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Monitoring and analysis of policies and public financing instruments conducive to higher levels of R&D investments The "POLICY MIX" Project

Country Review Latvia

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Introduction and Policy mix concept

The policy mix project

This report is one of the 31 country reviews produced as internal working papers for the research project "Monitoring and analysis of policies and public financing instruments conducive to higher levels of R&D investments" (Contract DG-RTD-2005-M-01-02, signed on 23 December 2005). This project is a research project conducted for DG Research, to serve as support for policy developments in Europe, notably in the framework of CREST activities. It does not form part of the ERAWATCH project, but the working documents are made available on ERAWATCH webpages for the purpose of steering a debate on the policy mix concept.

The "Policy Mix" project is run by a consortium of 7 partners:

- UNU-MERIT (The Netherlands), consortium leader
- Technopolis (The Netherlands)
- PREST – University of Manchester (United Kingdom)
- ZEW (Germany)
- Joanneum Research (Austria)
- Wiseguys Ltd. (United Kingdom)
- INTRASOFT International (Luxembourg).

Each country review is produced by an individual author, and provides expert's view on the policy mix in the country. This report is not approved by the Commission or national authorities, and is produced under the responsibility of its author.

The role of country reviews is to provide an exploratory analysis of the current policy mixes in place in all countries and detect the most important areas of interactions between instruments as well as new modes of policy governance that are particularly adapted (or detrimental) for the building of policy mixes. They provide analytical material for the analysis of the policy mix concept and its implementation in Europe. This material will be used as background for further reports of the project and for the construction of a tool for policy-makers (to be made available in late 2007 and 2008).

The policy mix concept

The country reviews are based on the methodological framework produced by the consortium to frame the "policy mix" concept. They have been implemented on the basis of expert assessments derived from the analysis of National Innovation Systems characteristics and policy mix settings, using key information sources such as Trendchart and ERAWATCH reports, OECD reviews, and national sources, among which the National Reform Programmes.

In this work, the "policy mix for R&D" is defined by the consortium as: **"the combination of policy instruments, which interact to influence the quantity and quality of R&D investments in public and private sectors."**

In this definition, policy instruments are: "all programmes, organisations, rules and regulations with an active involvement of the public sector, which intentionally or unintentionally affect R&D investments". This usually involves some public funding, but not always, as e.g. regulatory changes affect R&D investments without the intervention of public funds.

Interactions refer to: "the fact that the influence of one policy instrument is modified by the co-existence of other policy instruments in the policy mix".

Influences on R&D investments are: "influences on R&D investments are either direct (in this case we consider instruments from the field of R&D policy) or indirect (in that case we consider all policy instruments from any policy field which indirectly impact on R&D investments)".

Structure of the report

The report is structured along the following questions.

First, in section 1, and in order to place the policy mix in context, the general challenges faced by the National Innovation System (NIS) are analysed by the expert. The view is here not restricted to the challenges with regard to raising R&D investments, but rather encompasses all the conditions that directly or indirectly affect the functioning of the NIS and R&D expenditures. These context conditions are very important for the discussion of the relevance of the policy mix later on.

Second, the stated main objectives and priorities of R&D policy in the country are spelled out in section 2, as well as their evolution over the last ca. five years. This discussion is based on White Papers and official documents, i.e. on published policy statements. The reality of these objectives compared to actual working of policy instruments will appear in section 5.

The third section provides an expert assessment and critical analysis of a possible gap or convergence between the NIS challenges and the main policy objectives and priorities stated before.

Section 4 presents the policy mix in place, following the above definition, i.e. policy instruments affecting R&D activities in the private and in the public sector, either directly for instruments from the R&D policy domain, but also indirectly for instruments outside the R&D domain which are of particular relevance to R&D activities. A typology of instruments is used, to categorise the R&D-specific and non-R&D specific instruments. A short description of each instrument is provided: aim, nature, target group, budget.

Then, section 5 discusses whether there is a gap between the main policy objectives and priorities stated in section 2, and the instruments in place. This is done by

comparing the set of objectives with the set of instruments at work. When individual evaluations of programmes or policy instruments are available, their results are used if they shed light on contribution of these instruments towards the policy objectives.

Section 6 discusses the orientation of the policy mix, indicating priorities amongst various possible routes to increase R&D investments. Policy instruments are categorised under 6 different routes according to their relevance, and this categorisation is followed by a discussion on the range of instruments affecting each route, missing instruments, routes that are not addressed by instruments, possible redundancies or overlaps, etc.

Section 7 provides another view on the policy mix, focusing on the relative importance of each types of instruments. The aim is to get a picture of the policy mix, the balance between (sets of) instruments, and the relative weight between them.

From section 8 onwards, the review turns to the crucial question of policy governance. That section discusses the emergence of the policy mix through examination of the following question: how did the set of R&D policy instruments arrive? What is the rationale behind them, what was the driving force behind their establishment, and how is this evolving recently. A crucial question relates to the existence of some consideration of possible interactions when establishing new or suppressing existing instruments. The section tries to establish whether the policy design process is incremental or radical, analytical or non-analytical. From this, that section discusses if the policy mix is a “construct” or an “ex post” reality.

The next section, section 9, focuses on the governance of the system of R&D policy instruments take place. It examines the key question of interactions, i.e. whether there is a form of co-ordination between R&D policy and policy instruments from outside the R&D domain, and the existing mechanisms that favour or hinder such interactions.

The final section, section 10, deals with the core question of the policy mix concept: it endeavours to discuss interactions between policy instruments to affect R&D expenditure. The section discusses possible positive, neutral and negative effects of R&D policy instruments; both within the R&D policy domain, but also with instruments from other policy domains. In most cases, this takes the form of hypotheses rather than hard evidence.

