key factor for the innovative capability and international competitiveness of Dutch industry. The main areas of concern were the low level of business expenditure on R&D (BERD), the share of innovative products of firms, the commercialisation of knowledge generated by universities and research institutes, the climate for 'techno-starters', and the increasing shortage of qualified technical personnel.

Several collaborative R&D schemes were designed to overcome these issues and the budget of more strategically oriented competitive research funding was increased. Dutch policy aimed also at making IPR better known as a tool to help stimulate innovation. The use of patents was advocated not only as a means to protect new inventions, but also as a publicly accessible source of technical knowledge. Innovation support mechanisms were already starting to change: in the mainstream, direct measures (subsidy programmes), R&D support started targeting groups of firms or firms with universities, rather than individual firms. The government aimed to shift its role from financier to facilitator and cluster

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strategy. As the topic remains a policy focus, in 2008, the Ministry of Employment and the Economy commissioned a new study: Going Global – The Challenges for Knowledge-based Economies (2008). See http://www.tem.fi/files/19714/TEM_20_2008_innovation.pdf online.

[60] See http://www.tem.fi/index.phtml?l=en&s=3161 online.

[61] Valtiontalouden tarkastusvirasto (2008) T&k-arviointitoiminta (R&D evaluation activities). Valtiontalouden tarkastus-viraston toiminnantarkastuskertomus 157/2008, Helsinki.

[62] Lemola, T., Lehenkari, J., Kaukonen, E. and Timonen, J. (2008): Vaikuttavuuskehikko ja indikaattorit (The Impact Framework and Indicators for Science, Technology and Innovation). Publication of the Academy of Finland 6/08.

broker, and had therefore refocused existing policy areas towards a cluster approach ([63]). The Cabinet sought to adopt a more systemic approach to innovation policy as opposed to the traditional policy of removing market imperfections ([64]). New technology-based firms had for a long time been neglected in national innovation policy and the initiative was left to universities or regional government bodies. As of 2000, more policy emphasis was put on this issue and initiatives were launched at national level. In addition to initiatives such as increasing the autonomy of the research sector, and a general policy of economic liberalisation and deregulation, the government was already launching benchmarking and prospective studies in order to inform policymaking.

In 2001, EZ was reorganised including the creation of a specific directorate dedicated to innovation, expected to become the main centre of expertise on innovation nationally. Within the wider European context and in view of the implementation and realisation of the Lisbon Agenda, the Dutch innovative infrastructure had to measure up to those in leading countries in order to preserve and, if possible, improve Dutch competitiveness. The major issues in this respect were knowledge and technology, employment and innovative entrepreneurship. At the same time, EZ streamlined its company-oriented technology policy instruments. The number of schemes was reduced along the following lines: fiscal facilities, credit facilities, cooperation schemes, and knowledge transfer. Along with the streamlining of instruments, EZ also aimed to expand monitoring and impact assessment of the instruments. Up to 2001, EZ assessed the impacts of the instruments once every four years through an evaluation. Evaluation and impact assessment have carried increasing weight over the last decade, particularly as there is an overall trend to hold public authorities more accountable for the spending of public funding. Since 2002, policy design and evaluation are subject to the ministerial decree on performance measurement and evaluation (RPE). Based on the RPE, the EZ developed a guideline for a systematic evaluation of policy instruments and regularly conducts studies to see if policy supports innovation effectively and to inform policymaking. In particular, prior to new policy action, EZ carries out an international analysis of relevant existing policies.

An 'integral assessment' of innovation policy (IBO), carried out by the Ministry of Finance (December 2001 to May 2002) had a strong impact on policy design. This assessment looked at all the instruments and programmes for innovation run by the various ministries and used foreign measures as a benchmark. The assessment method was chosen to help ensure that the national innovation policy would be coherent and consistent. The Commission for Technology and Information Policy (CTI) was set up during this review period as part of the improved structures for preparing proposals for STI policy. Other actions for policy coordination included the joint preparation of White Papers.

The IBO report concluded that the effectiveness of the existing firm-oriented support schemes for technological development and innovation could be improved through better coordination and a reduction of the number of schemes. Following this assessment, a debate about the complexity and effectiveness of the Dutch innovation system began in the policy arena. One element of the innovation system was particularly criticised: the multitude of public research organisations and the lack of accountability of these institutes. The EZ worked towards the optimisation of the instruments for innovation policy with a reduction in the number of instruments, as well as a more systematic categorisation of types of measures. As of 2004, these were:

- basic/strategic research conducted in organisations, such as TNO, the large technological institutes, the technological top institutes;
- instruments with a long-term programmatic character with multi-annual research plans;
- instruments supporting collaborative RTD projects (often with specific tasks and limited in time);
- large-scale, integrated activities and programmes, such as a package of measures on the topic of genomics, using several existing instruments to focus on one strategic technology area;
- a fiscal instrument (WBSO) to support R&D efforts in individual firms;

[63] Clustering and cooperation was one of the key elements in Dutch innovation policy since the launch of the Cluster Policy Paper 'Opportunities Through Synergy, The public sector and innovation oriented cluster development in the market sector' (1997).
[64] Kabinetsreactie op AWT-advies nr. 38 'Hoofdlijnen innovatiebeleid', Den Haag, December 1999.

The explicit cluster policies initiated in the late 1990s were slowly replaced by a more mainstream networking approach in traditional R&D instruments, and a policy concept based on 'dynamic innovation systems', where the public intervention targets bottlenecks in the innovation system. Between 2000 and 2004, the concept of a 'dynamic innovation system' surfaced in the policy mainstream and a series of background studies have been performed within and on behalf of the EZ, methodically looking into various aspects of innovation strategy, and appraising the Dutch position. Numerous studies were performed (both by internal teams as well as external experts) to analyse various aspects of innovation such as the rationale for innovation policy, innovation governance, possibilities for streamlining various categories of schemes, international aspects of innovation, interaction between science and firms, framework conditions, innovative entrepreneurship, breakthrough technologies, etc. These studies were the basis for the 2003 Innovation White Paper taking into consideration the policy challenges set out in the IBO reports. The policy concentrated on three objectives: 1. strengthening the climate for innovation; 2. dynamism: towards more companies that innovate; 3. taking advantage of opportunities for innovation by opting for strategic areas.

Historically, a strong division of labour has existed between the science and basic research (i.e. ministry of Education, Culture and Science (OCW)) on the one hand, and technology and innovation (i.e. EZ) on the other, both in terms of policy design, funding and research performers. As a result, two different governance cultures in the science and innovation parts of the system have emerged. While EZ's approach can be characterised as 'hands on' with an active role in policy design, programme design and programme management, OCW's approach is rather 'hands off', delegating more responsibilities to the Organisation for Scientific Research (NWO) and the various organisations in the science and research system. This rather strict division of labour and the differences in approach have created (coordination) problems for effective policy design. OCW, for instance, was not actively involved in the definition of the 'key areas' (a cornerstone of EZ's programmatic package) and did not incorporate these prioritised areas in its policies, nor did it align its research priorities with EZ's innovation priorities. OCW 'outsourced' priority setting to NWO, who selected its own research themes (and eventually did not get sufficient (additional) funding from OCW to fully develop the thematic programmes).

The current government (2007-11) has made a first step to enhance coordination by establishing the interdepartmental K&I programme department, where all relevant ministries collaborate on joint issues in innovation policy. The establishment of the inter-departmental K&I is a step to address the lack of coordination in the governance system between the Ministry of Economic Affairs and the Ministry of Education, Culture and Science (responsible for research and education). In addition to developing an inter-departmental long-term strategy for knowledge and innovation ([65]), K&I is responsible for developing innovation agendas for prioritised societal themes (sustainable energy, water, health care, education, sustainable agro-innovation and safety and security). K&I also has the task to introduce more coherence in the policies for knowledge, innovation and entrepreneurship of the various ministries. K&I also works closely with the Innovation Platform (IP), especially on the development of societal innovation agendas. The IP is an advisory body established in 2003 as a temporary organisation, and re-established in 2007 by the Cabinet Balkenende IV (2007-11) with new members and new tasks. The IP, which can be compared to the councils in the Nordic countries, with high-level representatives from research, industry and the policy arena, especially focuses on the development of new innovation programmes in health care, sustainable energy and water management. Currently, the government is reorganising the system of advisory councils as part of a broader effort to reorganise the ministries, their agencies and other (advisory) councils.

The Dutch government has progressively adopted an active innovation policy, characterised by integral support for innovation processes and a targeted approach aimed at 'backing winners'. As a small country, the Netherlands aims to achieve focus and critical mass in those areas in which the Netherlands can excel. The aim is to deliver 'top performances' in fields which have a powerful influence on the entire Dutch economy. The Innovation Platform has identified six 'key areas'. For those areas, substantial innovation programmes can be developed. Also in its policy for regional economic development, the ministry has challenged regions to identify strong innovation clusters (or 'hot spots') for which regional innovation programmes can be developed.

