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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 Czech Republic

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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

Regarding the European Trend Chart on Innovation country report of the Czech Republic the three challenges described below are chosen as representatives of the range of challenges the Czech Republic has been facing. Corresponding indicators in the European Innovation Scoreboard show a poor performance for the Czech Republic. The general challenge for the Czech Republic consists of a weak transfer of research results to the market in the form of commercial applications.

The Czech Republic emerged from the socialist system with a relatively competitive heavy industry and a general infrastructure favourable to economic development. The divorce from Slovakia probably strengthened the fairly good outlook, because friction between the two countries was thus avoided. Moreover, according to some opinions, the economic situation of Slovakia was pulling down also the Czech Republic. Initially successful reforms were, however, slowed down toward the end of the 1990s. The underlying reasons were many, but crucial elements were the mode of privatisation, which rarely brought in fresh capital, and the repeated political stalemates, producing weak governments with only limited possibilities to enact institutions favourable for long-term economic development. In addition, the privatisation of Czech banks was delayed. Nevertheless, in recent years the growth of Czech GDP has increased and is presently clearly higher than the EU-average.

With regard to industrial structure, engineering industry has traditionally been the backbone of the Czech economy and continues to perform rather well, contributing with more than a third of total GDP. This is also reflected in the Czech higher education system with a relatively high share of science and engineering graduates (29 per cent).[1] The Czech Republic has been successful in attracting FDI to several sectors. One of the biggest, earliest and probably most important privatisations was the selling of Skoda automobile production to Volkswagen.[2] This made it possible for the Skoda brand to quickly re-enter the world market.

There has not been any innovation policy in the Czech Republic before 2005 (there previous policy was from 1992, when numerous issues still remained to be settled). The reasons for this are manifold, but in addition to the general trends in the Czech Republic mentioned above, it should be added that the government has actively refrained from extensive involvement. One reason for this might have been that the economy of Czechoslovakia was one of the most state-controlled in Eastern Europe before 1989. Therefore, innovative activity has primarily been seen as the responsibility of the enterprise sector.

The Czech Republic clearly lags behind the EU-average in several R&D-related indicators, such as employees in R&D, employees in research, R&D as a share of

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[1] Source:www.czechinvest.org

[2] In order to avoid confusion, it should be stressed that there is also a large engineering company, Skoda Plzen, which is not a part of Volkswagen. This company is specialized in various engineering products, such as locomotives and trams.

GDP or private sector contribution to overall R&D.[3] On the other hand, in most cases the Czech Republic is ahead of most other recent EU members.

The future development of Czech NIS is no doubt challenging. Historically, the Czech industrial development followed the paths of Germany and Austria and still today this tradition is alive (for instance with the large share of engineering industry). On the other hand, Czech industrial development was hampered for 50 years, leaving a wide gap between the Czech Republic and Germany and Austria. To narrow this gap will require more than ordinary innovative ideas. The Czech Republic can so far compete with these countries only with lower costs, which is hardly the recipe for the future. Despite being of relatively good quality, the education system can not yet match that of its neighbours. Another factor acting unfavourably for the Czech Republic is the lack of knowledge of major foreign languages.

The Czech Republic has been able to develop a large tourism industry, mainly thanks to the capital Prague. This source of income has had a stabilizing effect on Czech economic development.

In general, the Czech Republic, despite positive developments, still has to make further steps in order to foster innovation and growth. Particularly challenging is the cooperation between universities and industry, the financing of innovative enterprises and start-ups, and the low patenting and commercial exploitation activities.

1. Cooperation between Universities and the Business Sector

Although only one specific programme of the Ministry of Industry and Trade is in place – Tandem – the cooperation between universities and industrie has been widely discussed and it is addressed by concrete measures of the National Innovation Policy (2005-2010):

- research programmes have to be launched in which both the research performers (research institution or a university) and application entities (e.g., firms) jointly participate,

- there is a need to prepare and launch programmes supporting mobility between the academic and business sector with the aim to develop cooperation between the public and private sector entities, focusing on knowledge transfer, as well as cooperation in research aiming at commercial application of research results.

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[3] Information compiled from www.vyskum.cz

2. Financing of Innovative Businesses and Start-ups

Programmes operated by the Ministry of Industry and Trade support the creation of companies and their development by granting credits and bank guarantees. However, there is no programme focusing on financing early stage development of innovative and start-up companies by venture capital (e.g. through a programme on a venture capital fund).