Feedback welcome

Feedback on this report is gladly received. Individual country reports will not be updated but discussion on policy mixes is welcome during the timeframe of the study (2006-2008). Please send your comments to:

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1. National Innovation Systems Challenges

Low investments in R&D

Latvia only relatively recently emerged from the Soviet tradition in R&D. According to that tradition, science, development and production were strictly separated from each other. This was certainly not typical only for the Soviet system, but it was probably more thoroughly implemented there than in Western Europe. The staunch adherence to this division hampered the development of a market oriented production.[1]

This phenomenon is clearly related to the so called linear model, which illustrates a one-way link from basic science to applied science, i.e. technology. Today, this model is usually regarded as not being relevant for a modern economy.[2] Instead, there are numerous feed-back loops between basic science, technology, design, and marketing. The present difficulties in Latvia to incorporate R&D and business stem from this earlier separation of basic science, applied science and design. These problems have relatively recently been mapped.[3] Main obstacles in this sector are management competence, lack of insight on internal barriers to growth, limited awareness of innovation support.

In general, the R&D and knowledge creation infrastructure is rather weak in Latvia. The main problems with regard to human resources are ageing and the decreasing number of research staff. Latvia being one of the smaller EU members creates natural limits to how large the pool of researchers can be. However, the share of Science & Technology graduates is below the EU average. The number of doctoral students is low. The R&D infrastructure is poorly developed. Public expenditures in R&D are lagging behind – figures from other rather small countries such as Denmark and Finland, with twice as many inhabitants show an enormous gap in R&D productivity with a factor of 100.[4] According to the European Innovation Scoreboard (EIS), Latvia is falling further behind with regard to public R&D. The share of business R&D is low although the EIS foresees a positive trend with regard to business R&D and a catching up in relation to the other European countries. Watkins & Agapitova (2004) illustrate the absolute level of Latvian R&D spending by finding that total annual Latvian R&D equals that of one week's spending on R&D in a big US corporation.

[1] See for instance Dyker, D. & Perrin, J. (eds.)(1997) "*The Technology of Transition*" Central European University Press

[2] See Kline& Rosenberg (1986) "An Overview of Innovation" in Landau & Rosenberg "The Positive Sum Strategy", National Academy Press

[3] RIS Latvia. The Latvian Innovation System. Strategy and Action Plan 2005-2010, Riga 2004

[4] Ibid.

As a consequence of the rather weak infrastructure for knowledge creation, the output in terms of patents is low as well. There is a risk that Latvia falls further behind with respect to USPTO patents whereas the EIS foresees a catching up with regard to EPO patents. Interestingly, Latvia is above the EU average with respect to ICT expenditures with a positive development foreseen by the EIS.

Latvia has few natural resources and therefore knowledge creation is a necessity for the Latvian society. Moreover, Latvia has not enjoyed the benefits of a bigger, wealthy, culturally and linguistically close neighbour (in contrast to Estonia's relation with Finland) where its companies could have found a testing ground for exports. Thus, the challenges facing Latvia have been significant. At the same time, Latvia´s relatively small population excludes the possibility of focusing on the home market.

Latvia faced a major downturn of production in connection with the demise of the communist system, which paradoxically also reduced emissions of green-house gases. Using 1990 as the base year, Latvia reduced its emissions by almost 60 per cent. The main reasopn for this development was, however, the massive closure of polluting Soviet-type industries[5] The flip side of the coin was wide-spread unemployement in the 1990s. Energy production, although not able to cope with demand, is based on hydropower, which gives Latvia some advantage.

At present there seems to be a trend among young, skilled Latvians emigrating to the "old" EU-member states, thus worsening both the age structure of the population as well as draining the pool of skilled employees.[6] As a result, Latvia will face the rather complicated issue of how to compensate for the wave of emigration. As a result of more or less forced immigration of non-Latvians during the Soviet rule, Latvians constitute less than 60 per cent of the total population of Latvia. Under such circumstances it can be understood if there would be reluctance in the Latvian society to large-scale immigration.

Nevertheless, Latvia has taken steps to improve its National Innovation System. In 2003, the government adopted the National Innovation Programme and Action Plan.

Low national capacities in transferring research results into innovation

It should be pointed out that Latvia encountered significant difficulties during the initial years of transformation. Contrary to Estonia and Lithuania, Latvia was a centre

[5] http://www.eea.europa.eu/pressroom/newsreleases/ghg-accession-en (The European Environment Agency)

[6] http://www.eiro.eurofound.eu.int/2005/12/feature/lv0512104f.html

for Soviet electronic consumer appliances (radios, for example) as well as some other industries with an output directed towards consumers (such as small transport vans). When the Soviet and East European markets crashed in 1989-91, there were basically no markets left for Latvian industry.[7]

The needs-orientation of applied research has remained relatively low. The transfer competence of R&D institutions is low. University-industry collaboration is still weak in Latvia. In general, results from public R&D efforts are frequently transferred through high-tech companies. Latvia has disadvantages in this context. Latvia is lagging behind in employment in high-tech manufacturing although the catching up process is progressing. Employment in high-tech services is low although there is a positive trend foreseen by the EIS. The share of value added in high-tech manufacturing is low in Latvia.

Developing entrepreneurship

Entrepreneurship is only developing in Latvia. The share of SMEs is the lowest among EU countries with 18 SMEs per 1000 inhabitants, while the average figure for the whole EU is 51.[8] This figure clearly reflects Latvia's heavy industry traditions, but should nonetheless be addressed urgently. Thus, a prime object of creating a vibrant NIS would be to encourage start-ups, address prevailing values in society, especially towards risk-taking and enhance the transformation of ideas into businesses.

The share of SMEs innovating in-house is comparatively small. In addition, the share of SMEs engaging in some form of innovation cooperation is low and lagging behind in relation to other EU countries. However, it has to be remembered that there was no entrepreneurship whatsoever before 1988-9 and the development so far has been little short of impressive, although there is still a long way to go in order to reach a West European level. There are very strong incentives for entrepreneurship (not too much red tape, a taxation system favouring initiative etc.). Latvia has attracted a significant amount of FDI, which is an indirect proof of a business friendly environment.