Over the last decade, there has been a shift in the way in which the ministries, in particular EZ and OCW, are using intermediaries to execute policy programmes. The merging of Senter (historically the

[65] 'Towards an agenda for sustainable productivity growth' (2008).

front desk of EZ) and Novem (more science based) in 2004 was a move towards collaboration between the various parties to provide better support (and scientific links) to industry. In the process of innovation policy delivery, SenterNovem plays a key role. Currently, SenterNovem not only implements policy via programmes and measures, but its activities also include advice on policy development and policy instruments, design and development of policy instruments, control of procedures and integrity, and evaluation and measurement of effects of policy. Policy design and policy delivery have become more aligned and part of a policy cycle. The relationship between EZ and its agency SenterNovem has been changing since 2005. SenterNovem used to focus on the efficient implementation of policy instruments, but with the introduction of the new approach in innovation policy in 2005, SenterNovem has collaborated much more intensively with EZ in developing new innovation programmes in strategic areas ('key areas'). Three implementation organisations of EZ (SenterNovem, the Netherlands Patent Office and the EVD) are being brought together in one implementation organisation – in line with the horizontal policy objective to reduce the number of front offices for firms and citizens (operational in 2010). SenterNovem's principals from national ministries and the European Commission are also increasingly making use of the practical experience within SenterNovem to form the basis of their policies. This 'policy interaction' is visible throughout the collaborative partnerships between EC policymakers, national ministries and SenterNovem staff, for example with respect to the innovation programmes. The alignment between policymakers and implementers has improved. Thus, SenterNovem not only implements policy via programmes and measures, but its activities also include advice on policy development and policy instruments, design and development of policy instruments, control of procedures and integrity, and evaluation and measurement of effects of policy.

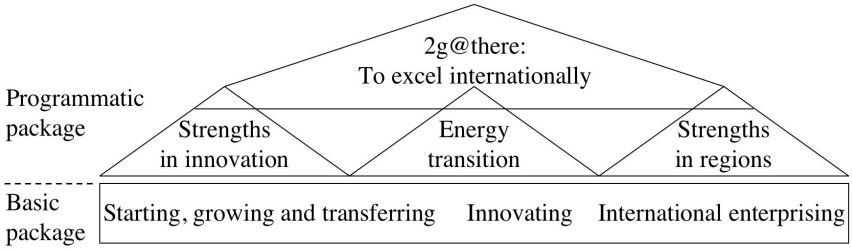
A typical feature of the Dutch innovation governance system is the upsurge in the number of public-private consortia that manage research and innovation programmes. These are mainly the result of investment impulses from the Fund for the Enhancement of the Economic Structure (FES) that bypassed the traditional channels of R&D and innovation funding. In the period since 2004, the intermediary level between the government and researchers became filled with new (temporary) intermediary structures, in addition to the main policy implementation bodies SenterNovem and NWO.

Moreover, there has been a move towards the use of specially formed bodies to execute programmes in certain key technology areas. In strategic research areas (ICT, life sciences, nanotechnology, sustainable chemical technology), temporary task forces (Netherlands Genomics Initiative (NGI), Advanced Chemical Technologies for Sustainability (ACTS) and ictRegie) have been set up to coordinate and execute programmes. The task forces have a semi-permanent status and are hosted by NWO, which is responsible for enhancing the quality and innovative nature of scientific research as well as initiating and stimulating new developments in scientific research.

As a response to the assessment that innovation policy did not sufficiently address the specific needs of the target group, i.e. the entrepreneurs, and in order to better address the challenges of the Dutch innovation system, EZ recalibrated its instruments and their implementation in 2006. The aim of the reform was to achieve greater flexibility and customised solutions to meet the needs of businesses. The accessibility of the instruments was improved by reducing the number of access points and by means of a substantial reduction in the preparation costs and administrative burden. Financial and non-financial measures should motivate entrepreneurs to deliver 'top performances'. The government has acknowledged the problems concerning collaboration and has dedicated the core of its instruments to supporting cooperation. In order to improve the effectiveness of investments in R&D and innovation, the Netherlands looked for examples of good practice concerning both policy definition and policy delivery in countries like Finland, for example. The new approach groups the restructured instruments in two different 'packages' with seven 'modules', which address the main challenges for (innovation) policy:

- a 'basic package', primarily aimed at SMEs, providing information and advice on, for example, access to the knowledge infrastructure, and financial support in the form of credits, loans and guarantee schemes;
- a 'programme-based package' aimed at specific key strategic areas for the economy.

Figure 13: The packages and modules in the Dutch policy mix



The basic package is accessible to all entrepreneurs and includes instruments for all phases of entrepreneurship. Moreover, the first steps towards innovating and international enterprising are stimulated. In addition to information and advice, there are financial instruments, e.g. innovation vouchers, credits and (cooperation) subsidies. The programmatic package consists of three modules: strengths in innovation, strengths in regions, and energy transition. In addition, there is a fourth module to provide programmatic support to enter prioritised foreign markets ([66]).

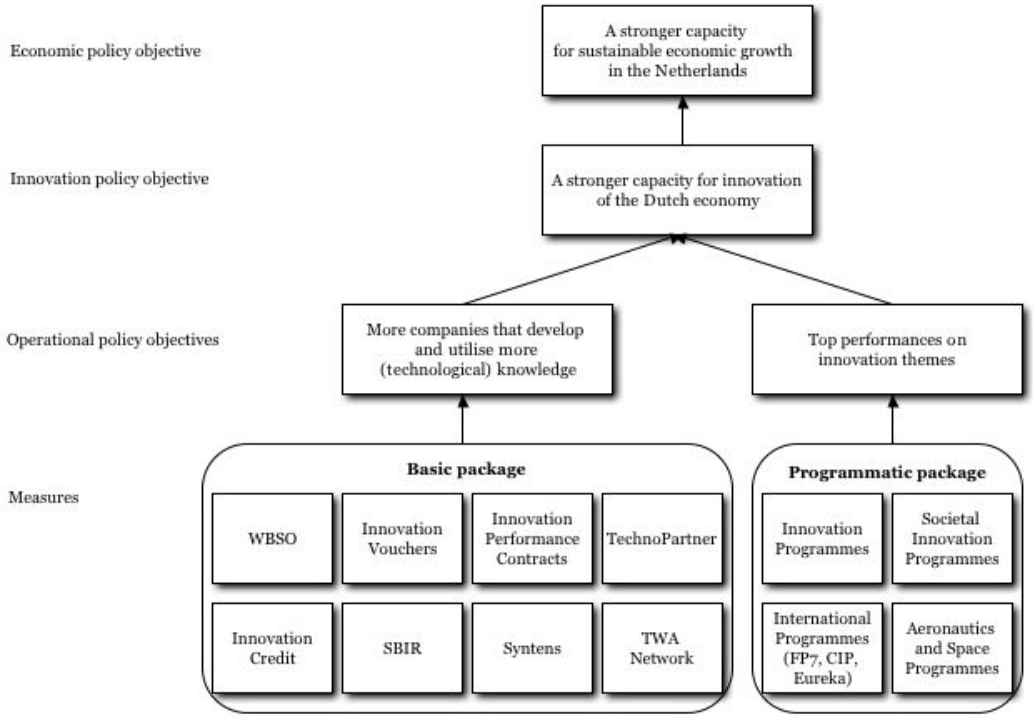
A good estimate of the volume of public support to innovation can be made by using the 2009 budget; EZ allocated EUR 584 million for innovation policy in 2009 ([67]). In addition, the fiscal incentive WBSO carried a budgetary weight of EUR 466 million. Together, the total budget for Dutch innovation policy amounts to circa EUR 1 billion. The 'basic package' (without WBSO) receives EUR 146 million and the 'programmatic package' EUR 434 million ([68]). The share of the budget for the 'programmatic package' increased in the period from 2007 to 2009, fluctuating around 40%; meanwhile, the weight of WBSO decreased, but will increase in 2010 (EUR 542 million).

Taxation was used as means for stimulating business development and in particular innovation well before 2000. As of 2001, the **WBSO** became the single most important tax instrument, and the financial resources allocated by this measure are by far the largest of all innovation policy instruments. The WBSO scheme aims to stimulate R&D by alleviating the wage burden for companies through a tax reduction. The scheme is directly targeted at increasing the intensity of BERD in the Netherlands, one of the main weaknesses in the innovation system. The WBSO scheme aims to broaden the base of businesses that undertake R&D. The measure addresses the policy challenge to increase the number of innovative SMEs in both industry and services. This type of measure was chosen to stimulate R&D in firms, due to the fact that wage costs form a bottleneck for the take-up of R&D. A fiscal form was chosen so it could easily merge with private spending on R&D. Also, the low threshold and generic and broad coverage of a fiscal form fits well with the aim of the measure. An evaluation of WBSO in 2007 concluded that firms use the fiscal advantage fully for R&D and invest their own means on top of that. The effect on BERD depends on the size of companies: the effect is larger in small companies. Revenues (extra private investments in R&D) are larger than costs of the act.