There is a Strategy for Economic Growth (2005-2013) adopted by the Government in November 2005 that specifies the need to support commercial sources of financing, such as private equity and venture capital.

There is a need to support start-ups and development of new and technology-based companies through creating financial tools facilitating SMEs' access to pre-seed and seed capital. This is stated as one of priorities for the next programme period 2007-2013 in the study "Assessment of Priorities and Formulation of Recommendations for Implementation Measures towards Developing Knowledge Economy within Preparation of National Programming Documents of the Czech Republic for 2007 – 2013" published by the Ministry for Regional Development. In addition, seed capital financing is to be provided by the new Operational Programme Enterprise and Innovation, which is being prepared for the programming period 2007-2013.

3. Low Patenting Activity /Low commercialisation of Research Results

The costs related to patenting are eligible costs in the Czech research programmes. However, there is no programme supporting the patenting activity itself. On the other hand, the situation in this respect may be improved soon. In the study on "Assessment of Priorities and Formulation of Recommendations for Implementation Measures towards Developing Knowledge Economy within Preparation of National Programming Documents of the Czech Republic for 2007 – 2013" published by the Ministry for Regional Development a measure is proposed aimed at increasing patent activity of Czech entities (e.g,. firms) abroad and in the CR. It will provide subsidies to cover part of the costs related to patent applications at the Industrial Property Office of the CR and abroad. A part of the measure will also support education and raising legal awareness at universities, research institutions and SMEs, as well as increasing qualification of advisers in industrial law who provide counselling in the field of intellectual property protection.

The support to patenting activity is also covered by the National Innovation Policy which proposes to set up a special short-term financing scheme (with a contribution from the state budget) for the support of the IPR protection. In addition, a special measure focuses on support of patenting is proposed in the new Operational Programme Enterprise and Innovation, which is being prepared for the programming period 2007-2013.

2. Objectives and priorities of R&D policy

According to the European Trend Chart on Innovation, the main objectives are defined as follows:

1. strengthened research and development as the source of innovation,

2. cooperation between the public and private sector,

3. sufficient human resources for innovation, more effective performance of state administration in research, development and innovation.

Research and development is promoted by support to both **targeted research** (i.e. specific projects) and **institutional research**. The former receives some 40 per cent of total R&D funding, while the latter receives the rest. The main source of funding is the Ministry of Education, through which some 28 per cent of public R&D funding is allocated.[4]

Overall R&D and innovation policy is laid down in the two documents National Research and Development Policy (2004) and the National Innovation Policy (2005). Policy instruments are the two National Research Programmes, one covering the period 2004-2009, while the second one covers the period 2006-2011.[5]

Furthermore, support for industrial research and development is channelled through the Ministry for trade and industry and its two programmes, TANDEM and IMPULS.[6]

In the Czech government's own words, the objectives are as follows:[7]

- to increase the efficiency and the outcome of R&D, it means the increase first of all contribution to economy and the society;

- to ensure more complex links of the R&D policy with other policies of the Government of the Czech Republic;

- to concentrate the state support on a less number of efficiently co-ordinated programmes and projects;

- to improve the legislation of the state R&D support;

- to increase demands on the complete area of R&D, including the more significant differentiation of the quality of reached outcomes;

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[4] ERAWATCH
[5] Ibid.
[6] Ibid.
[7] "National Reseacrh and Development Policy of the Czech Republic" Attachment to government resolution, Januray 5, 2000. Available on www.vyzkum.cz

- to increase the objectivity and the transparency of the distribution of financial means.

There is no direct mentioning of such "meta-challenges" as globalisation, aging of society, climate change, scarcity of resources, and change to knowledge society, but at least challenges resulting from globalisation can be read between the lines. The absence of a clearly stated climate policy is likely a result of the significant decrease in green-house gas emissions resulting from the collapse of the communist regime. By 2004, emissions from the Czech republic were cut by 25 per cent as a result of industry re-structuring (measured against a base line for 1990) while the target was set at 8 per cent.[8]. Thus, there has been no obvious challenge in Kyoto-terms.