- As a consequence of 50 years of Soviet rule, Latvia only relatively recently started to develop ties between research and business.
- The number of scientists is low in Latvia, both in absolute and relative terms. R&D spending is low in both absolute and relative terms
- Latvia is at present facing large-scale emigration, particularly of skilled workers. Compensating this loss by immigration can be very tricky because of Latvia's modern history.

[7] As a result of Soviet planning there is even a sparkling wine industry in Latvia (where no grapes are grown!). The grapes used to be transported from Moldavia and the Ukraine to be processed in a factory in Riga, which supposedly had a well developed technology. This sparkling wine is still produced today, based on imported grapes, and seems to do well.

[8] RIS Latvia p. 29

- Due to its relatively small population, Latvia lacks a vibrant domestic market but unlike Estonia, also lacks the advantage of a larger, wealthy neighbour.

2. Objectives and priorities of R&D policy

According to ERAWatch, R&D policy in Latvia has the following objectives and priorities:

- to increase public R&D funding and attract R&D funding from private sector
- to prioritise applied research, which would result in new products with high value added
- to promote scientific work at higher education establishments
- to increase the qualification of academic staff and train new scientists
- to provide financial incentives for the involvement of young people in scientific work and obtaining degree in science.

Moreover, Latvia aims at targeting the following issues: protection of intellectual property, innovation financing and enhancing the capacity of SMEs capacity to absorb technology.[9]

There is little evidence of Latvia using the concept of NIS and R&D in particular for addressing issues such as globalisation, ageing of society, climate change, security of resources and change to knowledge society. As a result of its relatively small size, Latvia will have to focus on a few key areas of R&D. The areas being targeted are: ICT, organic chemistry and biomedicine, material sciences, pharmaceuticals/biotechnology and wood sciences. By a government decision on May 30, 2006, additional priority areas for basic research were singled out; agro-biotechnology, health, energy and environmental sciences. The latter two fields are of particular interest in the Latvian case.

As has been mentioned before, as a consequence of the collapse of communism, Latvian industry took a hard hit but at the same time emissions of green-house gases were reduced by a massive 60 per cent (compared with the base year 1990). Moreover, as a result of Latvia relying almost entirely on hydropower for domestic electricity generation, emissions are low (on the other hand, Latvia imports electricity generated from fossil fuels abroad).

Facing large-scale emigration, a country in Latvia's position is facing a double challenge. In order to create a dynamic NIS, the need for skilled people is obvious, but when people in this group are emigrating in large numbers, it is justified to be sceptical about the prospects for success.

In 2005 the Latvian Parliament passed a law on research activity, which calls for increased funding of R&D by at least 0.15 per cent annually, the aim being to reach 1 per cent of GDP. According to the National Lisbon Programme the aim is to reach 1.5 per cent of GDP by 2010 from current 0.42 per cent.

[9] Scwaag Serger, S. & Wise Hansson , E. (2004)"Innovation in the Nordic-Baltic Sea Region. A case for regional Cooperation" Vinnova.

3. Coherence between NIS challenges and R&D objectives and priorities

The crucial challenge for a functioning Latvian NIS to take off would be to identify and eliminate bottlenecks in the process. Such bottlenecks seriously hamper the development of any innovative activity by presenting obstacles to knowledge diffusion. Examples of bottlenecks are the lack of cooperation between scientific institutions and industry, which is a legacy of the previous regime. Moreover, the activities of R&D institutions are perceived as distant by business and perhaps of quality below requirements. This, in turn, is most likely a result of low salary levels at R&D institutions, making them less attractive as employers. This is, naturally, also the explanation why the average age of employees at the R&D institutions is quite high.

Applying a somewhat more speculative approach to the issue, one might talk about confusion as to what role the R&D institutions should have. Without much experience in cooperation with business, there is uncertainty as to where to begin. Institutional rigidities should be a recognized problem when analysing an innovation system, especially in countries without a long, unbroken experience of a vivid market. Staff that has never cooperated with business and having few, if any, examples of how to commence are likely to stick to old habits. One might even ask whether the situation in this respect in a country in Latvia's position should be judged on the same basis as those with decades of experience, because the outcome might risk addressing the wrong parameters.

An important question is also to what extent goals created in this fashion are realistic. There seems to be a wide-spread notion today that an innovation system must contain either ICT or biotechnology or both. However, if this is the path recommended, then two questions need to be answered. First, is it a well founded assumption that innovations thrive particularly in these sectors? Latvia lacks at present the resources of developing a cluster in these sectors for reasons mentioned above. As it cannot be safely assumed that ICT and biotech will thrive even in the medium run, heavy investment from limited resources in these sectors will face the double dilemma of being too small for catching up with the front runners, but too big for Latvia if there is a sudden shift in world markets. Thus, concentrating investment in these particular sectors is not likely to produce the outcome aimed at.[10]

Second, should a small country in particular try to be more selective and more original? The success of Finnish and Swedish companies in ICT was the result of numerous favourable factors, which can probably not be repeated. Therefore, a country in Latvia's position should target sectors where there are significant weaknesses among EU members. Creating a fruitful environment in such sectors is

[10] A similar reasoning can be found in Watkins & Agapitova (2004) "Creating a 21st Century Natinal Innovation System for a 21st Century Latvian Economy" World *Bank Policy Research Workin Paper 3457, November pp. 6-10

more likely to produce a positive outcome. True, there is a risk, but in this case there will also be the possibility of success.

Such a path would definitely not run contrary to other commitments of Latvian R&D policy, but instead open up the possibility of a virtuous circle. At present, the Latvian approach to R&D seems to lack coherence and there is a doubt that some of the targets are simply repetitions of what is done elsewhere. Government has of course only limited possibilities to order growth in a certain sector, but focusing on those measures that can be administratively regulated and deregulated should cerate new options. It was mentioned that Latvia is struggling with transfer of research results into innovations. However, there are a number of policies and measures in place that aim to address this challenge (e.g., Basic and Applied Research Programme). The development of entrepreneurship is also targeted by national support programmes and initiatives, such as the Consulting Support for Start-ups Programme.