TechnoPartner is an example of so-called packaged programme grouping four measures: TechnoPartner Knowledge Exploitation Subsidy (SKE), TechnoPartner Seed facility, TechnoPartner Certificate and TechnoPartner Business Angel Programme (BAP). The overall aim is to improve the economic climate for technology-based start-ups ('technostarters') through the following means: giving them access to capital, knowledge, experience and equipment; motivating knowledge institutes and investors to invest money and knowledge in pioneers; and providing a platform where they can ask questions, explore ideas and make comments. TechnoPartner addresses both the challenge to increase the number of innovative SMEs and the weakness in commercialisation of knowledge in the Dutch innovation system.

[66] For a complete overview of all instruments in the modules, see Annex 2 of the letter to the Parliament (TK 31200 XIII, nr. 47, 28 February 2008).
[67] This is the budget allocated to the policy aimed at 'Article 2: A strong innovation capacity' in EZ's 2009 Budget.
[68] Note that the programmatic package is broader than the Innovation programmes (NL52) and also contains (programme-based) contributions to research institutes (e.g. TNO and the GTIs) and to specific programmes in aerospace.

Figure 14: The global intervention logic in Dutch innovation policy



Dutch innovation policy addresses the key challenges and the policies tend to be implemented effectively and efficiently. However, macro-economic indicators do not reveal a significant impact of innovation policy. In particular, public and private expenditure on R&D (as % of GDP) has not improved much since 2000. Investments in knowledge, research and innovation have not kept up with the GDP growth or with trends in other advanced countries. Although individual measures in the policy mix have been positively evaluated (the mid-term review of the programmatic package, which aims to achieve top performance in focus areas, was positive), there is little progress towards the objective to increase the number of innovative SMEs that develop and utilise more knowledge. Nonetheless, the impact of innovation policies on economic indicators takes time, often decades. In particular, structural changes in the sectoral composition of the business sector take a long time and therefore policies aiming at such changes should be consistent over long periods of time.

4.4 A moderate innovator: Spain

The Spanish innovation system has developed over the 2000s in order to respond to the objectives set by national development priorities and the EU's Lisbon Agenda. However, despite the efforts made, national innovation performance continues to underperform compared to other EU Member States. Spain's relative position in the EIS 2008 remained the same as previous year (16th), below what could be expected from a major and fast growing economy. This is all the more so since Spain has been particularly hard hit by the economic recession since the fourth quarter of 2008. This underperformance in innovation seems to be partly due to relative weaknesses such as insufficient business investment in R&D, and weak linkages in the innovation system and entrepreneurship.

From a programming perspective, Spain adopt multi-annual, generally four-year duration, national plans for R&D and innovation that establish general priorities and specify the main instruments, while the exact financial commitments are set in annual action plans. In 2000, the Spanish innovation governance system underwent a restructuring of government departments due to the creation of a new Ministry of Science and Technology (MCYT). At the same time, Spain was immersed in a process of liberalisation of markets for goods and services, especially focused on the energy and telecommunication sectors. The main STI policy measures focused on supporting private-public cooperation (e.g. the PROFIT programme replacing ATYCA), supporting development of 'start-ups'

and 'investment funds' to foster creation and consolidation of technology-based companies. A tax deduction measure for private R&D activities was also introduced at this time.

During 2000 and 2003, a trend to develop regional innovation systems was reinforced. Most of the autonomous communities (regions) had already prepared a regional innovation strategy (with the support of the ERDF during the period form 1994 to 1999). However, there was still a lack of coordination and, in most cases, differences in competences among the different organisations. During this period, the first efforts to start impact evaluations of research and innovation policies began.

In 2004 as a result of a new government, a new organisation of the ministries led to a return to the previous model; the MCYT, only created in 2000, was dissolved and the competences split between the Ministry of Industry and the Ministry of Education and Science. The main weaknesses of the Spanish NIS remained the same: the low number of innovative medium- and large-sized enterprises and the weak position of Spanish enterprises in international markets; weak innovation orientation of enterprises; few industry-science links that required support to increase collaboration between agents of the Innovation System; and the low number of scientists and technologists in the private sector. These main challenges of the innovation system were well understood, and new measures introduced from between 2004 and 2006 tried to bridge the gap of public-private collaboration, the lack of innovativeness in industry, as well as the low level of private expenditure on R&D.

In 2007, the first hints of an economic slowdown appeared and the Spanish productivity rate attained its highest level since 2001 (increasing 1.1% in early 2007), while still growing below the potential productive capacity, mainly because of the low rate of innovation. National R&D and innovation performance became a major policy concern and an important topic in the media, and for the first time, innovation policy was viewed as interrelated to other policies. While the national government remained the main actor in innovation policy, the process of decentralisation through the increased devolution of responsibilities (and funding) to the regional authorities made the latter important players, and most regions continued to pursue their own innovation strategies and plans with SF support. In two regions, Navarra and the Basque Country ([69]), this autonomy is reinforced by their fiscal federalism that allows regional governments to raise taxes and transfer them to central government ([70]). The National Plan for Scientific Research, Development and Technological Innovation 2004-07 also included some R&D tax incentives, simplifying the administrative requirements of fiscal policies across the country.

From 2006, financial support and business investments have been the main drivers of the improvement in innovation performance; notably, as a result of strong growth in private credit (12.7%), broadband access by firms (15.3%) and non-R&D innovation expenditures (13.4%). On the other hand, performance in linkages and entrepreneurship and innovators has worsened, in particular due to a decrease in the firm renewal rate (-0.6%).

In general, the research and innovation support system seems to be evolving in the right direction, with the main measure achieving acceptable results: INGENIO 2010 (launched in 2005) which has been implemented effectively and coordinated with the 2008-11 National Plan; the Consolider programme that managed to mobilise groups of prestigious researchers resulting, in some cases, in the creation of permanent research structures; the CENIT programme (National Strategic Consortia for Technical Research) that had a positive boost effect on cooperation between companies and, finally, the Avanza programme supporting the development of the information society ([71]).

Recent developments in the innovation governance, include important changes, such as the creation of the Ministry of Science and Innovation (MICINN) in 2008 and as result of the re-organisation, other ministries (i.e. Education and Industry) lost competencies and responsibility for implementing agencies (such as the Spanish National Research Council (CSIC) and the Centre for the Development of Industrial Technology (CDTI)). There have also been reforms and mergers in the university system to

[69] A recent evaluation of the ERDF's support for structural change and globalisation through Objective 2 programmes during the 2000-2006 period, highlights that the Basque Country pursued a coherent strategy and found evidence of positive effects on innovation and competitiveness of the ERDF measures.

[70] 'R&D and innovation in Spain: Improving the policy mix'. An Organisation for Economic Co-operation and Development (OECD) and Spanish Foundation for Science and Technology (FECYT) report, 2007.

[71] While only 12 million people used Internet in 2003, today around 20 million people use the Internet in Spain, in 2003 only 8% of house-holds were provided with Broadband connection, whereas today this figure rises up to 40%, etc.

encourage, for instance, an increase in the number of business-orientated PhDs. According to the Spanish TrendChart Report 2009, room for improvement still exists even if the NIS is functioning better than ever before.

Among the measures launched against the crisis it is worth mentioning 'Plan E' which aims at creating 22 000 jobs in R&D through the allocation of EUR 490 million. Investments to counter the crisis mainly focus on health and renewable energy sectors as well as research infrastructure, allocating a total of EUR 187.5 million to university and research infrastructure. On the other hand, the approved budget for 2010 implies a reduction of 7% for the Science and Innovation Ministry, mainly affecting the loans for investment of the autonomous communities.

Overall, especially during last two years, Spanish authorities have made special efforts to continue developing a set of instruments addressing main challenges that would drive a coherent R&D&I policy mix. On the one hand, the principle of horizontal coherence has been adhered to when designing new support measures, notably in the policy mix for science-industry linkages. Some regulatory reforms, like the new law on universities, aimed at fostering this kind of cooperation by, for instance, allowing public university professors to take up to a five-year sabbatical to launch a company based on technological innovation. In addition, apart from CENIT, the main programme to promote clusters and facilitate public-private links managed by CDTI (under the Ministry of Industry until 2009), the Ministry's of Industry's Directorate-General for SMEs provides so called mezzanine loans to university spin-offs and public and private research organisations, technology centres, etc. While the INNOEMPRESA programme provides grants for innovation projects, technological advice and joint innovation projects between value chain partners and, at the same time, one of its action lines is also part of the AVANZA plan to increase ICT use in internal and external business processes. A step further in increasing this coherence would be to consolidate small grants and loans into larger grants and/or a single source of funds, for instance grouping such funds to stimulate public/private partnerships involving SMEs, along the CENIT model.