The national Innovation Policy 2005-2010 of the government calls for an increase of R&D funding to a total of 3 per cent of GDP, where the share of public funding would be one-third (i.e. 1 per cent of GDP) by 2010. This target has not been reached. Public funding has remained sturdily just above 0.5 per cent of GDP for several years.[9]

According to the national research and development and innovation policies mentioned above, one particular goal is to promote Czech participation in EU Research Framework Programmes. Participation in the fifth Framework Programme had a profound impact on several researchers and research centres in the Czech Republic, especially concerning targeted research.[10]

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[8] http://unfccc.int/files/essential_background/background_publications_htmlpdf/application/pdf/ghg_booklet_06.pdf
[9] ERAWATCH
[10] Ibid.

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

As has been mentioned earlier, the Czech Republic has as strong tradition in technological development, manufacturing industries and education. To some extent these traditions were maintained during the communist regime and were never entirely lost. As a result, the Czech Republic today does not suffer from any particular shortage of educated people. For instance, employment in medium and high technological manufacturing is 8.7 per cent of total workforce while the corresponding figure for EU-15 is 7.1 per cent and that of neighbouring Austria 6.2 per cent. In high technological services the figures for the Czech Republic (3.2) and EU-15 are basically the same (3.22).

On the other hand, the ratio of R&D employees of total employment is only half of that of EU-15 and the share of research workers is also clearly below the EU-15 averrage.

These figures can be interpreted as a rather strong bias in the Czech NIS towards skilled labour in technology-related production, but relatively weak generation of innovation. Such an assumption is also supported by the figure for productivity, which was less than half of EU-15 in 2003 (the corresponding figures for Austria and Germany were 93 per cent and 103 per cent, respectively).[11] One conclusion that could be drawn from figures like these is that diffusion of new technology has been slow in the Czech Republic. Because productivity cannot be seen as a function of domestic technological innovation, there are likely to exist organisational rigidities throughout the economy hampering the introduction of new technology. Moreover, the share of domestic R&D funding is not necessarily correlating with productivity.

As a consequence of the reasoning above, there is reason to ask whether diffusion of technology is one of the crucial issues for the Czech NIS to address, or even more exactly, what are the obstacles for such a process?

As has been stated before, an important task for developing the Czech NIS is to enhance cooperation between R&D and business. This statement holds true for all former socialist countries. This challenge is addressed by the R&D objectives of the Czech government. A general objective of the government is to increase public R&D spending. There is a particular R&D programme that fosters science/industry collaboration (TANDEM).

Table 1 shows the main challenges and priorities.

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[11] All figures from "Analysis of the Existing State of Research and Development in the Czech Republic and a Comparison with the Situation Abroad – 2005" Available at www.vyzkum.cz

Table 1: Main challenges and priorities.

Main Challenges	Main Priorities/Objectives
a. Matching of Challenges and Priorities	
Development of a flexible R&D system	This is the very aim of Czech R&D policy reflected in the National Research and Development Programme and the National Innovation Programme. Industry/science collaboration is particularly addressed.
Cooperation between industry and research centres	Policy to promote public funding of R&D, to increase transparency of funding.
R&D diffusion	Pariticipation in the EU Framework Programmes.
Improvement of legislation	Measure is proposed by Ministry for Regional Development for the period 2007-2013
Financing of start-ups	Adressed by Operational Programme Enterprise & Innovation.
Increasing patenting	Adressed by National Innovation Policy and Operational Programme Enterprise & Innovation.
b. Challenges not addressed by Priorities	
Population development, birth rates are very low in CR	
Environmental issues. The Czech Republic has suffered excess emissions that were not only domestic. Moreover, the landscape of Northern Bohemia is scarred by coal mining and other industrial activities.	
c. Priorities without an obvious challenge	
Development of education	

4. Composition of the policy mix for R&D

Programs and their accompanying subsidies to support science are organized by several institutions in the Czech Republic. One worth mentioning is the Academy of Sciences of the Czech Republic but subsidies are also provided by ministries and EU institutions.