Table 1 below shows the main challenges and objectives in Latvia.

Table 1: Main challenges and objectives in Latvia.

Main Challenges	**Main Priorities/Objectives**
a. Matching of Challenges and Priorities	
Diffusion of new technology	Enhancing technology diffusion through FDI. Latvia has attracted significant FDI so far.
Low level of R&D, few researchers	Increasing R&D, investing in researcher training
Latvia still suffers from poor connection between research institutions and business	Developing cooperation between business and R&D institutions
Increase the number of SMEs	There is a policy in place for enhancing SMEs. In general, Latvian policy is rather SME friendly. At present the problem is access to skilled labour.
b. Challenges not addressed by Priorities	
1)The population decline, especially the emigration of skilled workforce	
2)The small size of the country does not allow for a broad-based innovation system. Latvia should engage in cooperation with its neighbours, especially the Scandinavian countries.	
c. Priorities without an obvious challenge	
Reduction of GHG emissions	No actual priority for Latvia, but important issue globally. Latvia has no problems in meeting the obligations.

4. Composition of the policy mix for R&D

There are a number of R&D policy measures that aim at overcoming the weaknesses according to ERAWatch and the European Trend Chart on Innovation. Table 2 shows the policy mix for R&D in Latvia.

Table 2: Policy mix for R&D in Latvia

Policy categories	Policy instruments: short descriptionand target group
R&D Domain	
R&D policy generic	**Basic and applied research projects programme:** Established in 1991. According to ERAWatch, the goal of the programme has been to strengthen Latvian research potential. In line with this aim grants are primarily and in greater volumes allocated to applications by high-performance research groups and groups involving young scientists, as well as post-doctor fellows. The programme covers all disciplines of science. The main beneficiaries of the programme are research groups at public research organisations. The programme was introduced by the Latvian Council of Science. **Promotion of science competitiveness programme**: The programme implies a public procurement initiative aimed at accomplishment of a single complex of scientific research (both fundamental and applied) in order to promote development of the respective research areas and facilitate their contribution to the competitiveness of the national economy and advancement of society. The aforementioned research areas are being marked as priority research areas. The Cabinet of Ministers defines research priorities every fourth year. In its turn competition in these priority areas is being announced and state research programmes elaborated. So far 5 priorities had been set and accordingly 5 state programmes have been approved on 20 July 2005 (Information technologies, Organic synthesis and biomedicine, Material science, Forestry and wood processing technology, and Letonica (Latvian studies)). According to ERAWatch, on 30 May 2006 the Cabinet of Ministers defined a set of new priority areas composed of 5 existent and additional 4 new priorities (Agro-Biotechnology, Medical science, Energy science, Environmental science). Announcement of competition and subsequent elaboration of state programmes in the new priority areas is in preparation. Funding for the programme "Promotion of science competitiveness" is being allocated from the budgetary subprogramme of the Ministry of Education and Science with the required financial resources for each year foreseen by the Ministry in the framework of the annual state budgets. **Supports to the development of research infrastructure:** This programme is a support scheme embodied in the national programme "Support to modernisation of scientific infrastructure in public research institutions". The overall aim of the programme is to supply excellence centres and other leading research institutions possessing resources for commercialisation of research with modern research equipment and infrastructure. It aims at the development of a strategic medium-to-long term vision of innovation challenges and innovation potential. Part of the cost will be covered by EU Structural Funds. **Support to modernisation of business infrastructure:** This programme aims to support private investments for improvement of business infrastructure, promote development of knowledge-based entrepreneurship and stimulate measures related to quality provision of the end product. This programme includes three sub-programmes: The first sub-programme covers the development and reconstruction of connections prerequisite for the development of infrastructure. The second sub-programme covers the upgrading of businesses in line with international standards and the third sub-programme supports the development of

	shared infrastructure. The objective of the policy measure is to increase the availability of innovative infrastructures to facilitate knowledge exchange and product/service development by enterprises and to provide adequate infrastructure to new technology based firms to facilitate their survival and growth. **Consulting support for start-ups:** This measure is a support scheme for creation of new start-ups providing consulting on elaboration of business plans, project proposals and business strategies. The goal of the policy measure is to increase the number of new innovation intensive enterprises created and their survival and to provide adequate infrastructure to new technology based firms to facilitate their survival and growth
R&D policy sectoral	
R&D / Innovation policy – Linkage	**Support to market-oriented research:** Established in 1993. This programme is a special programme for applied research aiming to promote integration of science and industry, development of technologically oriented sectors, promotion of industrial research and job creation. The goal of the programme is to encourage researchers from universities, research institutes and SMEs to develop new competitive products and facilitate the development of new start-ups. According to ERAWatch, within this programme, every year the Ministry of Education and Science is financing 70-90 market oriented research projects. These projects are mainly carried out in the state research institutes and universities, partly in innovative SMEs. Projects are funded if an essential part (~ 50%) of the total project costs is covered by an industrial or another partner. This approach intends to stimulate researchers to prepare project applications which are vital to the industry. **Support for joint research projects:** Established in 1995. The research programme provides grants for networking among research groups of different research institutions of public sector. This programme is a specific extension of the Basic and Applied Research Projects Programme. The goal of the programme is to promote collaboration between several research organisations jointly applying for and implementing projects of economic relevance according to ERAWatch. The programme covers all disciplines of science. The programme was introduced by the Latvian Council of Science. **Support to technology transfer:** According to ERAWatch, contact points of technology transfer are being established in order to promote co-operation of scientists and entrepreneurs and ensure efficient introduction of research results of state research institutions into production. Contact points of technology transfer usually accomplish the following main tasks: clarifies opportunities of the respective universities and scientific institutes to provide research and product development services according to the needs of entrepreneurs; clarifies demand of companies for research results and co-operation opportunities; promotes co-operation of entrepreneurs and scientists in order to attract financing of the private sector for research work; ensures patenting for intellectual property, which is created as a result of state financed research, ensures its protection and promotes its usage in the national economy; encourages establishment of new high technology companies on the basis of results of research conducted by Latvian scientists. The aim of the policy measure is to facilitate the acquisition and transfer of knowledge and technologies to enterprises and to encourage in particular cross-border initiatives. Furthermore, the policy measure aims at increasing the rate of commercialisation/marketing of the results of innovation activity in enterprises
R&D / Innovation policy – IPR	
R&D specific financial and fiscal policy	
R&D specific education policy	**Support for the training, retraining and continuing education of employees:** This programme is a grant scheme embodied in the state support programme elaborated by the Ministry of Economics and approved in October 2003. The programme aims to provide support to entrepreneurs in rising the productivity