On the other hand, from a vertical coherence point of view, Spanish governance of innovation policy still lacks some clarity on the role of the regions in the national strategy. There is a need to ensure that institutional coordination and planning work to serve the broader national interest; indeed, there is still a risk of duplication, lack of synergy and overlap or even conflict of objectives. In terms of implementation, the two-tier structure of national and regional system makes it difficult for firms, especially SMEs and other individual stakeholders to exploit synergies between national and regional policies ([72]). Moreover, even at national level, competence sharing among the Ministry of (Science and) Education and the Ministry of Industry, Tourism and Trade (MITYC) have traditionally been a source of political conflict that still remain to some extent despite the effort made by the current government to unify all innovation competences under the MICINN. In the beginning, this ministry was responsible for the policies of higher education (with the State Secretary for universities), academic research and for the R&D and innovation policies devoted to the private sector (since it absorbed the direction of the CDTI previously placed under the MITYC), but in April 2009 the State Secretary of Universities was moved back to the Ministry of Education.

4.5 Catching-up: Hungary

Hungary was already experiencing severe structural problems before the 2008 global economic crisis. Indeed, during the 2000s, economic policies pursued have been short-sighted and, as a result, framework conditions have been unfavourable for innovation, hampered by the overall business climate, macroeconomic conditions, weak demand for new products and services and a perception of high costs of innovating. Nevertheless, innovation performance (as defined by the SII) has improved since 2004, up from 0.266 to 0.316 in 2008, but it is still trailing behind the EU-27 average (0.475). BERD has been growing since 2004 both in absolute and relative terms, yet innovation survey data show a low level of innovation activities in Hungary since 2001: only around one fifth of companies are innovative.

Recently, the depreciation of the national currency by 40% against the euro between August 2008 and March 2009 had severe economic and social consequences due to the debts denominated in foreign currencies held by the Hungarian population and enterprises. The contraction of the economy, expected to be around 6% to 7%, in 2009 was significantly worse than the EU-27 forecast (4%

[72] R&D and Innovation in Spain: Improving the policy mix. OECD and FECYT reports, 2007. (pp.26-27).

contraction) and the unemployment rate in Hungary has reached its highest level since the mid-1990s at around 10%. Hungary is strongly export oriented and currently demand is declining in its most important export markets, further undermining recovery.

Although there is a broad set of appropriate STI policy measures in place in Hungary, innovation performance is still poor by international comparison. The policy agenda has focused on short-term macroeconomic tensions for several years, and the global financial crisis has further aggravated the situation. Thus, the potential contribution of innovation to socioeconomic development is not at the centre of political and policy discussions in Hungary: STI policies are eclipsed by the immediate economic policy goals and political conflicts. On top of that, the STI policy decision making system has been reorganised frequently. The combination of all these factors hampers the following: i) the establishment of a legal and economic environment conducive to the creation and exploitation of knowledge, ii) the systematic and gradual building of comprehensive, well-coordinated policy mix, and iii) the development of norms and other informal rules necessary to develop an innovation-friendly culture ([73]).

The launch of the NDP in 2000 by the Minister of Economic Affairs, just after the Science and Technology Council (STPC) and the Science Advisory Board were set up in 1999, was a first step towards developing long-term innovation strategies. Beyond the general intention to improve economic development, the plan set out for the first time the following innovation-related objectives: strengthening the information and knowledge flow, facilitating acquisition of knowledge and skills, channelling FDI into high-tech sectors and accelerating the computerisation of the economy. The main support measures launched during this initial period addressed the gap between R&D activities in domestic and internationally owned enterprises. This was accompanied by a gradual increase in public expenditure for R&D, both direct budgetary resources and indirect means.

In 2001, GERD had reached 1% of GDP, and the government objective was at that time to achieve 1.5% of GDP. However, during 2002 and 2003, public expenditure on R&D remained low, R&D infrastructure was poorly developed and the research staff ageing. Furthermore, Hungary was not internationally competitive in innovation activity and the gap between the R&D sector and business was one of the main weaknesses, together with the complexity of the innovation system. In 2002, the government issued a programme that declared R&D&I as a priority sector with several aims: making Hungary an attractive location for R&D investment, strengthening intellectual property protection and financing innovation in SMEs. Moreover, after years of collecting data and surveys, a new national system of governance in the R&D policy was developed and captured in the new Innovation Act, which addressed the afore-weaknesses mentioned, creating a more effective and transparent structure in the field of R&D and innovation and placing the National Research and Technology Office (NRTO) at the centre of the new Hungarian R&D system. An important measure launched during that period was the Research and Technology Innovation Fund, providing financial assistance for industrial research and technological development activities and promoting the creation of R&D and knowledge-intensive jobs.

In 2004 Hungary joined the EU and became eligible for financial support from the SFs, lifting public R&D expenditures to approximately EUR 100 million. Although Hungary did still not have an explicit, stand-alone innovation policy document, several innovation objectives were spelt out in the government programme and in the 'Community Support Framework' document. The former identified four innovation-related priorities: i) creating an innovation-friendly regulation environment; ii) making Hungary an attractive R&D investment site; iii) strengthening the protection of intellectual property; and iv) easing financing of innovation for SMEs.

During 2003 and 2004 a number of important RTD bodies were reorganised and renamed, for instance the Science and Technology Policy Council (TTPK) became the highest-level advisory and coordination body; a former advisory board of the Ministry of Education became the Research and Technological Innovation Council and the Agency for Research Fund Management and Research Exploitation (KPI) was set up as the accredited implementing organisation of the Research, Development and Innovation priority within the Economic Competitiveness Operational Programme.

[73] Innovation Policy Progress Report, Hungary 2009. Executive Summary (p. i-ii).

In 2005, new legislation ([74]) stipulated that the government should devise a coherent RTDI strategy since, so far, overall economic policies and even the strategies of foreign-owned companies operating in Hungary were playing a much more decisive role in influencing economic performance than RTDI policies themselves. The launch of a number of new policy measures was not considered to be a particularly positive sign; on the contrary, policy coordination was fragmented notably between the TTPK and the Research and Technological Innovation Council. A positive step was the evaluation of policy measures becoming compulsory from 2005, although this requirement has never been fully complied with (in 2006, only one of the innovation support measures was evaluated ([75])). From the policymaking perspective, the main STI actors like the National Development Office or the NRTO launched a series of public debates that would serve as basis for the preparation of the 2007-13 SF programming cycle and helped to identify 'windows of opportunities'.

Hungary had traditionally focused on the horizontal type of support measures, while in 2006 for the first time schemes supporting specific technologies (e.g. nanotechnology and biotechnology) were launched by setting up new laboratories in the frame of various international R&D cooperation agreements and establishing model incubator centres. At the end of 2008, the government adopted a new concept for Hungarian development policy, namely the preparation of sector specific industrial and innovation policy programmes. The action plans focus on the development of knowledge-based, technology-intensive sectors with high added value (automotive industry, logistics, pharmaceuticals and biotechnology, ICT). They aim to better focus and complement the already ongoing implementation of the horizontal strategies.

The action plans of these high priority sectors were endorsed by the government during the summer of 2009. They consist of short-term crisis-recovery measures that are consistent with long-term measures as well. The action plans identify concrete measures based on three pillars (human resources; R&D and innovation; investment promotion and financing). The action plans give high priority to innovation through measures such as sector specific R&D tax allowances as in the case of the pharmaceutical industry (based on the performance of 2010, 100% reimbursement is possible in 2011). The implementation of the action plans is based on a strong collaboration between government and industry and involves a large number of policymakers.

The TrendChart analysis of the Hungarian STI policymaking process identified the need for a systemic policy review, foresight and systemic international policy benchmarking exercises that would help assess Hungarian innovation policy. In fact, RTDI policies were only based on evidence to a limited extent, partly due to a lack of data and to the limited access to existing data for further analysis which prevented policymakers from having adequate conclusions on which to base choices. These factors hindered a sound appraisal of the effectiveness of the process of designing and delivering policies. Hence, it could not be established whether the policymaking process lead to a coherent and balanced policy mix. Moreover, this posed a significant threat for transparent policymaking, since policies were open to influence from pressure groups and short-term political considerations rather than based a sound understanding of the impacts of foregoing decisions and socioeconomic needs. On top of that, other policies with a major bearings on innovation processes and performance (e.g. education, investment promotion, regional development, health) were designed without due consideration of innovation issues.

In 2006, Hungary was still lagging considerably behind the EU-25 average for a large number of EIS indicators, the most worrisome figures being those concerning business R&D and innovation expenditure, the ratio between public and private R&D efforts, human resources for R&D and innovation, as well as patenting. There was still a large number of measures addressing the main innovation challenges, notably the low share of innovative firms, the low intensity of innovation cooperation, the low ratio of S&E graduates and the low share of working age population with tertiary education.

Overall, there were several main challenges concerning the STI decision making system from 2000 to 2007.

