

**Study no. 4**

**PERFORMANCE IN THE CONTEXT OF  
THE LISBON AGENDA:  
SUCCES STORIES, INSTITUTIONAL  
DESIGN**

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*The authors thank Raluca Mitrea for her research assistance and Gabriela Dragan and Marius Spiridon for their comments and suggestions on an earlier draft.*

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## **Introduction**

The Lisbon Agenda is the most important European development project, the reflection of strategic thinking in terms of economy and society at community level. Initially thought to help Europe become “the most competitive knowledge-based economy” until 2010, in March 2005, only halfway to its deadline, the Lisbon Agenda underwent a revision which has shifted its focus to economic growth based on technological progress and labour force participation. Still, the research, development and innovation activity remains the most well-known component of the Lisbon Agenda, and its main key action, which bears attached the most prominent of all concrete targets of the Agenda. This refers to the commitment made by EU member states<sup>1</sup> to spend 1% of GDP for R&D from public sources and to facilitate private spending for R&D amounting to 2% of GDP.

This paper aims at analysing the performance of the EU-27 countries (the current 25 members, plus Romania and Bulgaria) in the context of the Lisbon Agenda, especially regarding the target set for public and private spending destined to research and development, while considering all matters from an institutional perspective. Thus, the following question arises: does the national institutional design for research and development activities matter in achieving the Lisbon Agenda targets, and if so, which are the lessons Romania can learn and apply in order to successfully implement the Lisbon Agenda?

According to the founding treaties of the EU, and also to the European Constitution, now undergoing the process of being signed, the research and development activity belongs to the category of “shared” or “parallel” competences between the EU and member states<sup>2</sup>, in the sense that the exercise of the EU’s competences cannot prevent member states from exercising their own. National implementation of the Lisbon Agenda, and coordinating efforts at community level, has become increasingly important after the revision of the Lisbon Agenda. There is a diversity of national experiences in what regards the implementation framework of the Lisbon Agenda, just as well as a diversity of performances in achieving the Lisbon Agenda targets. In brief, this paper aims at testing whether a correlation between national institutional design and national performances exists in the context of the Lisbon Agenda.

This paper is structured as follows: the first section renders a synthetic presentation of Romania’s results in comparison to the Lisbon Agenda objectives; the second part debates the reform underwent by the Lisbon Agenda from the institutional perspective; the third part deals with the national implementation of the Lisbon Agenda, summarizing the institutional framework existent in each country and the recent institutional changes; the fourth part describes the econometric model used, the tested variables and it interprets the results; the last section offers suggestions regarding the consolidation of the Romanian institutional framework – based on the analysis performed, aimed at improving Romania’s performance in the context of the Lisbon Agenda.

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<sup>1</sup> This commitment has also been undertaken by Romania through the Accession Treaty.

<sup>2</sup> The other types of competences are: exclusive, common, coordinated.

This paper is not intended to be exhaustive, especially that the Lisbon Agenda topic is relatively new in Europe, and it has been only recently discovered and explored in Romania by a series of elaborate studies<sup>3</sup>. This paper does not contain a detailed analysis of Romania's performance regarding the Lisbon Agenda indicators, particularly at sector level; it does not focus on potential regional differences in implementing the objectives of the Lisbon Agenda, within each member state; it does not make reference to the evaluation mechanisms of national policies regarding the Lisbon Agenda (not without justification)<sup>4</sup>; it only tests as dependent variables those related to the research and development activity (which represent only a part of the Lisbon Agenda focus); and it does not doubt the relevance of Lisbon Agenda targets for Romania (although it probably should, taking into consideration the large development gap between Romania and the EU).

Given these limitations, the paper does approach a theme of current interest in the international economic literature, trying to explain what went wrong in the implementation of the Lisbon Agenda up to now, at European level, and what could be improved. Romania and Bulgaria are fully integrated in this analysis, which is performed at the level of EU-27. The final goal of the paper is that of formulating recommendations regarding the reform of the Romanian institutional framework, as part of the national effort to adapt to and comply with the Lisbon Agenda targets. We do not state that the current institutional framework is necessarily inappropriate or inefficient – but we do try to determine whether, after an eight year period, a model has emerged at the European level to better answer the needs of the Lisbon Agenda.

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<sup>3</sup> The Group of Applied Economics published three editions of the report “Romania and the Lisbon Agenda” (March 2004, November 2004 – together with the Romanian Center for Economic Policies, and October 2005).

<sup>4</sup> Firstly, the evaluation instruments are still scarce, sporadic and relatively recent in member states' practice. Secondly, we presume that institutional changes, when they happen, are brought about by a negative review of the previous institutional framework's efficiency (so there is an ex-post efficiency evaluation, materialized in a change of the institutional design's structure).

## 1. Romania and the Lisbon Agenda

The European Union does not have a unitary performance as regards the Lisbon Agenda targets. The Scandinavian countries are best achievers by far, while the new ten member states lower the community average for most indicators.

There are several evaluations of the accomplishment of the Lisbon Agenda objectives, which also include Romania's performance. These evaluations are based on distinct approaches, which exceed and transform structural indicators in various specific categories.

One approach is undertaken by the World Economic Forum, which replaces the European Commission's structural indicators with its own qualitative proxies, based on surveys conducted among company managers.

*Table 1. Performance within the context of the Lisbon Agenda, World Economic Forum methodology (on a scale from 1 –minimum to 7-maximum).*

Country	Place	Score	Information society	Innovation and research	Liberalization	Industrial networks	Financial services	Enterprises	Social inclusion	Sustainable development
EU-15										
Finland	1	5.90	5.78	5.97	5.36	6.33	6.13	5.49	5.36	5.97
Greece	15	4.00	3.16	3.44	3.96	4.99	4.74	3.78	3.90	4.00
New member states -10										
Estonia	1	4.64	4.92	3.92	4.40	4.09	5.43	4.90	4.20	4.44
Poland	10	3.68	2.95	3.53	3.75	4.00	4.26	4.56	3.42	3.99
Accession countries										
Romania	26	3.35	2.91	2.98	3.04	3.49	3.77	3.65	3.74	3.33
Bulgaria	27	3.25	2.66	2.94	3.26	3.54	3.64	3.81	3.07	3.08
Romania's ranking			25	27	27	27	26	25	24	26

Source: adapted from World Economic Forum (2004), Lisbon Review 2004

According to data in Table 1, Romania ranks last in EU-27 regarding innovation and research. This ranking supports our decision to focus in this paper on the research and development spending (as dependent variable), since this is the category which

requires the greatest leap, if we are to catch up with the European Union. Romania ranks somewhat better with respect to social inclusion, and it overpasses Bulgaria for most indicators.

A different approach is used by the Centre for European Reforms in London, which assigns grades in concordance with the level of fulfilment of the main structural indicators monitored by the European Commission. Romania belongs to a numerous group of countries, which have only reached one target (out of the 17 analysed).

*Table 2. Performance within the context of the Lisbon Agenda, CER methodology*

Country	Number of Lisbon Agenda targets met (out of a total of 17 quantifiable targets)
Sweden	12
Denmark	9
UK, Finland	7
Netherlands	6
Austria, Portugal, Cyprus	5
Estonia, Lithuania	4
Germany, France, Spain	3
Slovenia, Latvia, Czech Rep., Slovakia, Italy, Poland	2
Luxembourg, Ireland, Belgium, Hungary, Romania, Bulgaria, Malta	1
Greece	0

Source: Centre for European Reform (2005), Lisbon Scorecard V

On average, in this classification, Romania ranks 25<sup>th</sup> for indicator fulfilment and 26<sup>th</sup> for progress recorded since the launching of the Lisbon Agenda. The greatest progress in recent years appears to have been marked by three transition countries (Hungary, Bulgaria, Latvia), a fact which could represent a stimulus and an example to be followed by Romania.

Still, it is worth mentioning again that the vast majority of the EU-27 countries do not fulfil, at halfway mark (year 2005), a mere third of the targets set for 2010.

The classic approach is still that of structural indicators. The European Commission identifies 14 key-indicators, presented in Table 3 below. We compare Romania's performances to the European average, as well as to cohesion countries (Greece, Portugal, Spain), new member states (Poland), accession countries (Bulgaria).