	and quality of the labour force and stimulating greater involvement of employers in the provision of training activities. According to ERAWatch, the objective is to ensure that the future skills base in the region/sector/country will correspond to the innovation needs of enterprises and to upgrade the innovation related skills and diffusion of new technologies in enterprises. Funding through EU Structural Funds will be channeled to doctoral and post-doctoral studies
R&D specific employment policy	

Other policies that significantly affect R&D investment levels

There are a number of other developments and policy fields that impact on R&D investment.

Especially important for R&D investments are the fiscal policy, the education policy, and the innovation policy. With regard to fiscal policy, ERAWatch mentions that there are no explicit fiscal incentives for research performers. In the policy debates, contradicting opinions have been expressed on the need to develop fiscal measures for R&D. On the one hand, a need to develop fiscal incentives to foster R&D has been mentioned in some policy documents. They include statements that priority research fields should be supported also by a tax relief for the enterprises involved in the state research programmes and that a tax relief has to be granted to high-tech exports, for example. On the other hand, doubts have been expressed on the efficiency of such measures; the Latvian corporate tax rate is with 15% -compared to the EU-25 average - 26.3% -nbsp; already one of the lowest in Europe. With respect to Latvian education policy, one of the priorities of the higher education policy is to increase sharply the number of PhD students and researchers with a PhD degree, especially in the areas of natural sciences and engineering. There is a special policy measure that aims to promote research and mobility of doctoral students and young scientists in science and technology intensive sectors. Stimulation of research is defined as an integral part of the innovation policy in Latvia as mentioned in the innovation policy documents (e.g., the National Programme on Innovation 2003-2006). According to ERAWatch, innovation policy addresses research issues mainly through policy measures to promote science-industry links (e.g., technology transfer offices at higher education establishments) and supporting collaborative applied research projects involving entrepreneurs and scientists. It can be expected that an updated approach to research issues in innovation policy will be set out in the new Programme on Entrepreneurship and Innovation for 2007-2013, which is currently under development.

A particular important impact on R&D investment levels can be expected from inward foreign direct investment (FDI). FDI plays an important role in Latvia (Hunya 2004). Empirical research suggests that FDI has a positive impact on economic growth, restructuring of the economy, and competitiveness. Inward FDI can be a means of knowledge and technology transfer since knowledge and technology frequently “spills-over” from the foreign investor to the domestic region. The bulk of inward FDI in Latvia comes from Nordic countries and Germany. Services, such as business services, finance, transport and telecom have attracted most of inward FDI while there has been relatively little foreign direct investment in the manufacturing sector. According to Hunya (ibid.), the high share of FDI related to transport, storage

and telecommunication is specific to the whole Baltic region including – besides Latvia – Estonia and Lithuania. High FDI can only partially be explained by the transit position between Russia and Western Europe. It should, however, be remembered that this picture is also changing. While the transit traffic was of utmost importance in the mid-1990s, its role has decreased due to two factors, namely the diversification and growth of the Latvian economy and the newly constructed large Russian oil port of Primorsk near Vyborg in the Gulf of Finland, which is having a significant impact on oil transit through the Latvian port of Ventspils.

In Latvia, telecommunication enterprises were privatised to foreign investors. A major reason why Latvia has been quite successful in attracting FDI is the stable and favourable macro-economic environment. Already in the early years of transition, Latvia opted for radical market reforms that led to the creation of a functioning market economy. Furthermore, exchange rate stability created a stable economic environment conducive to FDI.[11] In contrast to other CEE countries such as the Czech Republic or Hungary, Latvia provided no tax breaks or direct subsidies to foreign investors. Foreign investors get national treatment. In line with EU competition rules, large investments (domestic and foreign) are eligible for corporate income tax holiday of up to 40 percent of the invested amount. Due to geographical proximity, the Baltic countries (Estonia, Latvia, Lithuania) are engaging in tax competition. The corporate income tax rate in Latvia has fallen steadily (15% in 2004) and there is a flat personal income tax.

A significant part of research financing in Latvia, an estimated 22.5 per cent of total comes from foreign sources, especially the EU Structural Funds and EU RTD Framework Programmes. Funding from the Structural Funds also covers research infrastructure, doctoral studies and post-doctoral research. Moreover, a total of 238 million EUR (or 9.02 per cent of total) from the structural funds will be earmarked for science and R&D in the period 2007-2013, according to a decision by the Cabinet of Ministers on April 18, 2006.[12]

[11] Latvia, together with the two other Baltic states, introduced very stringent monetary policies from the very beginning of their economic reforms. As a result, the Latvian currency, lat, has not undergone any significant correction of its exchange rate vis-á-vis a basket of major currencies. Since 2005, the lat is pegged to the euro. For details, see the homepage of the Latvian central bank, www.bank.lv

[12] ERAWATCH Research Inventory Report For: Latvia 2006 p. 3,5 & p. 16

5. Coherence between main policy objectives and priorities, and policy instruments

It seems that the chosen policy measures to some extent respond to the key challenges, objectives and priorities. The issue in the case of Latvia is not necessarily the coherence between policy objectives and instruments, but rather whether the many changes of government actually hamper reaching long-term goals. Because the Latvian innovation governance is more or less government-centered,[13] there is an obvious risk for disruptions in the innovation policy.