[74] Law on Research and Technological Innovation (HU_95)

[75] The only measure evaluated at the time was 'Supporting co-operative research and technology-transfer between companies and higher education' (KKK, HU_49).

- Public support to RTDI was inefficient and ineffective given the lack of coordination of various STI policy measures managed by different organisations.

- Policymaking processes were not sufficiently transparent due to the lack of systemic, thorough dialogues with stakeholders and experts.

- Modern policymaking methods (technology foresight, technology assessment, evaluation, etc.) were rarely used. No policy reviews were produced, nor had a systemic international comparative policy analysis been used to assess STI policies.

- Policy measures were changed too frequently and similar or same objectives were supported by several measures. This caused not only parallel activities and 'deadweight losses', but it was also confusing for businesses and other potential beneficiaries.

The NDP for the period between 2007 and 2013 displays an evolution towards a more sophisticated innovation policy with the inclusion of a set of measures aiming at 'creating an innovative, knowledge-based economy' by 'supporting market-oriented R&D activities; promoting the innovation activities and cooperation of businesses; motivating the establishment of technology intensive (spin-off) small businesses' promoting technology transfer; strengthening bridge building and incubation activities; development of the background infrastructure of R&D. The plan also defined a group of objectives dealing with 'developing human resources necessary for R&D&I' and, for the first time, Hungary had a set of official STI policy targets.

In terms of governance, the division of decision making competences between the Ministry of Economy and Transport and the NRTO was re-designed in January 2007. Meanwhile, the Research and Technological Innovation Council launched its Strategy for 2007 concerning the schemes financed by the Research and Technological Innovation Fund.

However, in 2009, an important weakness of the Hungarian STI policy mix, apart from the ones already mentioned, seems to be the lack of measures in the category of governance and horizontal research and innovation policies. In particular, not much attention is paid to 'strategic research policies (long-term research agendas)' and without these types of analysis and strategic dialogues it is difficult to achieve an appropriate STI policy mix. Creation of new markets is not supported in Hungary and measures fostering demand-driven innovation would be the most suitable solution to this weakness, using public procurement to stimulate demand for new products and services instead of fostering groundbreaking technological solutions and creating new markets for them from scratch.

4.6 A candidate country: Turkey

Since 2000, Turkey has attached increasing importance to research and innovation policy and policy implementation. The Supreme Council of Science and Technology (BTYK) decided at its meeting in 2000 that the National Science and Technology Policy 2003-23 was to be designed through a participative and evidence-based policy-making process. In line with this decision, a number of projects including the 'Vision 2023 Technology Foresight Project', were implemented between 2002 and 2004 to achieve the widest participation possible, with increased commitment around a shared vision for the formulation policies for the next two decades.

Another key milestone has been full association of Turkey with the EU's Sixth Framework Programme (FP6) for research in 2003. Turkey provided this programme with EUR 250 million, the largest contribution among the candidate countries, and is expected to contribute EUR 423.5 million to FP7 by the end of 2013. Integration with the research FPs, along with the Turkey's harmonisation process with the EU legislative *acquis*, has helped create an increased awareness of research and innovation among all stakeholders of the Turkish NIS. It has also contributed to the development of an increased commitment among the policymakers. As a result, the BTYK defined and launched the Turkish Research Area (TARAL) in 2004, foresaw its integration with the European Research Area (ERA) and set the target of increasing the share of GERD/GDP to 2% (half of this amount is to be funded by the private sector) by 2010 (the government subsequently replaced the target year of 2010 with 2013). 2005 marked the launch of the new five-year implementation plan for Turkey's Science and Technology Strategy to 2010 and the new priority areas of technology were agreed by the BTYK.

The Ninth Development Plan (2007-13) issued by the government in 2006 also reflects the increasing political commitment to innovation in Turkey. The plan forms the basis for the documents required by

the EU for the accession process and the other national and regional plans and programmes. It emphasises the importance of R&D under the strategic objective of 'increasing competitiveness' to contribute to the economic and social development of Turkey.

Proactive and bottom-up initiatives in favour of innovation have greatly influenced policymaking and implementation since the early 2000s. Some achievements include the integration of innovation in the national education curricula and the initiation of a trend towards regional innovation strategy making and implementation, in what has been to date a highly centralised governance system.

The new national strategies and targets set by the mid-2000s have contributed to the enrichment of the policy mix. Until the last quarter of 2006, the number and diversity of innovation policy measures in Turkey was very limited and mainly focused on increasing private R&D investments. While there is still a need for more balanced policy mix, the new programmes introduced in late 2006 and in 2007 added new measures to system. Overall, the existing policy mix focuses on four main categories: (1) increasing the rates of expenditure on research and technological innovation in enterprises; (2) intensifying cooperation between public or higher education research organisations and enterprises on R&D activities; (3) increasing the number of new innovation intensive enterprises created and their survival; and (4) increasing the rate of commercialisation/marketing of the results of R&D activities by research and higher education organisations.

When the estimated annual budget per priority field is taken into account, the majority of funding is used for direct support of business R&D (grants and loans) and then for policy measures concerning excellence, relevance and management of research in universities. As regards the target groups of research and innovation measures, the first three rankings are HEIs, companies and scientists/researchers (as individuals). Innovation management tools, commercialisation of innovation (including IPR), development/prototype creation, applied industrial research and awareness-raising amongst firms on innovation are the most commonly covered aspects of innovation process targeted by measures. Grants are the most commonly used instruments which is followed by subsidised loans. On the other hand, Turkey uses more subsidised loan schemes on average than the EU-27, which heavily focuses on grants. Policy measures in Turkey are largely co-financed by the private sector.

With the increase in the government commitments, public funding allocated for research and innovation has increased since 2005. The total amount of funds disbursed from the state budget for research and innovation between 2005 and 2008 was EUR 842 million, representing a four-fold increase from 2005 to 2008. This, along with other factors like economic growth, has caused R&D expenditure to almost triple between 2002 and 2007. As a result, R&D expenditures in Turkey rose 2.7-fold during the period from 2002 to 2007, from EUR 1.24 billion in 2002 to EUR 3.37 billion in 2007. GERD as a percentage of GDP has increased from 0.53% in 2002 to 0.71% in 2007. Between 2003 and 2005 alone, the growth in total R&D expenditures in Turkey reached 50%, which represents a growth rate substantially higher than in the EU-27 (9%).

Although still lower than the EU average, the share of GERD performed by the business sector (BERD) has also been increasing in Turkey, from 28.7% in 2002 to 37% in 2006. It reached 41.3% a year later. A similar trend is observed in human resources for R&D. The full-time equivalent researchers rose to 50 000 in 2007 from 24 000 in 2002.

This progress positively influences the innovation performance. According to the EIS 2008, Turkey is among the catching-up countries, which suggests that although its innovation performance is well below the EU average, the performance is improving over time. In the Global Innovation Index, Turkey is among the countries showing the fastest improvement, climbing five positions between 1995 and 2005.

Turkey demonstrates a remarkable progress in research and innovation over the last decade. As the initiator of the new wave of policymaking paving the way to a better innovation performance, the Vision 2023 is an example of good practice in innovation governance in Turkey. Now the key challenge is to transform R&D results into innovation and viable business opportunities for the benefit of the society and economy, and to encourage all forms of innovation in all sectors of the economy.

Therefore, one of the key orientations for policy actions for the near future could be to revise policies and strategies in a way that they are not based on a linear view of innovation, which is heavily focused on R&D. An important evolution for the Turkish innovation policies would be addressing other means

and forms of innovation (e.g. non-technological innovation) and attaching sufficient level of emphasis on innovation in the private companies from all sectors. The initiation of an innovation policymaking process with the participation of the all stakeholders would increase the commitment and ownership of the actors in the NIS. This process could also be supported with the construction of an improved innovation governance system which also attaches sufficient level of importance to the regional level. Finally, building the culture of systematic monitoring and evaluation of innovation policies and policy measures is important to determine if they are meeting objectives efficiently and effectively, how far they reach the targets and how successful the responsible agencies are in implementation.

5 Conclusion

This report synthesises the main lessons from the TC country reports for 2009, putting them in the perspective of the development of innovation policy over the last decade, as well as the recent financial crisis. The report makes a number of suggestions for improving policy monitoring in view of better coordination and mutual learning. Ten years after the adoption of the Lisbon Agenda and based on the systematic monitoring of innovation policy and governance in the EU, the main lessons are that there is progress, but progress is more often than not, selective and vulnerable. Hence, building on current experience can help further improve national policies and EU coordination.

The decade of monitoring innovation policy has taught us three main lessons.

1. *Sustained innovation performance is not a coincidence; it is derived from persistently good governance and good policy*. Innovation followers and innovation leaders, as they are identified by the EIS, are the countries with the best governance and policies. They invest in human resources and foster incentives for people to be creative; they have relatively stable policies but are open to revisions, experimentation and adaptation to new challenges.