*Table 3. Key structural indicators, international comparison, latest year available*

	EU 25	EU 15	Romania	Bulgaria	Poland	Greece	Portugal	Spain
GDP per capita in PPP <sup>5</sup> , EU25=100	100	109.0	32.9	31.1	47.9	82.3	74.8	98.4
Labour productivity per person employed, EU25=100	100	106.6	37.4	31.8	60.7	97.5	68.8	99.3
Employment rate <sup>6</sup>	63.3	64.7	57.7	54.2	51.7	59.4	67.8	61.1
Employment rate of older workers <sup>7</sup>	41.0	42.5	36.9	32.5	26.2	39.4	50.3	41.3
Youth education attainment <sup>8</sup>	76.7	73.8	74.8	76.0	89.5	81.9	49.0	61.8
Gross R&D expenditure, % GDP	1.95	2	0.4	0.5	0.59	0.62	0.79	1.11
Comparative price levels, EU25=100 <sup>9</sup>	100	104	40.5	42.1	53.3	84.3	79.5	85.6
Business investment <sup>10</sup>	17.1	17.0	19.1	17.8	14.8	21.4	18.4	24.3
At risk-of-poverty rate <sup>11</sup> , after social transfers	15	16	18	13	17	21	19	19
Long-term unemployment rate <sup>12</sup>	4.0	3.3	4.2	7.1	10.2	5.6	3.0	3.5
Dispersion of regional	13.0	12.0	3.5	6.8	7.2	3.6	3.9	8.9

<sup>5</sup> PPP stands for Purchasing Power Parity

<sup>6</sup> Employed persons aged 15-64 as a share of the total population of the same age group

<sup>7</sup> Employed persons aged 55-64 as a share of the total population of the same age group

<sup>8</sup> Percentage of the population aged 20 to 24 having completed at least upper secondary education

<sup>9</sup> Comparative price levels of final consumption by private households including indirect taxes

<sup>10</sup> Gross fixed capital formation by the private sector, % GDP

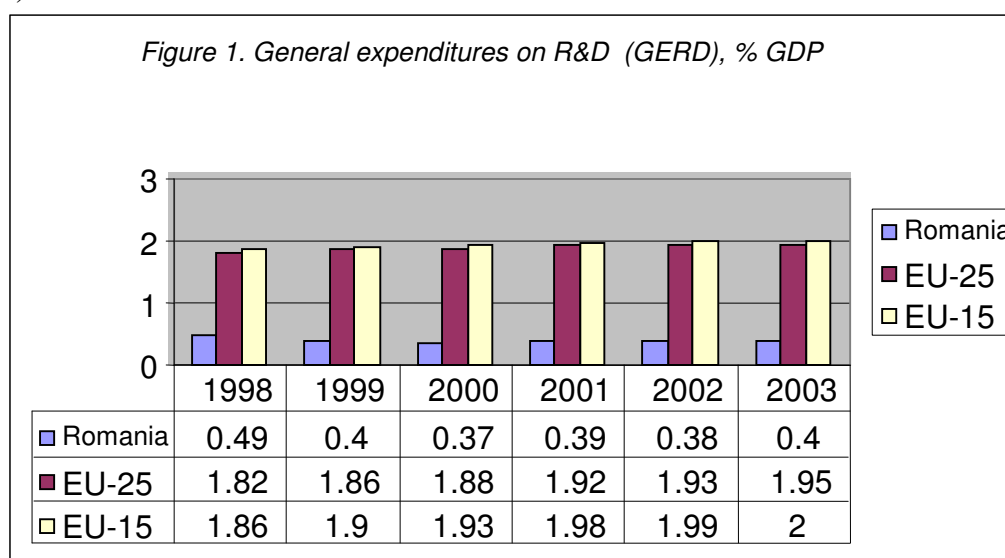
<sup>11</sup> The share of persons with an equivalised disposable income below the risk-of-poverty threshold, which is set at 60% of the national median equivalised disposable income

<sup>12</sup> Long-term unemployed (12 months and more) as a percentage of the total active population

employment rates <sup>13</sup>								
Greenhouse gas emissions <sup>14</sup>	92.0	98.3	53.9	50.0	67.9	123.2	136.7	140.6
Energy intensity of the economy <sup>15</sup>	209.5	190.8	1386.5	1756.2	663.1	250.1	251.3	226.6
Volume of freight transport <sup>16</sup>	99.7	100.6	95.4	35.0	78.4	122.7	118.3	139.2

Source: adapted from Eurostat, Structural Indicators, Spring 2005

Regarding the research and development objectives, the main structural indicator is represented by total research-development spending, as percent of GDP. During recent years, EU has registered much too slow progress compared to the 3% of GDP target to be reached until 2010, achieving only 2% in 2003. Of course, high discrepancies exist among EU members related to both shares (Finland and Sweden have over 3%), and growth paces (Ireland registered the fastest rhythm). However, it is clear that Romania has had an over 5 times smaller share than the EU average, as well as a slower growth rhythm. In fact, the share of total spending in GDP has almost stagnated over the period 1999-2003. We can thus notice that the delay between Romania and EU has increased since the launching of the Lisbon Agenda (see Figure 1).



<sup>13</sup> Coefficient of variation of employment rates (of the age group 15-64) across regions (NUTS 2 level) within countries

<sup>14</sup> Percentage change since base year. The target according to Kyoto Protocol/EU Council Decision for 2008-2012 - (in CO2 equivalents) is 92.0 by 2010

<sup>15</sup> Gross inland consumption of energy divided by GDP (at constant prices, 1995=100) - kgoe (kilogram of oil equivalent) per 1000 Euro

<sup>16</sup> Index of inland freight transport volume relative to GDP; measured in tone-km / GDP (in constant 1995 Euro), 1995=100



Note: Data for EU-15 are from 2003, and data for Romania are from 2004

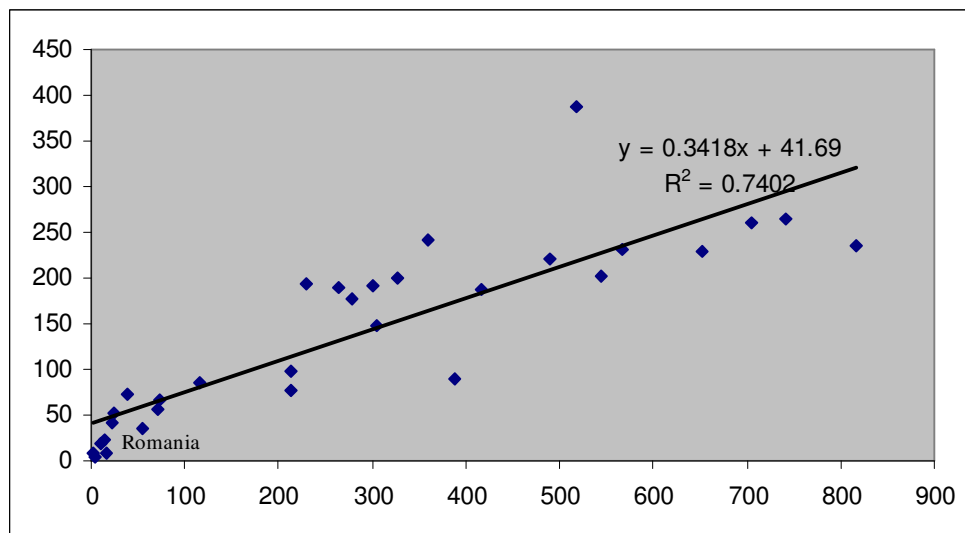
Source: authors, based on Eurostat and INS

Table 3 justifies our choice to focus our analysis on the institutional determinants of the research-development spending, as this represents one of the structural indicators in which Romania registers the lowest performance. It is true that in the 2006 budget a greater share of public research-development spending has been granted, i.e. 0.4% of GDP, which, on the whole, could lead to 0.6% GDP general research and development expenditures. But the efficiency of these funds is a totally different story.

First, the mobilization effect produced by public funds on the private ones is almost insignificant in Romania (much under the regression slope), as opposed to OECD countries (see Figure 2).

Second, public funding is increasingly directed to fundamental research, which is not fit to stimulate cooperation between universities (research institutes) and industry. Industrial research had dropped, as a share of governmental research and development spending, from 35% in 2000 to 17% in 2003. Also, out of the total 460 projects carried on in Romania within EU framework programs FP4 and FP5 (158 projects, out of which 10 had Romanian coordinators – in FP4, respectively 302 projects, out of which 40 had Romanian coordinators – in FP5), only 3 (three) industrially exploitable results were identified.

*Figure 2. Public and private R&D expenditures, OECD plus Romania*



Source: Voinea, 2004

## **2. The Lisbon Agenda reform – the institutional perspective**

At mid-term, the Lisbon Agenda proved to be more of a “wishful thinking” rather than reality. Europe did not catch up with the US in terms of competitiveness, and the government R&D spending increased only marginally (the public ones from 0.8% of GDP in 1999 to 0.86% of GDP in 2003). Under the pressure of the lack of results, the Lisbon Agenda was reshaped, benefiting from what was called “a new start” (European Commission, 2005). The new Lisbon Agenda now pursues three major objectives:

- Promote economic growth based on knowledge and innovation;
- Make Europe a more attractive place for investment and labour;
- Offer more and better jobs.

Thus, research, development and innovation remains at the core of the Lisbon Agenda, as a factor for economic growth. The European Commission has actually identified eight key actions in the context of the Lisbon Agenda, the first place being held by “the support for research and development”.

One of the most debated ways to support research and development is institutional reform. The role played by institutions in the success of major European projects cannot be denied – the most recent example being the institutional construction needed, at both community and national level, for the introduction and functioning of the single European currency.

Internal institutional infrastructure represents an important variable for integration in general and for the pressures of adjusting to the Europeanization process (Paraskevopoulus and Rees, 2002). Institutions matter, by means of all their functions – regulation, cognitive and normative – and at all governmental levels. Companies do not innovate in isolation, but within a system; the particularities of this system are essential to the innovation performance (Smits and Kuhlmann, 2004); the same authors consider that the role of systemic instruments in the innovation policy – including here institutional mechanisms – is growing.