Table 2: Policy mix for R&D in Czech Republic

Policy categories	Policy instruments: short description and target group
R&D Domain	
R&D policy generic	**Academy of Sciences of the Czech Republic (ASCR)**: Its main mission is to promote basic research in a wide spectrum of natural, technical and social sciences. The Academy also co-operates with applied research institutes and industry. Integration of Czech science into the international context is strengthened by a number of joint international projects and employees exchange programmes with international partner institutions. **Czech Science Association**: promotes the progress of scientific and technological development in the Czech Republic. Grants are provided to different kinds of Czech state and private research and development institutions and to private persons who are Czech citizens and reside permanently in the Czech Republic. The basis of the funds available is provided by the state budget, but contributions from other sources, such as the industry, foundations, private donations, etc., are also possible. Grant proposals can be submitted in five scientific fields: technical science, natural science, medical science, human and social science, agricultural science. Programmes by the Ministry of Education, Youth and Sports: **National Research Programme I** (2004-2009) is based on the National Research and Development Policy adopted by the Government in January 2000. The National Research Programme (2004-2009) concentrates a significant part of the targeted support to research and development. The remaining part is to be provided by the Grant Agency of the Czech Republic and the Grant Agency of the Academy of Sciences of the Czech Republic, especially to projects on fundamental research, further through specific sectoral programmes which are not part of the National Research Programme. **National Research Programme II** (2006-2011) follows up the National Research Programme (2004-2009). National Programme II is a set of programmes adopted by the Government which implements a substantial part of the National Research and Development Policy. National Research Programme II specifies concrete support targets for a focused financing of research priorities in the Czech Republic. The mission of the National Research Programme II is to boost the economic development of the Czech Republic and improve the quality of life of its population. The objective of the National Research Programme II is to realize priorities of the National Research and Development Policy through four thematic and three cross-cutting programmes in the period 2006-2011.
R&D policy sectoral	The Research and Development Conception of the *Ministry of Industry and Trade (MPO)* states concrete forms and ways of support (including organisational structure) for realisation of selected measures of the document "Investing in Research: An action plan for Europe" and parts of the National Research Programme (2004-2009). According to this Concept the support of the industrial research and development is provided by the following programmes: **IMPULS**: The main goals of the programme are: increased performance of manufacturing / production / industrial organizations, support to the SMEs, increased competitiveness of products and technology upgrade. **TANDEM**: The main goals of the programme are: improved cooperation

	between industrial and research organizations, technology support to SMEs, increased competitiveness of products and technologies, significantly enhanced transfer of basic research results towards industrial research and development / applications. **POKROK (Progress)**: POKROK (Progress) is a programme approved by the Czech Government in April 2003 - as a part of the National Research Programme (NRP). The POKROK programme is focused on supporting projects of industrial research and development. The Programme was officially launched in 2003. The funding itself began in 2004.
R&D / Innovation policy – Linkage	**Association of Research Organizations (AVO)**: It is the only organization within the Czech Republic, which represents and promotes in full extent the interests of applied research in business sector. Members of AVO are mostly Czech organizations and units oriented to research and development, who are promoted and operated from largely private resources in various branches of industry, building and architecture. The members of AVO represent at present more than 8 000 professionals working in this area. The role of the Association is to help actively to promote the Czech applied research and development as a key factor for transferring research results to industry and agriculture and its commercial exploitation. To achieve this role, the AVO collaborates closely with the Academy of Sciences of the Czech Republic and with universities. AVO supports also international cooperation of its members. Based on its present position, AVO is the partner for the state administration, which cannot be neglected during creation of new legislating and systems for support of research and development.
R&D / Innovation policy – IPR	
R&D specific financial and fiscal policy	
R&D specific education policy	**Academy of Sciences of the Czech Republic (ASCR)**: Institutes of the Academy of Sciences take part in education, mainly in education of young researchers by providing PhD studies and also by educational activities of its employees at universities.
R&D specific employment policy	

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

There is no obvious gap between objectives and instruments, unless the rather slow development of policy instruments. However, the Czech position seems to have been not to interfere too much in the economy, which again would support a claim that objectives and instruments are coherent. (If the objective is to minimize government interference then having only few instruments in place is a coherent measure). However, there are particular programmes that should improve the weak industry/science ties and foster commercialisation of research results, such as TANDEM. Furthermore, there are instruments that promote R&D in private industry (e.g., POKROK). The need to increase patenting activities in Czech industry as well as access to early financing (seed capital) of start-ups is acknowledged by the Czech government in the National Innovation Policy and Operational Programmes for Enterprise and Innovation.

However, there is a widespread recognition in the Czech Republic that the educational sector needs upgrading as well as the need for increasing the share of private funding of R&D. The latter is in the short run by and large a function of the improvement of economic conditions. The two main documents defining Czech R&D and innovation policy, the National Research and Development Policy and the National Innovation Policy cover a rather broad range of tasks. However, the targets are in line with the general policy of the Czech government to limit interference. For instance, the target to increase public spending to one-third of total R&D spending is obviously an attempt to stimulate private sector funding. Moreover the calls for improved cooperation between industry and R&D institutions are relatively free from specific instructions, but state only what could be said to be long-term goals, such as improving cooperation to achieve competitive products and services taking advantage of new technology.