2. *There is progress in innovation policy beyond any doubt*. Innovation budgets have systematically increased in the period from 2004 to 2008. Information contained in the 2009 TrendChart reports on budgetary trends suggests that in most of the EU-27 Member States there has been a boost in 'STI' funding over the last five years and in some cases this is as much as four- or five-fold increase in annual funding terms. This increase is in part due to the expected SF effect in new Member States since 2004, but there also significant increases in 'leaders-followers'. Based on the monitoring of the TrendChart national correspondents, a figure of EUR 24.7 billion for 2008 for innovation policy expenditure was estimated, keeping in mind that the actual funding allocated to 'pure innovation' policy measures is significantly less.

   Over the years, most areas of policy intervention were covered in all Member States. However, policy priorities remain focused on traditional direct funding type schemes even if newer forms of innovation support begin to appear amongst the policy mix. The need to create interactions and cooperation is well understood with higher education/public research organisations targeted by innovation policy measures as often as enterprises, while measures aimed exclusively at SMEs account for only a fifth of measures. In terms of the aspects of innovation, the focus remains largely on the industrial R&D development and commercialisation phases and the diffusion of technologies rather than the legal/regulatory environment, design, etc. In terms of financing, the vast majority of measures apply grant/loan (direct) support and the SFs are an important instrument in this context.

3. *Innovation governance is crucial for good policy but it is path dependent and as a consequence changes are slow and evolutionary.* Good governance includes certain common elements of a policy cycle including coordination, priority setting, stakeholder involvement, implementation and evaluation leading to better coordination and priority setting. Although we know what the principles of good governance are and most Member States demonstrate an effort to increasingly respect them, there is only modest progress and catch-up between the EIS-defined groups, leaving the question open as to whether progress observed is sufficient in the right direction. The observed progress seems to follow an improvement of processes but inertia and path dependence inhibit real behavioural changes.

The current economic crisis has however partly reversed these trends, identified hidden weaknesses and created new challenges. As a consequence, a fourth lesson has to be seriously taken into consideration.

4. The crisis may reopen gaps and innovation policy should be further strengthened, as a way to offset the crisis effects. A number of interventions by national or international observers have underlined the need for government responses to the crisis to include a strong element of support for innovation, which is a key instrument to boost productivity and sustainable growth. Strong innovation performance is more important than ever in the current context. Some countries launched special measures to alleviate the negative effects of the economic downturn. In these countries there is a strong belief that investing in innovation and R&D is

crucial to overcome the crisis. The measures mainly aim at facilitating access to funding for SMEs, guaranteeing employment for highly skilled R&D personnel, as well as keeping the commenced strategic R&D projects in progress. However, in other countries, the response to the crisis is linked to budgetary restrictions and this affects innovation policy directly. Firms in countries which have experienced the fastest rates of improvement in innovation performance have been most affected by the economic crisis and firms in countries with the largest economic downturns are more likely to reduce their innovation expenditures. However, public support appears to have helped firms maintain innovation expenditures.

One consequence of the credit shortages is that the financing of innovation and related educational and R&D activities has become more difficult. This risks increasing the gaps between rich and poor countries, big and small companies, high-tech and traditional sectors. If this is the case, increased emphasis on policies is needed to reduce the risk of divergence.

- The way Member States reacted indicates that the economic crisis may lead to a re-opening of a funding gap between leaders and 'catching up' countries that is being closed to some extent. The government response to the crisis was advanced, proactive and forward-looking in most innovation leaders and adequate in the others. Most innovation followers had also an adequate and in the case of the Netherlands even an advanced and proactive response. However, 14 Member States demonstrated a defensive and inadequate response to the crisis, indicating that the gap between leaders and followers on the one hand and moderate innovators and catching up countries on the other is expected to widen in the future.

- While most sectors perceive the credit shortage as a menace for innovation expenditure, no shortages were reported in some high-tech manufacturing sectors such as in the Finnish ICT sector or the pharmaceuticals and biotechnology sectors in Hungary and Ireland, where virtually no crisis impacts are reported. Similarly, some service and utility sectors such as energy, credit, insurance and telecommunication seem to have experienced no negative impacts at all and their innovation budgets have been only slightly re-adjusted or even increased.

- The consequences of the crisis clearly depend on the size of the companies – in multinational and large companies, the core issue would seem to be the cost optimisation and the adjustment of the production portfolio rather than the availability of credit. The latter is more important for SMEs and establishment of new start-ups, and there a plenty of examples of this negative impact across all country groups.

These findings raise issues about both the development of innovation policy in the Member States and the role of the EU in monitoring and fostering innovation performance and policy in the future. Policy development in the Member States has been significant over the last decade, and even during the last 18 months of financial crisis, certain Member States have continued to experiment and shift emphasis towards new forms of policy instruments. However, change is slow with areas such as innovation in services or demand side policies such as the use of public procurement, still in an 'infant' stage in a few 'leading' countries. The current financial crisis is likely to be only a foretaste of need for greater policy innovation with climate change and resource depletion in 'a finite economy' threatening the very sense of 'share prosperity' on which the European socioeconomic model depends. If the response of Member States to 'safeguarding innovation' in most significant financial crisis in 80 years is at best 'adequate', then shifting innovation policy towards 'eco-innovation' policy (to ensure that all innovation support includes the requirement that enterprises are reducing energy and resource use) will be a huge challenge. Leaving aside the SFs (which are co-funded by the EU but delivered nationally), the EU innovation instruments often have 'marginal budgets' but are equally often at the forefront of policy thinking. This 'leitmotiv' role should not be underestimated, nor should the need for even greater transnational (inter-regional) cooperation to create the scale of resources and access to 'innovators' required to deliver on the challenges of 2020. Even greater emphasis on 'multi-level governance' will be required in the future and this requires that Member States (and their regions) improve their own capacity to design, implement and evaluation impact of innovation policy. If there is one regret of the last decade, it must be that despite progress on evaluation methods and a wider understanding of the role of evaluation, not enough is yet known about the links between policy and performance. This is an area where even greater emphasis and effort is required at both European and Member State levels in the coming few years, in order to create a solid evidence base.

Respecting the subsidiarity principle and the OMC, in view of the EU 2020 agenda, more sophisticated monitoring and analytical tools seem to be necessary. A decade of experience gained through the TrendChart initiative suggests that both for governance and policy, more in-depth analysis and better indicators are needed to really supervise progress. Passing from monitoring/rating processes, as done in the past, to monitoring/rating the content and quality of governance and policy, calls for significantly more resources, commitment, new methodologies and the willingness of the whole policy community to cooperate. The utilisation of databases with adequate entries, their enrichment with new evidence, more clear standards to allow for benchmarking and, above all, a strong coordination and commitment from the side of the Member States can help transnational monitoring play a more significant role for progress, as the Member States will be – hopefully – coming out of the crisis.

6 Annexes

Appendix 1: The crisis and innovation, finding by country groups

Innovation profile of the countries Domain of analysis	'Innovation leaders': Denmark, Finland, Germany, Sweden, Switzerland and the UK	'Innovation followers': Austria, Belgium, France, Ireland, Luxembourg and the Netherlands	'Moderate innovators': Cyprus, the Czech Republic, Estonia, Greece, Iceland, Italy, Norway, Portugal, Slovenia and Spain	'Catching-up countries': Bulgaria, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Croatia and Turkey
1. Social and economic framework conditions: financial situation, labour market trends	1. The situation in the banking sector varies across Innovation Leaders: from no effect in Switzerland to deeply affected, malfunctioning banking sector in the UK. The remaining countries have been less affected or better prepared to deal with negative impacts. 2. Unemployment is high in the majority of the countries. To deal with the effects, the organisations apply (in similar extent) two type of responses - reactive strategies which entail dismissal of employees, and careful optimisation of the personnel-related costs, by applying temporary lay-offs, improvement of efficiency instead of firing. Some sectors even expect to hire more staff (Finnish ICT sector), and Danish companies are certain that due the increase of qualified labour force (i.e. those dismissed from other jobs or less-innovative sectors), they can initiate new innovation and R&D projects.	1. The situation in the banking sector varies across Innovation Followers. In Austria and Luxembourg, the banks were less affected than their peers in Europe. However, the lending behaviour of banks has become more strict and risk-averse everywhere. 2. 62% of SMEs are forecasted to reduce employment in Ireland. Despite the crisis, in France R&D positions, particularly in the automotive sector, are not eligible for voluntary departure plans. 3. Concerning business start-ups there has been a sharp decrease in Ireland and in France (ICT, pharmaceuticals, biotechnology). There is no specific evidence from Austria that lay-offs have established innovative start-ups due to the crisis.	1. The situation in the banking sector varies across Moderate innovators: from slight or moderate effects (Slovenia, the Czech Republic, Norway) to the full collapse in Iceland. 2. Unemployment is sharply increasing due to the falling demand on domestic and global markets. Staff reductions are the most common reaction at organisational level. Some countries forecast a serious risk for brain-drain (Estonia, Iceland).	1. Borrowing from abroad has become more strict and costly for all Catching-up countries. The public debt has shown a growing trend, more extensively in Latvia and Poland. Additional pressure on Romanian companies is caused by devaluation of local currency against the euro. Slovakia, belonging to the euro area, foresees this advantage to become likely in the longer-term future. 2. The number of unemployed has reached high levels, which is coupled with an increase in irregular and illegal employment (Latvia, Lithuania). The countries experience brain waste. Exceptionally, in Hungary mainly workers with lower qualifications have been dismissed. 3. There is a fall reported of newly registered companies (30% in Latvia), exceptionally in Malta, where some indications for a growing number of start-ups in the ICT sector are seen.
2. General innovation framework Public policies influencing innovation Other factors	1. All Innovation Leaders (except Denmark for which evidence is lacking) have launched recovery plans for the economy with a strong component of R&D and innovation and HRD components. In the most advanced cases (Switzerland, Finland), the plans are not only responsive to the current crisis but deal with future challenges. 2. Additional state allocations and investments have	1. All Innovation Followers have launched recovery plans for the economy. Government measures to stabilise the banking sector (Belgium, Austria, the Netherlands), facilitate employment (the Netherlands, Ireland) and support access to finance for companies (the Netherlands, Ireland)	1. The scope of the recovery plans of Moderate innovators varies: from extensive and broad in Norway, Italy, Spain and the Czech Republic, dealing with the challenges in R&D, innovation, labour market and HRD; to less comprehensive, mostly dealing with immediate problems – credit shortages, export support (Estonia). Innovation-related recovery measures in the	1. The Latvian and Lithuanian governments have reacted to the crisis with an immediate tax raise. In Latvia, the state budget cut for R&D by 40% will probably have a most extensive direct effect on the field compared to other counterparts in Europe. 2. The governments have been delaying