Institutional reform is important for managing the convergence to European policies and efficient governmental research and development structures are particularly needed for converging to the Lisbon Agenda targets (Stankiewicz, 2003).

The Kok report (November 2004) recommends a series of measures meant to correct the lack of national involvement in the Lisbon strategy, to ensure the coherence of the policy mix and to involve all stakeholders. Among these recommended measures we emphasize the following:

- Formulating a national action plan;
- Setting a national timeline, including milestones related to the achievement of the Lisbon targets;

- Appointing, in each country, a member of the government to coordinate the day-to-day implementation of the Lisbon Agenda objectives<sup>17</sup>;
- National parliaments should take the initiative in what concerns the Lisbon Agenda, by debating public policies dedicated to this purpose;
- A more active involvement of social partners in designing and realizing the national action plan.

Leaving aside the motivation and impact of each of these recommendations considered alone, all these recommendations refer to institutional reform, and they all aim at making changes at national level. Hence, the issue of reforming the national institutions designed to implement European policies (including the Lisbon Agenda) is an issue of current interest and relevance within the EU. To this effect, the Trendchart Report published by the European Commission (2004) comprises a series of recommendations regarding the governance of the innovation policy, among which we mention:

- The need to ensure the coordination and efficiency of the innovation policy, either through a competent and result-oriented central structure, or through a density of flexible agencies and councils;
- The need to accompany functional institutions with functional policies, especially by using periodical evaluation instruments and benchmarking.

Furthermore, the Sapir Report (June 2005) underlines the same idea: the necessity of better economic governance for the success of the Lisbon Agenda, which implies:

- A clearer governance system at all levels;
- More efficient institutions, including those at member states level;
- More efficient mechanisms, focusing on EU's role as a facilitator.

The efficiency of institutions at member states' level is once again mentioned as an important factor, which also supports our endeavour – to assess which is the role of the institutional design in the performance of Lisbon Agenda indicators, and to point out best practices in this field achieved by members of the European Union.

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<sup>17</sup> This recommendation makes part of a new re-regulation trend which appears to be manifesting within the EU. A recent example to support this statement is represented by the appointment of a special coordinator for each of the trans-European infrastructure projects considered to be of utmost priority.

### **3. The Lisbon Agenda implementation**

The European Commission (2004) identifies three main categories of national governance structures existing among EU-25 in what regards the research, development and innovation activity, namely:

- A more modern and dynamic approach, in which innovation is a transversal component of public policy and which requires coordination and cooperation; this approach is frequent in Scandinavian countries;
- A traditional approach, which appoints distinct roles to education and/or teaching ministries (considering innovation to be the expected result of the research-development activity), respectively to economy and/or industry ministries (for which innovation represents a means of encouraging and supporting SMEs); Germany, the Netherlands, but also Spain and Portugal are rather characterized by this approach;
- A series of special cases, with numerous particularities which are quite difficult to reproduce (the United Kingdom, France, Belgium, Greece).

Romania and Bulgaria are regarded as special cases, which do not replicate one model only. However, the European Commission (2004) considers that Romania joins a group of countries – comprising Greece, Portugal, Poland, and Spain – in which public policies place a greater focus on fundamental or academic research than on industrial innovation.

Nevertheless, there is a rich diversity of national innovation systems within the EU. Our research has led to the result that, at the mid of the year 2005, the aggregated situation in EU was as follows:

- 6 countries have had a national strategy for Lisbon;
- 24 countries have had a national strategy for research and development;
- 4 countries have had a distinct ministry for research-development-innovation;
- 21 countries have had National Councils for research and development with public stakeholders; 6 of these councils have also had private stakeholders; 1 country has had a National Council for research and development with private stakeholders only;
- 23 countries have had an inter-ministerial structure which coordinates the research and development activity; 10 of these are coordinated by the Prime Minister, and the remaining 13 by a line minister;
- All 27 countries have had consultative commissions for research and development; in 21 of these countries, the commission subordinated to a ministry; 12 of them also have independent commissions which function in parallel; 6 countries have had only independent consultative commissions;

- All 27 countries have public implementation agencies; 12 countries also have mixed or private agencies for the implementation of the research and development policy.

Annex 2 presents a synthetic table regarding the governance of the national innovation system for each country of EU-27, realized on the basis of a single set of institutional benchmarks.

The European Commission (2004) considers that five trends in the research-development-innovation activity can be observed at the European level: efforts to increase human resources abilities and to enhance the national and international flows of skills; a more active role played by regions in implementing the objectives of the Lisbon Agenda; an increasing stimulation of private investment in innovative activities; the growing focus placed on the regulatory framework, on governmental orders for research-development and on factors which influence the business environment between member states; the creation of partnerships which may widen the level of involvement of all stakeholders of the national innovation system in member states. The last two of the five trends have an institutional nature and reflect the growing role institutional related initiatives can have on stimulating the research, development and innovation activity.

Along the same line, in our analysis, we have identified a series of recent changes in the institutional framework concerning research, development and innovation. Table 4 describes some of the institutional changes for Lisbon recently introduced in the EU-27 countries, while Table 5 presents a series of indirect fiscal and financial measures recently introduced in EU-27 to stimulate the research, development and innovation activity.

*Table 4. Recent institutional evolution within the EU, in order to implement the Lisbon Agenda*

Country	Institutional evolutions
Austria	The Inter-ministerial Council for Development, Research and Innovation, initially created by merger and then transformed into an independent council (2004); recent programs to support the trading of innovative ideas;
Belgium	Timeline for reaching the Lisbon Agenda targets agreed and accepted by the central government and regional governments (2004).
Bulgaria	The Program for Sciences, Technology and Innovation (2004).
The Czech Republic	The National Strategy for Innovation (2004).
Denmark	The Initiative for the Innovation Consortium (2004); Law to facilitate the transfer of research results between universities and industry (universities are allowed to found Limited Responsibility Societies to trade innovations created in their laboratories).

France	The founding in 2005 of the National Agency for Research and of the National Agency for Industrial Innovation.
Germany	A series of strategic plans have appeared, among which: The 2010 Agenda (2003), Information Society Germany (2003), High-tech MasterPlan (2004); The emergence of initiatives to support research through social partnerships (Partners for Innovation – 2004) and through partnerships between the academic and industrial environment (Competence Centers for Innovation – 2004); The State has financed important risk funds for innovative SME.
Greece	The introduction of the Greek Technology Foresight Programme, in order to support a strategic vision on research.
Ireland	In 2003, the High Level Steering Group (inter-ministerial) was formed, with the role of supervising the implications of public research and development policies, and also the Enterprise Strategy Group was founded, formed by representatives of the business environment, with the aim of promoting industrial innovation.
Italy	The Action Plan for Innovation in Enterprises (2003);
Latvia	The founding of the Innovation Department within the Economy Ministry (2003).
Great Britain	A new strategic plan for innovation (2004), entitled the Framework for Investment in Innovation 2004-2014, through which the strategic vision regarding research and development is consolidated.
The Netherlands	The creation (through merger) of a single agency in charge with implementing innovation policies.
Poland	The Bill for Financing Science (2005); the founding of the Council for Science, as a consultative body (2005).
Portugal	Placing the focus on risk funds destined to innovative enterprises (the new policy regarding enterprises development, 2005).
Slovenia	The National Strategy for Lisbon (2005).
Spain	Renouncing to a distinct ministry for science and technology (2004).
Hungary	The founding of the Fund for Research and Technological Innovation (2004), based on firms' contribution (0.3% of turnover until 2006).

Source: multiple national sources and Trendchart reports.

*Table 5. Indirect fiscal and financial measures recently adopted by EU countries in order to stimulate research-development*

Country	Indirect fiscal and financial measures
Austria	Subsidized interest credits for applied research.

France	New fiscal measures supporting RDI, introduced through the Innovation Plan (2004) include: fiscal credit for research (for 5% of expenditures and for 45% of expenditures' increase); multiple cuts for recently founded SMEs, whose research-development spending amount to 15% of their total expenditures.
Greece	Supporting fiscal measures introduced in 2002, among which: fiscal credit for up to 50% of R&D expenditures at company level.
Ireland	Fiscal credit for 20% of the increase of R&D expenditures at company level.
Italy	Recent fiscal measures, among which the deduction of R&D expenditures from the tax base.
Great Britain	Fiscal credit of 150%, for SMEs, and 125%, for large enterprises, of R&D expenditures.
Portugal	Since 2003, the reserve for research-development related investment has been introduced, allowing companies to withhold up to 20% of the profit tax in order to make research and development investments during the following two years.
Hungary	Total deduction of research-development spending, fiscal credit for reserves of research-development related investment.

Source: multiple national sources and Trendchart reports.

It could be worth noting that, by elaborating National Development Plans, which are part of the budgetary programming process for Structural Funds, the cohesion countries (Greece, Portugal, Spain) and the new member states (the 10 countries that joined the Union in 2004) have created research-development strategies by default.