The target areas of promoting science are (as was mentioned above) information technology, biochemical, wood processing, material science and Latvian studies, i.e. Lettonica. However much one might value the cultural dimension, it remains questionable to what extent a country in Latvia's position should emphasize such areas as Letonica. Moreover, as has been pointed out before targeting biomedicine and information technology unfortunately sound more like fashionable topics than possible sectors of strength. Latvia does posses skills in forestry and wood processing as well as in some consumer electronics. Why not build more on these, especially because the former is a strong sector in the nearby countries? Table 3 shows the main objectives and instruments in Latvia.

Table 3: Priorities and instruments in Latvia.

Main Priorities/Objectives	**Main Instruments in place**
a. Matching of Priorities and Instruments	
Latvian science is in need of re-vitalization.	Law on Research Activity 2005, National Development Plan for 2007-2013, National Lisbon Programme 2005-2008
	Promotion of Science competitiveness programme
	Support to modernisation of business infrastructure
The recognized need to enhance the emergence of new SME:s	Consulting support for start-ups
Enhancing cooperation between the public and private sector. The development of a strong scientific community	National Lisbon Programme 2005-2008
	Support to market oriented research (Government programme from 1993)
Latvia need upgrading of its technology. FDI is strong.	Technology transfer scheme (2005) for creating technology transfer points at universities. National Lisbon Programme for 2005-2008

[13] Scwaag Serger, S. & Wise Hansson , E. (2004)"Innovation in the Nordic-Baltic Sea Region. A case for regional Cooperation" Appendix B, Vinnova.

	Support for the training, retraining and continuing education of employees
b. Priorities not covered by Instruments	
No obvious discrepancy	
c. Instruments without obvious priority	
No obvious discrepancy	

6. Policy mix instruments and target groups

Although caution has to be observed when evaluating the question of which routes Latvia at present aims at embarking upon, it can be seen from the table below, a few patterns can be identified. First, Latvia is committed to the enhancement of education on various levels, with the notable exception of the public sector. This can nevertheless be explained by the lack of large-scale government-run projects, indicating an attempt at shifting initiative to the private sector. The outcome of such a process is by far too early to judge.

Another aspect worth noticing is the emphasis on the domain called R&D policy generic. Elsewhere in this report it has been pointed out that there might be an element of fashion in directing efforts towards such measures, especially in potential high-tech start-up firms. First of all, the outcome is highly unlikely to be outstandingly successful. Second, such a policy in a country in Latvia's position might drain resources from areas where investment would produce more profitable results in a shorter time-span.

Furthermore, another aspect that can be deducted from the table below is that there is no obvious focus, but rather what could almost be described as a wish list. For instance, there are policy instruments for stimulating R&D in firms performing R&D and in firms not performing R&D and in new firms. Once again it should be pointed out that being a small, relatively poor country, Latvia does not necessarily have the resources to follow such a broad path. There is a risk of not achieving any of the targets set when embarking on too broad a policy.

Table 4: Policy instruments and broad routes to increase R&D investments

Policy categories	**Policy instruments**	**ROUTE 1**: promote establishment of new indigenous R&D-performing firms	**ROUTE 2**: stimulate greater R&D investment in R&D-performing firms	**ROUTE 3**: stimulate R&D investments in firms non-performing R&D	**ROUTE 4**: attract R&D-performing firms from abroad	**ROUTE 5**: increasing extramural R&D carried out in cooperation with public sector	**ROUTE 6**: increase R&D in public sector
R&D Domain							
R&D policy generic	Basic and applied research projects programme						X
	Promotion of science competitiveness programme	X	X	X	X		X
	Support to the development of research infrastructure						X
	Support to modernisation of business infrastructure	X	X	X	X	X	
	Consulting support for start-ups	X					
R&D policy sectoral							
R&D / Innovation policy – Linkage	Support for market-oriented research	X	X	X	X	X	X
	Support to joint research projects				X	X	X
	Support to technology transfer	(X)	(X)	(X)	(X)	X	X
R&D / Innovation policy – IPR							
R&D specific financial and fiscal policy							
R&D specific education policy	Support for training, retraining and continuing education of employees	X	X	X	X		
R&D specific employment policy							

X: target group and eligible for funding

(X): target group but not eligible for funding

7. Balance within R&D policy mix

Table 5 below provides an assessment of the "importance" of different R&D policy instruments.[14]

The criteria used are a) overall contribution to increase private R&D expenditures, b) impact on specific aspects of the NIS ore R&D performers, c) public attention/attention by policy makers, d) volume of public funding involved, and e) beneficiary of a shift in public funding.

Table 5: Assessment of 'importance' of R&D policy instruments

Instruments	Funding	Criteria				
		a	b	c	d	e
Funding of scientific institutions (basic and applied research projects programme, support to market oriented research, support to joint research projects, promotion of science competitiveness programme)	/		XX	XX	XX	
Support to development of research infrastructure	5.3 million EUR	X	XX	X		
Support to modernisation of business infrastructure	23.8 million EUR	X	XX	XX		
Consulting support for start-ups	3.1 million EUR	X		X		
Support for training, retraining and continuing education of employees	4.8 million EUR	X	X	X		

[14] The figures refer to annual budgets taken from TrendChart and EraWatch.

8. Emergence of R&D policy mix

Due to the Communist breakdown in Eastern Europe in the late 1980s, the Latvian research system has undergone considerable transformation over the last 15 years. The research system transformed from the socialist science and technology system under planned economy to the contemporary research system under market economy.