boosting innovation Identified emerging opportunities for innovation	been channelled to transport and communication infrastructure (broadband), (higher) education, research and training (across all countries). 3. The current crisis has stimulated environmental and energy saving innovations, and low-carbon technologies (Germany, Finland, Sweden). For instance, the consortium of German engineering and energy companies together with the federal government announced a EUR 100 billion long-term investment in new solar energy plant in North Africa.	have been launched. 2. Additional investments concern transport infrastructures, higher education and research, health, etc. In Austria, the greening of the economy is aimed as part of stimulus package, in Ireland, a smart broadband network called the Exemplar Network is to be developed to boost the speed of fibre-based communications.	latter sub-group of countries are minimal, and in some cases, not reported (Cyprus, Estonia, Iceland). 2. Additional state allocations and investments have been channelled mostly to transport and construction, SME support, less in communication infrastructure (broadband) (Estonia, Portugal), higher education, research and training (the Czech Republic, Norway, Portugal, Spain). 3. Certain investments focused on innovation and R&D in health (Spain) and energy technologies (Portugal, Spain).	the introduction of structural reforms and a recovery plan for the economy (earlier reacted by Polish government). Also, the recovery plans do not always put emphasis on innovation but are almost exclusively concerned with 'fire-fighting' (Hungary).
3. Spending on Innovation Trends in innovation expenditures Sectoral effects Effects on companies Effects on specific types of innovation activities	1. Government spending on innovation across the countries is stable and in many cases even increased by special budget allocations, incentives and new measures (Switzerland, Finland, the UK). It responds well to the growing interest from business to get more access to public financing (Denmark, Sweden, Finland). Business communities in some countries (Denmark, the UK, Germany) are of the overriding opinion that the consequence of the crisis might be falling innovation expenditures, and damage of businesses' long-term competitiveness (the UK). Moreover, in the UK, many businesses are finding it difficult to access private financing. Meanwhile others (Finland, Denmark, Switzerland) express more confidence in continuing innovation activities. 2. The mostly affected sectors across all countries is industry (automotive, machinery and equipment), especially the export-oriented domestic multinationals and specialised SMEs. Effects have been less evident (or better handled) in the software sector (Finland) and knowledge-intensive SMEs (Sweden, Denmark). 3. Contrary to the general trends and doubts, some German global enterprises with large R&D centres have reported higher R&D expenditure for the first quarter of 2009 compared to 2008 – even despite a sharp fall in sales (all leading automotive concerns, and Siemens and Bayer). 4. The level of product innovation is not expected to decrease, and the process innovation might increase in 2009 (Denmark, Germany). In the UK, the trend of	1. Companies have decreased their R&D and innovation expenditures, although it is sector-specific phenomena (in the Netherlands in high-tech sectors, in France in automotive, pharmacy, communication and aerospace, in Ireland in metal, engineering and non-metallic minerals, and wood, in Austria in automotive, in Belgium in textile, automotive, chemicals). In Ireland the electronic sector attempts to maintain the level of innovation. 2. Companies have started restructuring the business processes, which has increased demand for the IT sector (Austria). Technology-based start-ups and other small, innovative firms are particularly affected by the crisis (the Netherlands, Luxembourg, Ireland). The crisis has also affected the availability of seed and VC (the Netherlands).	1. Government spending on innovation across countries differs: Norway has increased spending substantially, and introduced several new measures, and the Czech Republic committed to keeping its spending stable while other countries have no new incentives or additional allocations to the existing measures, and in extreme cases have reduced some R&D and innovation measures (Estonia). 2. A large number of businesses across all countries (except perhaps Slovenia) struggle with capital and liquidity problems. 3. The most affected sectors across all industrial countries in the group are automotive, machinery and equipment, especially the export oriented (the Czech Republic, Italy). 4. Evidence about the effects on specific types of innovation activities is limited: only the Czech report argues that while the investments in product and process innovation may decrease despite the governmental stimulating measures, introduction of organisational innovation is expected to develop.	1. The economic involution has mostly taken place in export-oriented industries (automotive, electronics, food in Hungary; metal production, automotive, chemicals in Poland) but also in local sectors (construction, banking). A tendency for redistribution of human resources among different sectors has not been observed due to the overwhelming crisis' impact on virtually all domains of the economy (Latvia). 2. Concerning RTDI activities in the business sector, in Hungary pharmaceutical and biotechnology companies have significantly. Companies are optimising costs by introducing innovation and allowing flexibility in management.

	growing convergence between manufacturing and service innovation is highlighted in 2009.			
4. Internationalisation General trends International trade Innovation Collaborations Geographic focus	1. All Innovation leaders remain in high positions in the WEF's Global Competitiveness Index for 2008-09 2. The situation in foreign trade is characterised generally as declining or even falling (Finland). 3. The crisis has most affected the export-oriented manufacture sectors in all observed countries (Switzerland is expecting a fall too). The most common response is adjusting products and services, and reshaping the markets (companies in Germany, Finland, Sweden), not leaving the markets. Still, some sectors are ready to adjust their internationalisation strategies more radically, even to withdraw from certain markets (Finnish-Swedish forestry and paper industries). 4. The Danish business community feels that the credit crisis will lead to a decrease in their international collaboration on R&D.	1. Smaller economies like the Netherlands and Ireland are vulnerable to declines in international trade, funds and access to international financing. 2. Ireland reports on continuous investments on innovation by multinational companies, but those who are largely dependent on semiskilled labour have moved to lower labour cost countries (for instance, Dell moving to Poland). Other multinationals have reduced labour numbers (for instance in Intel 300 redundancies) or salaries.	1. The situation in foreign trade is characterised generally as declining or even falling (Estonia). FDI has decreased across all EU countries and Iceland. 2. Industrially developed countries (the Czech Republic, Italy) are affected by the falling demand on consumer markets, but also declining orders from the industrial partners. Italy has elaborated a special recovery plan on export in response.	1. Export-oriented sectors are mostly hit in all observed countries. In addition a drop in local demand has taken place (Latvia, Lithuania, Hungary, Slovakia). 2. The inflow of funds to the region has diminished (Poland, Slovakia, Bulgaria). Also, the most severe lay-offs have been suffered by subsidiaries of large multinational firms (Hungary). Deep falls in consumer spending in developed EU countries immediately affected both branches of the multinationals (Volkswagen, Hyundai-Kia, Peugeot-Citroen, Samsung, Sony), and their domestic suppliers of components and services in Slovakia.
5. Strategic policy initiatives and responses Priorities and focuses, target groups Examples and lessons	1. The innovation, R&D and higher education are strongly positioned in all recovery plans: about 7% the recovery plan allocations in Switzerland (approximately EUR 32 million is being channelled directly into research and innovation expenditures. Additionally, the innovation policy promotion budget is increased by EUR 14 million. The main target group of the Swiss plan is companies – to prevent a reduction of their R&D and innovation expenditures, the government has launched three measures: first, it has increased the budget of the KTI/CTI, the main funding agency for applied research, by EUR 13 million (increase of 23%). Second, a pilot scheme with innovation cheques to encourage SMEs to engage in technology transfer. Third, the government is launching an information campaign targeted at the academic and private sector on funding opportunities offered by the KTI/CTI. 2. In Finland, the government agreed in January 2009 on a stimulus package whose main focus is on measures that directly promote employment, including investments in transport infrastructure and broadband, support for construction and lifting the	1. The energy field is taken as a priority for investment particularly by Austria and the Netherlands. Other such fields are the automotive sector, eco-technologies, nanotechnologies for France; green tech, logistics, biomedicine, IT for Luxembourg. The Dutch government supports eco-systems in high-tech sectors in nano-electronics, embedded systems and mechatronics and automotive fields. The Austrian car industry demands public procurement to foster innovation (for instance, the state acts as a first mover by purchasing electric cars). 2. Special focus is placed on start-ups and SMEs (through expanding financing opportunities). For instance, in Belgium, the federal state has launched a bond debt to finance loans to 'starters' through the Belgian Participation Fund. With regard to	1. The dominant focus is on general anti-crisis measures: state credit and export guarantees, export support, support to SMEs and certain national key industries. Labour market support measures in Portugal and the Czech Republic are focused to maintain or requalify staff, to avoid further reductions. 2. Some countries – Italy, Norway, Spain and the Czech Republic – also have clear R&D and innovation priorities (e.g. investments in research infrastructure, establishment of campus of excellence, incentives of researchers' instalments to Social Security in Spain). 3.The most comprehensive and generous is the Norwegian recovery package, comprising budget increases for a number of support schemes under Innovation Norway, the state R&D contracts schemes, and significant strengthening of the investment capacities of the state export credit and investment agencies. To stimulate new business ventures, a new national start-up grant scheme is established and to stimulate R&D in the companies, the	1. The economic recovery plans underline the intrinsic necessity to promote competitiveness, productivity rise and high value added production (Latvia) but for instance not in Hungary, which deals mostly with 'fire-fighting' (cutting expenditures, tax reform, short-term job protection, etc.). In Lithuania, the government is drafting the Lithuanian Innovation Strategy for 2009-20. In Romania, government expenditures were supplemented. The Slovakian government decided to speed up implementation of incumbent policy measures and increased government allocations to RDTI. 2. The five provisionally indicated priority sectors for Latvia are the food industry, wood-processing, chemical industry, industry of electric and optical machinery and metal-processing. For Hungary, the automotive industry, logistics, pharmaceuticals, biotechnology