#### **4. The econometric model**

The panel data are of the following type:

$$Y_{it} = \beta_{1i} + \sum \beta_{ki} X_{kit} + \varepsilon_{it}$$

where:  $i = 1, \dots, N$  represents the number of units (countries)

$t = 1, \dots, T$  represents the number of years,

$k = 1, \dots, K$  represents the number of explanatory variables, the first one being the constant,

$Y_{it}, X_{kit}$  represent the dependant, respectively the explanatory variables,

$\varepsilon_{it}$  are the residuals.

There are a number of reasons why one econometric model is used instead of  $i$  models. First, for studies that aim at associating institutions and/or policies to certain situations, the panel data are needed because in some cases the dependent variable changes either during the time period analyzed, or between countries surveyed. Second, when data series for a group are not long enough, it might be that the number of explanatory variables exceeds the number of years with statistical observations. In these circumstances, the only way to obtain statistically significant results is to introduce other groups, which would increase the number of degrees of freedom (we have now NT observations) without increasing the number of restrictions.

We mentioned above the chance that an econometric relation does not exist, when

$\beta_{k1} \neq \beta_{k2} \neq \dots \neq \beta_{ki}$  for all  $i = 1, \dots, N$  and  $k = 1, \dots, K$ . In this case there is no reason to add data, since one could estimate  $i$  independent equations. When a common relation exists for all groups, the model can be written as follows:

$$Y_{it} = \beta_1 + \sum \beta_k X_{kt} + \varepsilon_{it}$$

On many cases, especially when country panels are involved, if individual characteristics can not be captured by the explanatory variables, panels with fixed effects are used. This means that, instead of having only one constant for the whole time series, we will have one free element for each group<sup>18</sup>.

The equation above can be estimated using the least squares method, if the validity hypothesis are satisfied:

- there is a linear relationship between the dependent variable and the independent ones,
- $Y$  and  $X$  are normally distributed,

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<sup>18</sup> In fact, the model is estimated as deviations from the median, hence the constant disappears.



- there is no correlation between errors and the explanatory variables,
- the errors are normally distributed<sup>19</sup>:  $\varepsilon_{it} \sim N(0, \sigma)$ .

In general, the errors do not satisfy the normality condition, they can be serially correlated within the same group, can have a different variation from one group to another (heteroskedastics), or can be correlated between groups (errors from group  $i$  at time  $t$  are correlated with errors from group  $j$  at time  $t$ ).

When the hypotheses are not satisfied, the OLS estimator can not be used. When errors do not satisfy the normality condition, but the other hypothesis are satisfied, we use OLS for estimating coefficients and alternative models for estimating the variation of coefficients.

We tested two dependent variables: GERD (total expenditures on research and development, including public/government and private/business expenditures, as per cent of GDP) and BERD (business expenditures on research and development, as per cent of GDP). We have selected these two dependent variables also given the controversial relationship between the public and the private expenditures. Are they complementary or inter-changeable? Guellec and Pottelsberghe (2003) reported a negative correlation between private and public expenditures, while Von Tunzelmann and Martin (1998) reported positive correlation. Garcia-Quevedo (2003) undertook a meta-analysis of the econometric studies on the relationship between the public and private R&D spending and found a number of 24 studies on this topic; 13 of them reported complementarity between the two variables, 5 reported inter-changeability, and 6 found no significant correlation. To avoid such problems, we tested the model both with and without public expenditures.

The explanatory variables are of two types:

- Institutional variables.

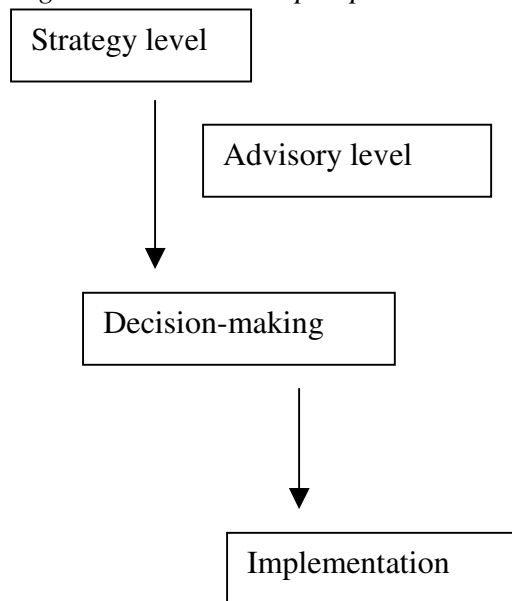
The institutional variables (each line in annex 2 tables represented one variable) were dummies, taking 1 or 0, depending on whether or not a certain institution existed. Unger and Zagler (2000) confirmed the importance of institutional determinants. We looked into a series of institutional variables, based upon our holistic (integrated) perspective on national innovation systems.

The institutional variables selected are: the national strategy for Lisbon and/or for research and development; the national target for Lisbon; the inter-ministerial structure (run by respective ministry or by the prime-minister; the existence and functioning mode of a National Council for Lisbon and/or for research and development; the existence and functioning mode of some advisory commissions; the administration of EU funds for R&D; the nature of the implementing agencies; the existence of venture capital funds for R&D co-financed by the state. For another institutional variable, namely the regional development of R&D through regional centers and hubs, we could not find a sufficient number of observations.

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<sup>19</sup> This hypothesis has a double implication. On the one hand, the errors have to have the same variation, while on the other hand they must not be correlated between themselves.

*Figure 3. The holistic perspective on national innovation systems*



Source: the authors

- The “hard” variables.

We have not intended to test these variables, as the focus of our work was on testing the institutional variables. Thus, we selected those “hard” (statistical) variables for which we found support in other cross-country econometric studies. However, we were unable to find annual data for the whole period of time analyzed for a series of variables which are usually approximated by surveys, such as: the intellectual property protection (correlation confirmed by Varsakelis, 2001; Lederman and Maloney, 2003; Kanwar and Evanson, 2003); the level of university-industry cooperation (confirmed by Lederman and Maloney, 2003 and Falk, 2003); the quality of academic institutions (confirmed by Lederman și Maloney, 2003). What we found data for, and what we used in our model, were the following explanatory variables: the GDP growth rate (confirmed with plus by Gustavsson and Poldahl, 2003 and with minus by Lederman and Maloney, 2003); labour productivity, as a proxy for competition (confirmed with plus by Gustavsson and Poldahl, 2003 and Griffith and Harisson, 2004); the degree of specialization, proxied by the share of technology-intensive exports in total exports (confirmed with plus by Romer, 1990; Caballero and Jaffe, 1993; Bebczuk, 2002); the human capital, proxied by either science and technology graduates<sup>20</sup> or public expenditures on education<sup>21</sup> (confirmed with plus by Romer, 1990; Kanwar and Evanson, 2003; Falk, 2004; Bebczuk, 2002); the gross fixed capital formation (confirmed with minus by Bebczuk, 2002); the trade intensity (confirmed with plus by Reinthaler and Wolff, 2004 and with minus by Bebczuk, 2002).

<sup>20</sup> When the dependent variable is GERD

<sup>21</sup> When the dependent variable is BERD

In the various scenarios tested, we had between 120 and 140 observations. In the two scenarios reported, the number of observations fit within these margins. The sample includes 27 countries, over an 8 years period (1997-2004).

We used the generalized least squares method, and we assumed that the variation of errors differs between groups (i.e. errors are heteroskedastics). We only kept the observations that are complete as regards the variables used in the model.

Chi2 test = 0.0000 This is the test that checks the model specification, which is the probability that all coefficients are zero. One can note that this test is rejected even at the 1% level.

- Dependent variable: GERD

*Table 6. testing the model with dependent variable GERD*

Estimated covariances = 26	Number of obs = 132
Estimated autocorrelations = 0	Number of groups = 26
Estimated coefficients = 17	Obs per group: min = 1
Wald chi2(16) = 2876.42	
Log likelihood = 38.35771	Prob > chi2 = 0.0000

GERD	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
Lisbon strategy	-0,41172	0,288351	-1,43	0,153	-0,976875 0,153441
R&D strategy	0,090977	0,03695	2,46	0,014	0,0185566 0,163398
R&D target	-0,17755	0,054327	-3,27	0,001	-0,284025 -0,07107
Inter-governmental structure coordinated by PM	-0,13426	0,040737	-3,3	0,001	-0,214108 -0,05442
Distinct ministry	0,083253	0,045928	1,81	0,07	-0,006763 0,17327
National Council – public (missing variable: private)	-0,11647	0,039256	-2,97	0,003	-0,193406 -0,03952
Advisory Commission – under ministry (missing variable: NGOs)	-0,08955	0,037211	-2,41	0,016	-0,162486 -0,01662
Advisory Commission – business associations	-0,11949	0,046649	-2,56	0,01	-0,21092 -0,02806
Implementing Agency – mixed (missing variable: public)	-0,32545	0,087166	-3,73	0	-0,496287 -0,15461

Implementing Agency - private	0,051162	0,051825	0,99	0,324	-0,050414	0,152738
Venture capital co-funded by state	0,140697	0,088614	1,59	0,112	-0,032984	0,314378
Labour productivity	0,009318	0,001721	5,41	0	0,005944	0,012691
Trade intensity	-0,00084	0,001263	-0,66	0,506	-0,003314	0,001636
EPO patents	0,007751	0,000335	23,14	0	0,0070943	0,008407
Foreign investment intensity	-0,0124	0,005501	-2,25	0,024	-0,023181	-0,00162
New member states	0,301875	0,114171	2,64	0,008	0,0781043	0,525646
Constant	0,076078	0,15281	0,5	0,619	-0,223425	0,375581