The main challenges and issues for research policy during the transformation process concern redefining role of the state in research process, reforming research governance and funding system, integration of research and higher education, building linkages between research and industry as well as integration in international and European research arena. One of the main problems, which hampered development of R&D during the transformation process, has been very low R&D funding. Public R&D funding was drastically cut in the early 1990s, while newly emerging private sector was too weak to make considerable investments in R&D. Low R&D funding led to internal and external brain drain, ageing academia, depletion of national research potential and forced internationalization of national islands of scientific excellence as they were forced to look for funding opportunities abroad. Nevertheless, Latvian R&D spending grew on average 5% annually between 1998 and 2003, which is by far too slow, but still a little higher than the average growth rate of EU-25.[15] It could be pointed out that in Latvia there is still a kind of a competition between high-tech and low-tech industries, because of the relative advantage resulting from a low salary level, i.e. low-tech industry is competitive in an EU context, thus attracting investment, while there is less reason for investment in high-tech. This will most likely change, though, in the not-so-distant future.

Little attention was paid to research policy at political level during the transformation. The political agenda was overloaded with macro-issues of re-establishing independence, the establishment of a market economy and citizenship issues and urgent problems of hyperinflation, banking crisis, etc. In addition, governmental intervention and government support to R&D did not fit well into the neo-liberal consensus type of reforms based on principles of privatisation, liberalisation and de-regulation pursued by the Latvian government.

It is important to mention that considerable changes have taken place in recent years. Since 2004, Latvia has access to EU Structural Funds for R&D and the research funding of national government has significantly increased. Those developments have improved the financial situation and opened new opportunities for the development of the national research system. Considerable changes in research governance, policy and funding system are still going on.

[15] Ketels & Sölvell (eds.) "State of the Region Report 2005. Competitiveness and Cooperation in the Baltic Sea Region" Tekes and Vinnova. Available at http://www.nordicinnovation.net

An important issue in research policy is the potential contribution of R&D for overall socio-economic development and national economic competitiveness. Specific priorities of R&D policy are the development of national R&D strengths in priority research fields, the promotion of science-industry co-operation, and raising awareness and interest of R&D issues in the private sector.

Latvia is facing those challenges that the programmes highlight but there should be precautionary steps taken in order not to embark on a path that is not realistically achievable. Latvia being an important producer of, say, biomedicine, in the short or medium run is unlikely. Attempts at implementing such a program might end up in a waste of resources. It is more likely that the Latvian programmes will simply not be implemented.

As has been implied before, Latvian wage levels still allow putting emphasis on mass production of goods of medium technology. There is clearly a niche in this, although it today seems to be less fashionable.

9. Governance of the policy mix

Although a lot of coordination is necessary to ensure synergies between various R&D support activities, no formal coordination bodies exclusively for research policy (e.g., coordinating councils) exist, and informal coordination and cooperation among different ministries is poorly developed. There have been several attempts to establish policy coordination mechanisms, which among other things would have dealt also with R&D issues. Two main coordinating bodies established so far have been the Steering Council of the National Programme on Innovation (headed by the Minister of Economics) and the Supervisory Board of the Lisbon Strategy (also chaired by the Minister of Economics and consisting of other responsible Ministers, members of the Parliament, as well as representatives of local governments and social partners). However, these coordinating institutions have mostly dealt only with the respective policy documents and positive synergies between different policy fields and initiatives have not been achieved. Moreover, main activities of above mentioned institutions have largely ceased soon after their establishment. The new draft Guidelines for Development of Science and Technology 2006-2013 envisage the establishment of a new consultative and coordinating institution – Science and Technology Development Strategy Council chaired by the Prime Minister.

The Latvian system of innovation is centered around the government, which in many respects could be a guarantee for flexibility taking into account the still existing problems of institutional friction. However, the unstable governing coalitions turn out to be counterproductive in this respect.

10. Interactions between policy objectives and instruments

A major strength of the Latvian governance system for R&D is the existence of a national programme for innovation and respective annual action plans according to the European Trend Chart on Innovation. R&D programmes are oriented towards the development of applied research and the promotion of competitiveness. There is a presence of coordinating bodies of innovation policy and increased governmental awareness of the role of innovation. There is also an expanding scope of innovation policy measures. Nevertheless, it seems that there is weak coordination between the different stakeholders. The European Trend Chart on Innovation identifies a lack of coordination of major policies (macroeconomic, innovation, R&D, education). This is particularly important since major non-R&D policy measures have a strong impact on R&D and innovation in the new EU member states, such as tax policy or policies gearing foreign direct investment in Latvia. The linkages between the producers of scientific knowledge (universities, public research institutes) and industry are underdeveloped. In general, there are low capacities in transferring research results into commercial products and innovations. In addition, the evaluation culture is underdeveloped. Nevertheless, there are efforts and studies to increase the interaction of the different actors in the national innovation system of Latvia. Increased cooperation between different ministries and stakeholders involved in R&D policy can increase the linkages and interactions considerably. Another important opportunity for the effectiveness of R&D policy in Latvia is the full-scale implementation of existing programmes geared at promotion of innovative development. Important threats with regard to the Latvian national innovation system are the possible mismatch between words and deeds, which means that actual policy statements and action plans are not implemented properly, the insufficient use of the EU structural funds, and weak business involvement in the innovative development of the country. In general, there is the risk that Latvia fails to develop a well-functioning knowledge-based economy, which can result in deepening regional socio-economic disparities in the country.

It should, nonetheless, be pointed out that Latvia has performed well according to the Lisbon Agenda and it belongs to the top performers. The scores measure employment, social cohesion, innovation and research, economics in general, environment and economic reform.[16]

Particularly important in the Latvian case is the stable macro-economic environment and the consequent restructuring to a liberal market economy.

There is evidence in the case of Latvia that the evaluation culture of innovation policy has not developed yet. This hampers the capacity to learn from previous experiences and leads to some uncertainty regarding what to emphasize in the future. The Latvian innovation system thus suffers from both insufficient coordination of measures and

[16] Ketels & Sölvell (2005)

evaluation. However, it should be stressed once more that Latvia only relatively recently re-emerged as an independent state and at the same time developing both institutions which elsewhere have been in place for several decades and new institutions for innovation is a daunting task.