	social insurance contribution. Other priority areas of the stimulus package concern education, research and training. Inter alia, according to the stimulus package, appropriations allocated to R&D will be raised, in addition to already existing high R&D support. The public response to the financial crisis is well in line with the guidelines set out in the new National Innovation Strategy (2008). 3. A number of economic stimulus packages, introduced by Germany, include additional incentives for R&D and innovation, particularly in the field of energy and environment. 4. In the UK, there is the new innovation-related support measure, the Economic Challenge Investment Fund, providing support for knowledge transfer, job training of researchers and other personnel involved in innovation, recruitment of skilled personnel in enterprises, and support to organisational innovation.	innovative businesses, France has decided an anticipated reimbursement of the Research tax credit. The Dutch government has made tax rules more entrepreneur-friendly and expanded a guarantee scheme. 3. There is simplification of the procedures to accelerate the pace of the projects and to reduce their cost (Luxembourg). 4. New measures have been introduced to prevent the loss of knowledge workers and new shortages once the economy picks up again (the Netherlands).	maximum deductible support amounts under the R&D tax credit scheme are raised.	and ICT. For Malta, tourism, emerging fast-growing sectors such as eco-innovations and the green economy, pharmaceuticals and biotechnology. 3. Boosting entrepreneurship (including innovative start-ups, micro-companies and SMEs), promoting employment and exports are headlights of all catching-up countries to recover from the crisis. The Bulgarian Development Bank was created as an instrument supporting innovation and technologies in SMEs. In Lithuania, additional credit resources for businesses at an affordable price (the establishment of Controlling Fund, loan guarantees) were opened. The Polish government foresees the support to two groups of companies, notably to all companies and those faced by temporary crisis.

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Appendix 2: Summary of recent policy trends in innovation measures

Country	Recent policy trends in innovation measures	Example
Austria	Integration of several measures to improve efficiency and launch of new programmes notably focusing on university-industry cooperation.	AT_ Josef Research Centres
Belgium	Increase of inward mobility of researchers, new measures to support business R&D and R&D cooperation.	BE_183 Wallonia Technology Vouchers
Bulgaria	Easier access to funding for SMEs and micro-enterprises (part of anti-crisis measure).	BG_3 Bulgarian Development Bank, Guarantee Fund for micro-crediting
Cyprus	Strengthening of university-industry cooperation and networking between public R&D organisations, private firms and intermediary bodies.	CY_35 Thematic and Innovation Networks
Czech Republic	Continuation of implementation of the SF OP for Research and Development, no further modifications.	No new measures
Denmark	Mainly R&D measures, included by the ERAWATCH correspondent.	No new measures
Estonia	Modification and continuation of a wide range of measures targeted at support of enterprises: cooperation, incubators, innovative staff, innovation vouchers, cluster developments and mobility of researchers.	Competence centres (largest support programme) cooperation!
Finland	General increase in public expenditures for innovation, support of innovation in private and public services as well as use of public procurement as a tool enhancing innovation.	FI_77 Serve – support to innovation in business services
France	Hardly any new measures have been adopted lately, and most of the changes involved the deepening, renewal or modification of existing measures.	FR_199 Second phase of competitiveness cluster policy
Germany	Continuous modification of existing programmes rather than developing new initiatives. Increased focus on cooperation between industry and public R&D sector.	DE_133 Innovation Alliances
Greece	Modification and continuation of existing measures, new measures started within SF OPs for Innovation and R&D.	GR_99 Creation – support to new innovative enterprises, notably highly knowledge intensive
Hungary	Wide range of measures covering all aspects of innovation and R&D policies, implemented to a great extent within the SF OPs for Economic Development.	HU_155 National Technology Programme and many others
Ireland	New measure supporting business innovation, innovative start-ups (gazelles) and sectoral innovation in manufacturing.	IE_74 Stimulating Business Innovation
Italy	Wide range of measures covering several aspects of innovation and R&D activity, including tax reductions and exemptions.	Measures concerning tax exemption for start-ups, innovation funds, experimental development projects, risk capital funds for SMEs, IPR, mobility of researchers, sectoral measures in energy sector.
Latvia	The programmes are generally aimed at promotion of the knowledge-based economy, i.e. to facilitate knowledge and technology transfer in production in order to ensure development of products with higher value added.	LV_119 Support for introduction of new products and technologies into production.
Lithuania	The new measures reflect the actual start of the implementation of the OPs for the EU SFs implementation cycle 2007-13. They cover a wide range of innovation and R&D areas.	Measures supporting clusters, technology transfer, e-business, innovation activities, services, advisory, management: start-ups, public research organisations, research centres.
Luxembourg	n.a.	n.a.
Malta	The new measures cover a wide range of innovation and R&D activities, framed mainly in the EU ERDF scheme 2007-13, and are targeted at stimulating innovation and creating innovation culture among indigenous SMEs.	Several measures promoting research, technologies as well as the creation and growth of innovative enterprises.

The Netherlands	New measures providing support to innovative firms, which have been particularly hit by the economic crisis and face significant decline in turnover in order to enable them to continue their strategic R&D projects.	Knowledge Workers Scheme High Tech Top Projects scheme
Poland	n.a.	n.a.
Portugal	Thorough revision of innovation policy with the start of the new programming period 2007-2013, to support 'collective efficiency strategies', i.e. strategies aimed at innovation, notably through cluster, networking, cooperation and training. In mid-2008, in the scope of the Incentive Schemes for SME Qualification and Internationalisation and R&D, were respectively launched, the 'Innovation Voucher' and 'R&DT Voucher'.	PT_98 FINOVA – Innovation Financing Support Fund
Romania	n.a.	n.a.
Slovakia	No new innovation measures have been introduced since the last report.	
Slovenia	New measures aiming mainly at support of SMEs and innovation services as well as creation of centres of excellence.	SI_55 SMER Programme (Small and Medium Enterprise Research)
Spain	Modification of existing programmes; new measures aiming at alleviating the effects of economic downturn, mainly with respect to SMEs.	ES_152 Interempresas programme
Sweden	Development and start of sectoral innovation programmes in aeronautical research, vehicle and traffic safety, health and environment.	SE_123 National Aeronautical Research Programme
United Kingdom	New measures focus on promotion of innovation through national information campaign as well as provision of support in order to ease the negative effects of the economic downturn.	UK_115 Enterprise Finance Guarantee

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NB-80-10-290-EN-N

ISBN 978-92-79-15513-0