- Dependent variable: BERD

*Table 7. Testing the model with dependent variable BERD*

Estimated covariances = 26	Number of obs = 123
Estimated autocorrelations = 0	Number of groups = 26
Estimated coefficients = 18	Obs per group: min = 1
Wald chi2(17) = 4832.35	
Log likelihood = 73.72441	Prob > chi2 = 0.0000

BERD	Coef.	Std. Err.	z	P> z	[95% Conf.	Interval]
Lisbon strategy	-0,31117	0,200124	-1,55	0,12	-0,703406	0,081066
R&D strategy	0,157724	0,029095	5,42	0	0,100699	0,214748
R&D target	-0,15329	0,034913	-4,39	0	-0,221713	-0,08486
Inter-governmental structure coordinated by PM	-0,08006	0,032139	-2,49	0,013	-0,143056	-0,01707
Distinct ministry	0,121449	0,041251	2,94	0,003	0,040598	0,202299
National Council – public (missing variable: private)	-0,14961	0,035428	-4,22	0	-0,219047	-0,08017
Advisory Commission – under ministry (missing variable: NGOs)	-0,04428	0,024524	-1,81	0,071	-0,092342	0,003791
Advisory Commission – business associations	-0,01339	0,028559	-0,47	0,639	-0,069366	0,042585
Implementing Agency – mixed (missing variable: public)	-0,18372	0,055199	-3,33	0,001	-0,291904	-0,07553
Implementing Agency - private	0,07599	0,037629	2,02	0,043	0,0022384	0,149742
Venture capital co-funded by state	-0,12724	0,049437	-2,57	0,01	-0,224139	-0,03035
Labour productivity	0,006237	0,001267	4,92	0	0,0037544	0,008719
Trade intensity	-0,00121	0,001142	-1,06	0,287	-0,003453	0,001023
EPO patents	0,006206	0,000234	26,55	0	0,0057476	0,006664
Foreign investment intensity	-0,01092	0,004255	-2,57	0,01	-0,019264	-0,00259
Public spending on education	0,02492	0,013117	1,9	0,057	-0,000789	0,050628
New member states	0,177518	0,091616	1,94	0,053	-0,002045	0,357082
Constant	-0,26692	0,109335	-2,44	0,015	-0,481211	-0,05262

It can be remarked that the “hard” variables introduced confirm the initial hypothesis, and they all have a significant impact on the two dependent variables tested. However, our focus stays on the institutional explanatory variables.

For the regression with the dependent variable GERD, the existence of a strategy for research and development proved to be positively and significantly correlated. Contrary to what one may have expected, the existence of a Lisbon strategy and a

specific Lisbon target at national level does not have a positive effect (quite the opposite, they appear with a negative sign). A possible explanation might be that precisely the laggard countries in terms of the Lisbon targets were more eager to implement Lisbon strategies. Moreover, only the countries underperforming with respect to the Lisbon target for R&D expenditures might have been needed to set explicit targets. The more advanced countries, the Scandinavian ones, have already exceeded that target even before it was set. An R&D strategy, on the other hand, might be an indicator of the fact that those countries made a priority out of the development of R&D activity, a priority that may have started previous to the Lisbon Council.

The results show that higher GERD are positively correlated with the existence of a distinct R&D ministry and with the coordination of the administrative (inter-ministerial) relevant structure by the line ministry, rather than by the Prime Minister. The existence of private institutional structures is beneficial to increasing R&D expenditures, as follows: a national public council is associated with lower GERD; as for the advisory commissions, the public ones lead to worst results, while the best results are associated with academic/NGOs commissions. The situation is somehow changed for the implementation agencies, as the mixed ones are less efficient, while the private and public one are more efficient. The existence of a venture capital fund is also positively correlated with higher GERD. To sum it up, for general expenditures on R&D, the private institutions are associated with better performances.

The results remain valid for the regression using business R&D expenditures as the dependent variable. This means that the institutions that enhance higher general R&D expenses, they also induce higher business R&D expenditures. This is an encouraging result, because otherwise it would have been difficult to choose between institutions if their effect was opposite.

The main results of the model tested can be summarized as follows:

- There is a positive correlation between the existence of a national strategy for research and development (different from the National Development Plan) and the total expenditures on research and development;
- The same is not valid as regards the existence of a national strategy for Lisbon or the existence of specific national targets for Lisbon. However, this could be explained both by the limited number of observations post-2002 (after the Barcelona Council, which actually set the European targets for the Lisbon Agenda), and by a path dependency effect;
- It is better (more effective) for an inter-governmental structure for Lisbon to be coordinated by a line ministry, rather than by the Prime Minister;
- It is better for the consultative commission to be independent (involving NGOs), rather than subordinated to a ministry;
- It is better for the National Council for Research and Development to be independent, including business and academic representatives;
- Private institutions are more associated with higher research and development expenditures (both private and total expenditures);

- Venture capital funds are correlated with higher research and development expenditures.

Of course, these conclusions must be considered with caution, while keeping in mind that each country has its own characteristics, other than those of an institutional nature, which influence the efficiency of the institutional mechanism in general and the institutional framework for research and development in particular. Nevertheless, we proved with econometric means that there are a series of common institutional aspects which facilitate the increase in research and development spending.

We are not saying that the institutional framework in Romania is wrong or ineffective *ab initio*, yet we submit the idea that, at European level, over an 8 years period, an institutional model has emerged which better responds to the needs of the Lisbon Agenda.

## **5. Interpreting the results for Romania's institutional design**

The CREST Report published in September 2005 on the Romanian innovation policy hints at a large series of shortcomings in the innovation policy, among which:

- The uncertain role and the lack of efficiency of the industrial national institutes and of those related to the Academy;
- Low interaction between universities and the industry;
- Low research and innovation capacity in the industrial sector, which is still dominated by assembling and licensing imports;
- The structure of the Academy, dominated by humanist sciences;
- The lack of involvement on the part of the business community in formulating and tracking the research development innovation strategy;
- The lack of ex-post evaluations for financed programmes and the lack of impact analysis.

Part of these malfunctioning has already been mentioned in this paper. The team that realized the CREST Report itself acknowledges that it did not have “the capacity to understand the complexity of the Romanian research, development and innovation system”. Nevertheless, the CREST Report suggests the improvement of the governance system, and of the research, development and institutional framework.

The above cited report confirms an important part of the hypotheses stated in this paper. Moreover, the econometric analysis that we realized allows us to reach a series of interesting conclusions regarding some elements of the institutional design common to the countries which have recorded better performance with respect to R&D expenditures

Interpreting our results in the context of the current Romanian institutional design, we suggest that the following public policy actions regarding the institutional framework, the governance mechanism and the support measures might help increasing the research and development expenditures in Romania (both public and private):

- Designing a national strategy for research and development, other (more detailed, with clearer responsibilities and benchmarks) than the one included in the National Development Plan. This strategy should identify not only the targets, but also the means to reach those targets, and should be widely accepted by the business and academic representatives. The strategy should clarify the position of public research institutes, which currently represent a waste of public spending (in terms of their efficiency). The strategy should identify ways to allocate budgetary resources more effectively, and should be based on multi-annual budgetary programming.
- Eliminating the overlaps between the Ministry of Education and Research and the Ministry of Economy and Commerce. There should be only one organism,



inter-ministerial, too coordinate de research activity, and this organism should be run by on eline ministry. If one wishes to build this institutional capacity on the basis of the recently established National Authority for Scientific Research, then the latter should incorporate the research activity domiciliated at other ministries and it should also represent the interface between the fundamental research and the industrial research. The existent Inter-Ministerial Council for Science, Technology and Innovation is only quasi-functional as long as it does not have decizion making attributes.

- Setting up an independent National Council for Research and Development, which should include business and academic representatives. Its role would be that of supervising the activity of the R&D responsible public authority, monitoring the general research and development activity in Romania and publishing regular reports on the performce indicators mentioned in the national strategy. We draw attention on the fact that the current initiative of establishing such a National Council under the authority of the Prime Minister is the least efficient of all alternatives - based on the experience of the EU members.
- Setting up an independent consultative commission at the strategy level. Its role would be that of conciliating the strategic vision and the funds allocation.
- It is essential that both the council and the commission finance their activity not only from public funds, but also from private contributions, so that they could secure their independence. The commissions currently operating within the Ministry of Education and Research do not comply with this condition and do not have the above mentioned attributes.
- Setting up a large venture capital fund for R&D projects, initially supported 100% by the state, while having the goal to attract up to 50% private financing in the first 2-3 years. It is important that the initial capital provided by the state be large enough. This fund could bear most of the difference between the current public R&D expenditures representing 0.4% of GDP and the 1% of GDP level to which Romania has committed itself by 2007.
- Introducing indirect financial support measures for research, development and innovation, similar to those applied in EU countries, such as deduction of R&D spending from the tax base and fiscal credit for R&D investment reserves.
- Introducing a permanent ex-ante, on-going and ex-post evaluation mechanism for the projects financed from public funds, in order to improve the efficiency of public spending on R&D and to enhance the spreading-out effect.