Despite these problems, there are strong indicators that the awareness of the need for an efficient innovation system policy has spread in Latvia. According to the Latvian National Lisbon Programme 2005-2008, a technology agency will be established. One of its main tasks would be to attract private sector investment into applied research and promote transfer of technology. Also public support programmes will be developed. This programme also calls for the creation of technology incubators, although without mentioning precise characteristics.[17]

One particular point worth mentioning is the need for wide-spread knowledge of especially English but also other foreign languages throughout the entire Latvian society. It is well-known that cooperation between many institutions in the new and old EU-member states is seriously hampered by the absence of English-speaking staff in the new member states.

In this context it could be speculated whether a country in Latvia's position should instead opt for a Baltic cooperation in the field of an innovation system. There would be several advantages, such as scale, funding etc. This solution would certainly not infringe too much on the Latvian national innovation system, but simply create a more viable environment for large scale projects. It should be kept in mind that the total population of the Baltic states is smaller than that of Sweden. Due to its geographic location in the Baltic and its industrial heritage, Latvia would have several advantages in this respect. It can also be added that the only metropolis in the Baltic states is the Latvian capital of Riga.

There is one more fundamental question that requires consideration. Latvia has approximately 2.5 million inhabitants. Latvia is also significantly poorer than the member states of "old" EU-15. Thus any direct comparison with such countries is highly complicated. The smallest countries of the EU-15 were Luxembourg (pop. 300,000) and Ireland (pop. 3.7 million). Both of these countries have close cultural and linguistic ties with much larger neighbours, in fact a large part of the world. Latvia lacks these attributes. Among the EU-15, those countries closest in size to Latvia in the Baltic region are Denmark and Finland, both having roughly twice the population of Latvia. There are no linguistic ties with these countries, nor with any "old" EU-member. Thus Latvia is not only poorer, but culturally more isolated than Luxembourg and Ireland. Even a comparison with Finland, with its own lingual identity, shows significant differences. Finland has for a long time been integrated with rest of Scandinavia, it has a history of uninterrupted economic, industrial and scientific development. But for a long time also Finnish industry was dependent on one abundant raw material, namely wood.[18] Latvia has none of these characteristics. The consequence of the above mentioned facts is that the question of the direction of

[17] http://www.em.gov.lv/em/2nd/?cat=11619

[18] The success story of Nokia in Finland was not inevitable. There were relatively few indicators of this development in the early 1990's when Nokia was almost bankrupt. At that time Finland still relied heavily on forest products – but this was the only true cluster in that country – twice the size of Latvia, and much wealthier.

the Latvian innovation system should perhaps be answered in terms different from those of wealthy, large (including highly integrated smaller countries). Is there really a plausible way for a country in Latvia's position today to aim at similar targets (high-tech) as others? It should at least be speculated whether some other policy measures would have greater prospects of success. Why not for instance aim at low-tech? Although such a concept is probably not widely hailed, examples of very successful low-tech industries are abundant. Denmark, for instance, has its furniture and food industries (especially meat), Sweden has a large number of smaller manufactures, Norway has fisheries. The success of these low-tech industries lies not in low salaries, but in a complicated web of mutual cooperation and competition, that is basically an institutional or cultural question. An attempt at developing a successful high-tech industry in today's Latvia might easily lead to failure. It is justified to ask, whether the limited resources of Latvia will be enough to achieve the target and if that is possible, the question is of opportunity costs. Even in the most positive scenario, in the medium-term Latvia can only conquer a narrow niche in the world market. Needless to say, this would be a high-risk project, that in the end may generate much less revenue and well-being for the general population than a perhaps more prudent emphasis on enhancing the overall perspectives for less R&D intensive production.

Furthermore, as has been mentioned before, Latvia should probably take the initiative to develop R&D in cooperation with other countries in the Baltic Sea area (including also the northernmost German Bundesländer). The possibilities for success are likely bigger in this context than in going one's own way. The total population of Sweden, Denmark, Norway, Finland, Estonia, Lithuania and Latvia sum up to little more than 30 million. Economic cooperation, such as cross-border mergers, is widespread in the region (starting from October 2, 2006, the stock exchanges of these countries, except Norway, have merged). A common Scandinavian-Baltic innovation system would most likely be in Latvia's interests.

Table 6 shows the effects of different R&D programmes on other programmes. As already mentioned, the links and interactions between public research and research conducted in firms are weakly developed. The R&D programmes in Latvia increase the separation between the different R&D performers since there are programmes that separately promote R&D in public universities and research institutes and other programmes that foster R&D in the private sector. Support and promotion of technology transfer from public research performers to private firms is underdeveloped. Particular emphasis of Latvian R&D policy is put on promoting the establishment and improvement of research infrastructure in the public as well as in the private sector. It has to be mentioned that there is always a risk that some measures substitute other policy measures. For instance, an increase in investments in the basic and applied research programme can lead to a decrease in investments in the support to market oriented research programme. However, an increase in the basic and applied research projects programme can also potentially increase the effect of other programmes due to synergy effects.

Table 6: Assessment of potential effects of an increase in activity of a particular R&D policy instrument on the effect of other R&D policy instruments on the level of R&D expenditures in Latvia

	effect upon è ê increase in activity	A	B	C	D	E	F	G	H	I
A	Basic and Applied Research Projects Programme		+/-	+	+/-	0	+/-	0	0	0
B	Support to market oriented research	+/		+	+	0	+	0	0	0
C	Support for Joint Research Projects	+	+		+	0	+	0	0	0
D	Promotion of science competitiveness programme	+/-	+	+		0	+	0	0	0
E	Support to modernisation of business infrastructure	0	0	0	0		0	+	0	0
F	Support to the development of research infrastructure	+/-	+	+	+	0		0	0	0
G	Support for training, retraining and continuing education of employees	0	0	0	0	+	0		0	0
H	Consulting support for start-ups	0	0	0	0	0	0	0		0
I	Support to technology transfer	0	0	0	0	0	0	0	0	

+: potentially positive effect; -: potentially negative effect; ±: effect may be either positive or negative

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