In general, all former communist countries have faced the same dilemma. There has been a window of opportunity for export incomes due to low labour costs. The income generated can either be used for R&D or for any other purpose. Thus, the question becomes how far sighted corporate managers have been or how much patience stockholders have shown. The answers to those question goes beyond the analytical level of innovation systems but perhaps greater general awareness of NIS challenges can have a constructive impact.

Table 3 shows the main priorities and the corresponding instruments.

Table 3: Main priorities and instruments.

Main Priorities/Objectives	Main Instruments in place
a. Matching of Priorities and Instruments	
Increased capacity of the manufacturing industry, product development, technology transfer to SMEs	IMPULS
Enhanced cooperation between business, research units for the purpose of technology diffusion	TANDEM and PROSPERITA (which is dealing with business incubators and science parks)
Creating a modern and effective research system, including the support of young researchers and enhanced professional quality of R&D employees.	National Research and Development Policy, National Innovation Policy. Operational Programmes by the Ministry of Education, Youth and Sports in the following sectors: Industry and enterpise, research and development fro innovation, education for competitiveness, human resources and employment
International cooperation	Participation in EU Frame Programmes
Regional aspects	Support for regional R&D activities. Operational Programme Industry and Enterprise (2004-2006) of the Minsitry of Trade and Industry, programme KLASTRY
Application of research results	The National Innovation Policy aims at creating favourable institutional conditions by reducing red tape, support R&D and innovation, both Czech and foreign through the use of EU structural funds. Establishment of the Technology Agency.
b. Priorities not covered by Instruments	
c. Instruments without obvious priority	

6. Policy mix instruments and target groups

The picture stemming from the table below is straightforward. The Czech Republic aims at targeting all other routes except fro number 5. This is supposed to be achieved solely through generic R&D as well as sectoral R&D. This is probably a rather appropriate policy for the Czech Republic, where the overall priority is to promote an already existing industry. It should be stressed that the Czech Republic differs significantly from other former socialist countries by having domestic manufacturing firms which have become internationally competitive (although some, such as Skoda Automobile, through foreign investment). While other former socialist countries are in need for developing successful industries, the needs of Czech Republic are different. The aim is to increase competitiveness among existing industries rather than developing new industries from scratch.

Table 4 shows the policy instruments and broad routes to increase R&D investments.

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	Academy of Sciences of the Czech Republic (ASCR)						
	Czech Science Foundation	X	X	X	X		X
	National Research Programme I	X	X	X	X		X
	National Research Programme II	X	X	X	X		X
R&D policy sectoral	IMPULS	X	X	X	X		X
	TANDEM	X	X	X	X		X
	POKROK	X	X	X	X		
R&D / Innovation policy – Linkage	Association of Research Organisations (AVO)						
R&D / Innovation policy – IPR							
R&D specific financial and fiscal policy							
R&D specific education policy	Academy of Sciences of the Czech Republic (ASCR)						
R&D specific employment policy							

7. Balance within R&D policy mix

The following table 5 shows an assessment of importance of R&D policy instruments.[12]

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
Academy of Sciences of the Czech Republic (ASCR)	224 926 667 EUR		X	X	X	
Institutional funding of higher education institutions	210 million EUR		X	X	X	
Czech Science Foundation	45 700 000 EUR	X	X			
National Research Programme I	108 750 000 EUR		XX	X		
National Research Programme II	51 088 330 EUR		XX	X		
IMPULS	23 000 000 EUR	X	X	X		
TANDEM	19 300 000 EUR	XX	X	X		
POKROK	330 000 EUR	XX	X	X		

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

8. Emergence of R&D policy mix

As for the other central and eastern European countries, the current R&D policy of the Czech Republic emerged only recently after the breakdown of the socialist regime. In the transition period in the beginning of the 1990s, R&D policy was neglected and the focus was on privatisation and institutional reforms. Radosevic and Auriol (1999) claim that the R&D system was mainly regarded as a liability or tax burden. This is in strong contrast to the socialist period where there was a strong emphasis on science as a production force. R&D investments were even a priority area in the socialist period. This changed considerably during transition and only recently, the R&D system is perceived again as a factor behind economic and employment growth. In 2000, the Czech government adopted a policy on research and development, which states a number of objectives, which have been addressed above.[13]