## Annex 1. The „hard” variables

All these variables are Lisbon structural indicators.

### General expenditures for R&D (GERD), % GDP

	1997	1998	1999	2000	2001	2002	2003	2004	2005
Belgium	1.87	1.9	1.96	2.04	2.17	2.24	2.33	:	:
Czech Republic	1.09	1.16	1.16	1.23	1.22	1.22	1.35	1.28:	:
Denmark	1.94	2.06	2.1	2.27	2.4	2.52	2.6	:	:
Germany	2.29	2.31	2.44	2.49	2.51	2.53	2.5	2.42:	:
Estonia	:	0.58	0.7	0.62	0.73	0.75	0.77	:	:
Greece	0.51	:	0.67	:	0.64	:	0.62	:	:
Spain	0.82	0.89	0.88	0.94	0.95	1.03	1.11	:	:
France	2.22	2.17	2.18	2.18	2.23	2.26	2.19	:	:
Ireland	1.28	1.25	1.19	1.15	1.15	1.09	1.12	1.20:	:
Italy	1.05	1.07	1.04	1.07	1.11	1.16	:	:	:
Cyprus	:	0.23	0.25	0.25	0.27	0.32	0.33	:	:
Latvia	0.39	0.41	0.37	0.45	0.41	0.42	0.39	:	:
Lithuania	0.55	0.55	0.51	0.59	0.68	0.67	0.68	:	:
Luxembourg	:	:	:	1.71	:	:	1.78:	:	:
Hungary	0.72	0.68	0.69	0.8	0.95	1.02	0.97	:	:
Malta	:	:	:	:	:	0.28	0.27:	:	:
Netherlands	2.04	1.94	2.02	1.9	1.89	1.72:	1.76:	:	:
Austria	1.71	1.78	1.91	1.95	2.07	2.15	2.22	2.31	2.4
Poland	0.67	0.68	0.7	0.66	0.64	0.59	0.59	:	:
Portugal	0.62	:	0.75	:	0.85	0.8	0.79	:	:
Slovenia	1.33	1.39	1.42	1.44	1.56	1.53	1.53	:	:
Slovakia	1.09	0.79	0.66	0.65	0.64	0.58	0.57	0.53:	:
Finland	2.71	2.88	3.23	3.4	3.41	3.46	3.48	3.51:	:
Sweden	3.55	3.62	3.65	:	4.27	:	3.98:	:	:
United Kingdom	1.82	1.81	1.85	1.85	1.89	1.87	1.88:	:	:
Bulgaria	0.51	0.57	0.57	0.52	0.47	0.49	0.5	:	:
Romania	:	0.49	0.4	0.37	0.39	0.38	0.4	:	:

### Public expenditures on R&D, % GDP

	1997	1998	1999	2000	2001	2002	2003	2004	2005
Belgium	0.53	0.55	0.56	0.56	0.57	0.54	0.53		
Czech	0.40	0.41	0.43	0.49	0.48	0.47	0.48	0.46	
Denmark	0.75	0.73	0.77	0.76	0.75	0.77	0.78		
Germany	0.75	0.74	0.74	0.74	0.76	0.78	0.77	0.73	
Estonia		0.47	0.53	0.48	0.48	0.52	0.55	0.54	
Greece	0.38		0.48		0.43		0.41		
Spain	0.42	0.42	0.42	0.44	0.45	0.47	0.48		
France	0.83	0.82	0.80	0.82	0.82	0.83	0.83		
Ireland	0.37	0.35	0.33	0.32	0.35	0.35	0.39	0.43	
Italy	0.53	0.55	0.53	0.54	0.55	0.58			

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Cyprus		0.20	0.20	0.20	0.22	0.26	0.25		
Latvia	0.30	0.32	0.31	0.27	0.26	0.25	0.25		
Lithuania	0.52	0.54	0.49	0.46	0.48	0.56	0.54	0.60	
Luxembourg				0.13	0.16		0.20		
Hungary	0.42	0.42	0.41	0.45	0.57	0.66	0.56		
Malta						0.21	0.19	0.20	
Netherlands	0.93	0.89	0.88	0.79	0.79	0.76	0.74	0.74	
Austria		0.65				0.69			
Poland	0.41	0.40	0.41	0.42	0.41	0.46			
Portugal	0.48		0.58		0.58	0.61			
Slovenia	0.63	0.67	0.64	0.63	0.66	0.62	0.60		
Slovakia	0.27	0.27	0.25	0.22	0.21	0.21	0.26	0.27	
Finland	0.92	0.94	1.03	0.99	0.99	1.05	1.04	1.00	
Sweden	0.89	0.86	0.91		0.95		1.02		
UK	0.63	0.62	0.60	0.64	0.61	0.61	0.58		
Bulgaria	0.39	0.46	0.45	0.41	0.37	0.40	0.40		
Romania		0.11	0.10	0.11	0.15	0.15	0.17		

*Business expenditures for R&D (BERD), % GDP*

	1997	1998	1999	2000	2001	2002	2003	2004	2005
Belgium	1.34	1.35	1.40	1.48	1.60	1.64	1.33		
Czech	0.69	0.75	0.73	0.74	0.74	0.75	0.77	0.81	
Denmark	1.19	1.33	1.33	1.51	1.65	1.75	1.84		
Germany	1.54	1.57	1.70	1.75	1.75	1.75	1.73	1.68	
Estonia		0.11	0.17	0.14	0.25	0.23	0.22		
Greece	0.13		0.19		0.21		0.20		
Spain	0.40	0.47	0.46	0.50	0.50	0.56	0.57		
France	1.39	1.35	1.38	1.36	1.41	1.43	1.36		
Ireland	0.91	0.90	0.87	0.83	0.80	0.76	0.77	0.77	
Italy	0.52	0.52	0.51	0.53	0.56	0.54	0.55		
Cyprus		0.03	0.05	0.05	0.05	0.06	0.08		
Latvia	0.09	0.09	0.06	0.18	0.15	0.17	0.13		
Lithuania	0.03	0.01	0.02	0.13	0.20	0.11	0.14		
Luxembourg				1.58			1.58		
Hungary	0.30	0.26	0.28	0.35	0.38	0.36	0.55		
Malta						0.07	0.08		
Netherlands	1.11	1.05	1.14	1.11	1.10	1.03	1.01		
Austria		1.13				1.42			
Poland	0.26	0.28	0.29	0.24	0.23	0.13			
Portugal	0.14		0.17		0.27	0.32	0.26		
Slovenia	0.70	0.72	0.78	0.81	0.90	0.91	0.90		
Slovakia	0.82	0.52	0.41	0.43	0.43	0.37	0.31	0.26	
Finland	1.79	1.94	2.20	2.41	2.42	2.41	2.37	2.51	
Sweden	2.66	2.76	2.74		3.32		2.93		
UK	1.19	1.19	1.25	1.21	1.28	1.26	1.24		
Bulgaria	0.12	0.11	0.12	0.11	0.10	0.09	0.1		
Romania		0.38	0.30	0.26	0.24	0.23	0.23		

Real GDP growth rate

	1997	1998	1999	2000	2001	2002	2003	2004	2005
Belgium	3.5	2.0	3.2	3.9	0.7	0.9	1.3	2.9	2.2
Czech Republic	-0.7	-1.1	1.2	3.9	2.6	1.5	3.2	4.4	4.0
Denmark	3.0	2.5	2.6	2.8	1.3	0.5	0.7	2.4	2.3
Germany	1.8	2.0	2.0	3.2	1.2	0.1	-0.2	1.6	0.8
Estonia	11.1	4.4	0.3	7.9	6.5	7.2	6.7	7.8	6.0
Greece	3.6	3.4	3.4	4.5	4.3	3.8	4.7	4.2	2.9
Spain	4.0	4.3	4.2	4.4	3.5	2.7	2.9	3.1	2.7
France	2.4	3.6	3.3	4.1	2.1	1.2	0.8	2.3	2.0
Ireland	10.8	8.5	10.7	9.2	6.2	6.1	4.4	4.5	4.9
Italy	2.0	1.8	1.7	3.0	1.8	0.4	0.3	1.2	1.2
Cyprus	2.3	5.0	4.8	5.0	4.1	2.1	2.0	3.8	3.9
Latvia	8.3	4.7	3.3	6.9	8.0	6.4	7.5	8.5	7.2
Lithuania	7.0	7.3	-1.7	3.9	6.4	6.8	9.7	6.7	6.4
Luxembourg	8.3	6.9	7.8	9.0	1.5	2.5	2.9	4.5	3.8
Hungary	4.6	4.9	4.2	5.2	3.8	3.5	2.9	4.2	3.9
Malta	:	:	4.1	6.4	-0.4	1.0	-1.9	1.0	1.7
Netherlands	3.8	4.3	4.0	3.5	1.4	0.1	-0.1	1.7	1.0
Austria	1.8	3.6	3.3	3.4	0.8	1.0	1.4	2.4	2.1
Poland	6.8	4.8	4.1	4.0	1.0	1.4	3.8	5.3	4.4
Portugal	4.2	4.7	3.9	3.8	-2.8	0.4	-1.1	1.0	1.1
Slovenia	4.8	3.6	5.6	3.9	2.7	3.3	2.5	4.6	3.7
Slovakia	4.6	4.2	1.5	2.0	3.8	4.6	4.5	5.5	4.9
Finland	6.2	5.0	3.4	5.0	1.0	2.2	2.4	3.6	3.3
Sweden	2.4	3.6	4.6	4.3	1.0	2.0	1.5	3.6	3.0
United Kingdom	3.2	3.2	3.0	4.0	2.2	2.0	2.5	3.2	2.8
Bulgaria	-5.4	3.9	2.3	5.4	4.1	4.9	4.5	5.6	6.0
Romania	-6.9	-6.9	-1.2	2.1	5.7	5.0	4.9	8.3	5.5

Labour productivity per employee, EU25=100

	1997	1998	1999	2000	2001	2002	2003	2004	2005
Belgium	127.2	125.6	125.2	125.5	125.7	126.3	127.6	129.2	129.2
Czech Republic	57.4	57.4	59.2	59.2	60.4	60.9	62.7	64.0	65.6
Denmark	103.0	102.2	103.6	104.1	104.6	101.8	103.2	104.0	104.4
Germany	107.3	105.8	104.5	102.4	101.5	101.1	101.3	101.3	100.0
Estonia	38.2	40.1	41.5	44.8	45.9	47.1	48.5	50.6	52.5
Greece	88.8	83.9	85.2	86.8	89.7	94.9	97.9	96.8	97.6
Spain	101.0	100.4	101.5	98.6	98.6	100.0	101.7	100.2	99.4
France	125.7	126.2	124.5	123.5	124.1	122.1	120.8	120.4	120.6
Ireland	123.2	121.2	121.8	123.3	125.8	130.3	130.9	134.3	136.5
Italy	120.9	122.4	120.8	119.0	116.3	112.4	109.6	108.5	107.8
Cyprus	80.7	82.8	79.2	77.6	78.4	72.9	72.1	72.3	73.2

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Latvia	33.3	34.5	35.7	38.2	39.5	40.3	41.3	43.3	45.4
Lithuania	32.9	35.2	34.2	36.4	40.3	45.2	47.4	49.8	52.0
Luxembourg	140.7	144.7	152.4	155.0	145.5	142.7	142.4	146.3	146.0
Hungary	59.6	60.6	60.1	60.8	64.5	66.9	67.3	69.3	70.6
Malta	:	:	95.2	88.9	83.6	84.8	85.5	83.7	83.5
Netherlands	103.5	103.2	101.8	102.1	108.3	107.2	107.3	108.1	107.5
Austria	105.2	104.6	105.4	106.4	104.4	103.2	103.6	105.1	105.5
Poland	45.7	46.2	48.7	50.5	49.8	50.5	58.0	59.7	60.8
Portugal	69.5	70.4	71.8	71.6	68.6	68.5	67.3	66.3	65.9
Slovenia	67.0	68.5	70.1	69.8	71.6	72.7	74.2	76.0	77.7
Slovakia	49.4	51.0	52.4	54.7	56.1	59.1	59.0	59.5	61.2
Finland	110.2	112.9	109.5	110.6	110.2	109.1	108.9	110.3	111.6
Sweden	105.9	104.8	106.9	106.7	103.1	102.0	102.7	105.4	106.6
United Kingdom	103.5	104.1	103.7	104.6	106.3	108.7	109.2	108.8	109.7
Bulgaria	28.2	29.0	29.8	31.7	32.9	33.0	31.8	31.1	31.9
Romania	:	:	:	28.2	30.2	32.5	33.6	36.0	37.5

*EPO patents per million inhabitants*

	1997	1998	1999	2000	2001	2002
Belgium	112.46	140.03	145.07	157.69	160.92	148.08
Czech Republic	7.27	9.70	9.81	13.51	11.39	10.88
Denmark	144.24	139.71	168.46	199.30	225.74	214.82
Germany	220.95	247.59	273.48	305.14	320.36	300.95
Estonia	6.42	5.02	5.79	11.65	12.41	8.86
Greece	5.28	7.09	8.12	6.06	8.27	8.11
Spain	16.71	21.03	23.31	24.89	28.75	25.46
France	110.41	125.65	131.03	144.39	150.18	147.24
Ireland	43.66	55.21	69.87	95.40	92.93	89.85
Italy	56.83	64.40	68.06	76.82	80.60	74.73
Cyprus	3.00	13.33	13.18	10.12	20.04	9.91
Latvia	3.63	4.47	4.91	3.78	7.58	5.95
Lithuania	2.15	1.08	0.55	1.35	2.58	2.59
Luxembourg	138.61	143.47	200.51	198.74	216.59	201.33
Hungary	11.16	13.33	13.44	18.27	20.86	18.27
Malta	5.35	7.91	10.57	18.39	12.75	17.69
Netherlands	164.96	178.27	197.33	228.78	255.43	278.86
Austria	111.27	142.30	140.33	158.43	180.31	174.84
Poland	1.47	1.98	1.47	3.05	3.20	2.72
Portugal	2.65	2.38	4.65	4.01	6.53	4.26
Slovenia	20.10	17.13	25.73	25.14	43.68	32.75
Slovakia	3.71	5.94	4.26	6.84	7.05	4.27
Finland	214.41	260.18	294.18	343.69	377.43	310.92
Sweden	264.43	306.96	308.49	361.50	382.98	311.51
United Kingdom	90.41	100.99	111.19	128.43	138.35	128.70
Bulgaria	2.03	3.14	3.04	4.15	2.64	3.67
Romania	0.40	1.33	0.98	1.11	1.20	0.85

High-tech exports, % in total exports

	1997	1998	1999	2000	2001	2002	2003
Belgium	6.6	7.1	7.9	8.7	9.0	7.5	7.4
Czech Republic	:	:	7.8	7.7	9.1	12.3	12.3
Denmark	11.8	12.5	13.9	14.4	14.0	15.0	13.4
Germany	12.5	13.1	14.2	16.1	15.8	15.1	14.7
Estonia	:	:	10.1	25.1	17.1	9.8	9.4
Greece	3.1	4.8	5.5	7.5	5.6	6.7	7.4
Spain	5.2	5.5	5.9	6.4	6.1	5.7	5.9
France	21.7	22.8	24.0	25.5	25.6	21.9	20.4
Ireland	37.5	37.7	39.4	40.5	40.8	35.3	29.9
Italy	6.9	7.4	7.5	8.5	8.5	8.2	7.1
Cyprus	:	:	4.0	3.0	4.0	3.5	4.2
Latvia	:	:	2.3	2.2	2.2	2.3	2.7
Lithuania	:	:	2.0	2.6	2.9	2.4	3.0
Luxembourg	:	:	15.1	20.6	27.9	24.6	29.3
Hungary	:	:	19.4	23.1	20.4	20.3	21.7
Malta	:	:	55.7	64.4	58.1	56.5	55.5
Netherlands	18.7	19.7	21.9	22.8	22.3	18.7	18.8
Austria	9.9	10.1	11.7	14.0	14.6	15.7	15.3
Poland	:	:	2.3	2.8	2.7	2.4	2.7
Portugal	3.6	4.0	4.3	5.5	6.8	6.2	7.4
Slovenia	:	:	3.7	4.4	4.8	4.9	5.8
Slovakia	:	:	4.0	3.5	3.7	2.9	3.4
Finland	16.4	19.4	20.7	23.5	21.1	20.9	20.6
Sweden	15.5	16.4	17.8	18.7	14.2	13.7	13.1
United Kingdom	21.1	23.2	24.4	25.4	26.4	25.5	21.0
Bulgaria	:	:	1.7	1.6	1.8	2.6	2.9
Romania	:	:	2.8	4.6	4.9	3.1	3.3

Human capital – education expenditures, % GDP

	1997	1998	1999	2000	2001	2002
Belgium	:	:	:	:	6.11	6.26
Czech Republic	4.43	3.93	4.05	4.04	4.16	4.41
Denmark	7.94	8.32	8.14	8.39	8.50	8.51
Germany	4.63	:	4.58	4.53	4.57	4.78
Estonia	5.91	5.66	6.13	5.59	5.48	5.69
Greece	3.44	3.47	3.64	3.79	3.90	3.96
Spain	4.54	4.49	4.50	4.42	4.41	4.44
France	6.03	5.95	5.93	5.83	5.76	5.81
Ireland	5.15	4.87	4.57	4.36	4.35	4.32
Italy	4.53	4.70	4.79	4.57	4.98	4.75
Cyprus	5.66	5.77	5.65	5.60	6.28	6.83
Latvia	5.19	6.29	5.78	5.43	5.70	5.82
Lithuania	5.42	5.96	6.14	5.67	5.92	5.89