The characterization of the Czech R&D policy mix is can be seen as a case of incremental approaches, differing in this respect from most other former socialist countries. There are practically no high-flying plans to develop an all-new high-tech industry, but rather to achieve improved competitiveness by a policy of numerous small steps. The main infastructure is already in place while the most important task is to guarantee its proper functioning. The Czech Republic has only reluctantly embarked on a government-led approach to R&D. Such a policy has particular shortcomings, but on the other hand, the starting point has been rather favourable for the Czech Republic. In brief, it could be said that the Czech policy is characterized by a factual approach, by more adjustment to existing structures and less far-reaching plans.

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[13] The entire document is available on www.vyzkum.cz

9. Governance of the policy mix

The coordination between different actors responsible for R&D policy (e.g., high-level councils, inter-ministerial committees) has been rather weak. Previously, there was no coherent system of policy coordination at government and agency levels (according to the European Trend Chart on Innovation). With the recent developments a clear structure has emerged. Proposals for funding are drawn up by the Council for Research and Development – an advisory body. Funds allocated by the Cabinet are then distributed through the two ministries having the main responsibility, the Ministry of Education and the Ministry of trade and Industry, but also the Academy of Sciences and the Czech Science Foundation.

Because the Czech policy mix takes the existing structures as its starting point, it also becomes more broad-based. The flip side is that there is little overall coordination, which hampers the potential for radical changes. Perhaps a challenge for the Czech Republic would be to coordinate its R&D policy in order to gain the capacity to redesign gaps if such were to emerge.

10.   Interactions between policy objectives and instruments

According to the European Trend Chart on Innovation, a particular strength of the governance system of the Czech Republic is that there are a number of government agencies that support business, investment and trade. The Czech Republic is rather attractive for foreign investment. The reasons are a well developed infrastructure and the availability of a qualified workforce at reasonable labour costs. There are incentives to attract foreign direct investment. There are good conditions for IT development in the Czech Republic. There are a number of weaknesses that affect R&D policy and the interaction among different policy instruments. One weakness is the legal environment which is complicated with low enforceability according to the European Trend Chart on Innovation. SMEs and start-ups have limited access to financing which seriously hampers the effect of R&D policy. There is a discrepancy between the "output" of the education system and the labour market requirements. Thus, the education system does not provide the human resources needed for further economic development. Particularly relevant in the context of R&D policy is the insufficient funding of research from public funds and insufficient support to industrial research. The number of research results that is commercially exploited is low. Another major weakness with regard to the effect of policy measures is the insufficient cooperation between public research and private industry. Both spheres seem to be separated to a considerable extent which seriously reduces the effect of R&D policy measures. The European Trend Chart on Innovation identifies lacking cooperation between universities and the business sector as one of the main barriers to the growth of the competitiveness of the Czech Republic. The absence of intermediaries that are important for commercial exploitation, such as technology transfer agencies or patenting and licensing agencies further reduces the potential effects of public policy intervention. A decentralised system of public support to R&D and innovation and insufficient state support through indirect measures has negative effects on innovation performance. Thus, interaction and coordination between different policy actors and organisations relevant for the performance of the R&D system is rather weak.

As already mentioned, the Czech Republic installed policy measures aimed at fostering innovation rather recently. Activities related to innovation were previously seen as the concern of business enterprises and not public policy. Thus, interaction is rather limited.

With regard to the specific R&D programmes, there is always a risk that some measures substitute other policy measures. For instance, an increase in investments in the high technology programme can lead to a decrease in investments in the improvement of business environment. However, synergy effects can increase the effects of some R&D programmes.

Table 6 shows an assessment of potential effects of the different R&D policy instruments.

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 the Czech Republic

	effect upon ➘ ➘ increase in activity	A	B	C	D
A	Institutional funding		0	+/-	0
B	IMPULS	0		+	+
C	TANDEM	+/-	+		+
D	POKROK	0	+	+	

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

11. References

ERAWatch Research Inventory, available at http://cordis.europa.eu/erawatch/.

European Trend Chart on Innovation, available at http://trendchart.cordis.lu/.

Radosevic, S. & Auriol, L. (1999) Patterns of restructuring in research, development and innovation activities in central and eastern European countries: an analysis based on S&T indicators, Research Policy, 28, pp. 351-376.

www.vyzkum.cz (Czech national page on R&D)