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Luxembourg	4.11	:	:	:	3.84	3.99
Hungary	4.61	4.56	4.66	4.54	5.15	5.51
Malta	:	:	4.43	4.55	4.47	4.54
Netherlands	4.75	4.80	4.77	4.87	4.99	5.08
Austria	5.80	5.77	5.80	5.66	5.70	5.67
Poland	4.84	5.09	4.88	5.01	5.56	5.60
Portugal	5.60	5.62	5.74	5.74	5.91	5.83
Slovenia	:	:	:	:	6.13	6.02
Slovakia	4.80	4.51	4.40	4.15	4.03	4.35
Finland	6.52	6.29	6.31	6.12	6.24	6.39
Sweden	7.62	7.71	7.47	7.39	7.31	7.66
United Kingdom	4.88	4.79	4.58	4.58	4.69	5.25
Bulgaria	2.64	3.23	3.66	4.41	3.53	3.57
Romania	:	4.38	3.37	2.89	3.28	3.53

*Gross fixed capital formation in the private sector (private investments), %GDP*

	1997	1998	1999	2000	2001	2002	2003	2004
Belgium	18.8	19.0	19.0	19.3	19.2	17.9	17.3	17.0
Czech Republic	25.9	24.2	24.0	24.7	24.3	22.9	22.7	22.9
Denmark	17.7	18.9	18.1	18.4	18.3	18.3	17.9	17.9
Germany	19.2	19.3	19.4	19.7	18.3	16.6	16.3	16.0
Estonia	23.4	25.2	20.5	21.7	22.9	24.0	25.5	25.2
Greece	16.4	17.6	19.2	19.5	19.8	20.3	21.6	21.4
Spain	18.8	19.5	20.8	22.8	22.6	22.7	23.6	24.3
France	14.5	15.1	15.8	16.3	16.4	15.7	15.6	15.9
Ireland	18.0	19.5	20.8	20.7	18.9	18.1	19.2	20.9
Italy	16.0	16.1	16.6	17.4	17.3	17.9	16.6	16.9
Cyprus	:	16.1	15.4	14.3	14.1	15.2	14.0	14.6
Latvia	15.0	23.7	21.7	23.2	24.0	22.8	22.9	23.9
Lithuania	20.7	21.6	19.6	16.4	18.0	17.5	18.4	18.7
Luxembourg	18.1	18.1	19.2	16.9	18.4	16.8	14.9	14.3
Hungary	19.2	19.8	21.0	20.3	19.7	18.5	19.0	19.2
Malta	:	:	16.7	18.2	15.5	10.3	14.5	16.4
Netherlands	18.6	18.6	19.5	19.0	17.5	16.4	15.9	16.4
Austria	20.4	20.5	20.4	21.3	20.9	19.4	20.2	19.9
Poland	18.0	19.7	20.5	21.1	17.2	15.4	15.0	14.8
Portugal	21.3	23.0	23.2	23.8	23.2	21.5	19.3	19.3
Slovenia	21.6	22.9	26.3	22.0	21.5	20.5	21.1	21.9
Slovakia	28.7	32.1	26.7	23.1	25.7	24.3	23.1	22.2
Finland	15.4	16.2	16.6	17.1	17.6	16.0	15.3	15.8
Sweden	12.6	13.3	14.1	14.8	14.4	13.4	12.6	12.9
United Kingdom	15.1	16.1	15.9	15.7	15.2	15.1	14.3	14.5
Bulgaria	9.5	9.8	11.3	12.1	14.7	15.3	16.5	17.8
Romania	:	:	15.6	17.0	18.3	18.2	19.1	19.1

Foreign direct investments intensity (inward and outward, % GDP)

	1997	1998	1999	2000	2001	2002	2003	2004
Belgium	:	:	:	:	:	5.8	11.3	7.9
BLEU	3.8	8.6	50.7	88.6	41.5	50.8	39.6	27.1
Czech Republic	1.2	3.1	5.5	4.6	4.8	5.9	1.6	2.3
Denmark	2.1	3.2	7.1	20.3	7.0	2.5	0.9	-4.5
Germany	1.3	2.6	3.8	6.7	1.5	1.1	0.5	-0.8
Estonia	4.1	5.2	3.5	4.1	6.2	3.0	5.8	5.3
Greece	:	:	:	1.4	0.9	0.3	0.2	0.5
Spain	1.7	2.6	4.8	7.9	5.0	4.9	2.8	2.5
France	2.3	2.7	6.0	8.2	5.5	3.4	2.9	2.0
Ireland	2.3	7.3	12.9	16.4	6.6	15.5	10.0	7.0
Italy	0.6	0.6	0.6	1.2	1.7	1.3	0.9	1.0
Cyprus	3.3	2.2	5.2	5.6	6.3	7.3	5.8	5.8
Latvia	4.3	3.1	2.6	2.7	0.9	1.4	1.5	2.8
Lithuania	1.9	4.2	2.3	1.7	1.9	2.6	0.6	2.1
Luxembourg	:	:	:	:	:	566.3	357.6	238.7
Hungary	2.9	2.7	2.3	2.4	4.2	2.5	2.4	2.4
Malta	1.5	4.0	11.1	8.5	4.0	-5.3	3.3	3.9
Netherlands	5.5	9.8	12.4	17.4	13.3	7.0	5.6	0.0
Austria	1.1	1.7	1.5	3.8	2.3	1.5	2.8	2.1
Poland	1.6	2.0	2.2	2.8	1.5	1.1	1.0	1.4
Portugal	2.1	2.7	1.9	6.7	6.1	2.1	4.7	2.2
Slovenia	1.2	0.9	1.1	1.7	1.4	2.5	1.4	1.6
Slovakia	0.6	1.6	-0.1	5.3	3.7	7.9	1.1	1.2
Finland	3.0	11.9	4.4	13.7	5.0	5.9	0.2	1.0
Sweden	4.6	8.3	16.5	13.3	4.2	4.6	2.0	-0.1
United Kingdom	3.6	6.8	9.9	12.2	3.9	2.0	2.4	3.4
Bulgaria	2.1	2.1	3.0	4.0	2.6	2.0	:	:
Romania	1.7	2.4	1.5	1.4	1.4	1.3	1.6	5,7

Openess degree (ratio of total foreign trade to GDP)

	1997	1998	1999	2000	2001	2002	2003	2004
Belgium	:	:	:	:	:	82.2	79.8	82.9
Czech Republic	44.0	44.6	46.2	55.0	57.4	53.4	55.1	62.8
Denmark	26.9	26.6	27.0	29.6	29.4	30.1	28.2	29.1
Germany	22.0	23.0	23.7	27.4	27.8	27.2	27.7	29.7
Estonia	57.8	58.5	52.0	67.7	62.8	57.6	58.5	61.8
Greece	12.4	12.3	14.0	17.9	17.1	15.4	14.6	15.3
Spain	20.2	20.8	21.2	23.0	22.0	21.0	20.5	20.8
France	19.1	19.6	19.8	22.5	21.8	20.8	20.1	20.8
Ireland	57.5	61.2	57.7	64.9	61.9	56.1	46.4	:
Italy	18.4	18.8	19.0	21.9	21.7	20.7	19.6	20.7
Cyprus	25.9	24.3	22.4	24.7	23.9	21.8	19.1	20.7



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Latvia	37.0	39.0	33.4	33.8	35.4	35.5	37.6	40.8
Lithuania	48.4	42.6	35.6	40.6	45.1	47.3	46.2	46.9
Luxembourg	:	:	:	:	:	49.5	46.7	48.1
Hungary	45.1	46.6	55.7	64.9	62.1	55.0	54.9	56.6
Malta	:	:	59.0	75.3	60.9	61.0	59.9	58.2
Netherlands	52.2	51.4	52.1	58.6	54.7	53.8	53.7	56.0
Austria	29.3	30.2	31.1	34.1	34.9	34.5	34.7	37.0
Poland	23.2	23.0	22.9	25.3	24.5	26.3	30.4	34.8
Portugal	27.8	28.3	28.1	30.1	28.7	27.1	26.5	27.6
Slovenia	45.1	45.4	43.4	49.1	49.3	47.8	47.5	50.8
Slovakia	50.4	53.7	52.8	60.9	65.6	63.8	67.9	69.4
Finland	28.6	28.4	27.9	32.3	30.0	28.9	28.4	29.3
Sweden	30.2	30.9	30.6	33.4	32.0	31.3	30.6	32.0
United Kingdom	22.0	20.4	20.0	21.4	21.1	20.0	19.2	18.9
Bulgaria	44.4	34.4	34.8	42.9	43.5	41.8	43.9	48.1
Romania	:	22.9	25.7	30.3	32.0	33.1	34.7	36.6

Sources for all tables: Eurostat, 2005



**Anexa 2. The institutional framework for R&D in EU-27**

All rows in the tables belows represent dummy institutional variables.

AUSTRIA		1997	1998	1999	2000	2001	2002	2003	2004	2005
National strategy	for Lisbon	-	-	-	-	-	-	-	-	-
	for R&D	-	-	-	-	-	X	X	X	X
National target for R&D		-	-	-	X	X	X	X	X	X
Administrative structure	Coordinated by PM	-	-	-	-	-	-	-	-	-
	Coordinated by line ministry	X	X	X	X	X	X	X	X	X
Distinct R&D ministry		-	-	-	-	-	-	-	-	-
National Council	Public stakeholders	-	-	-	X	X	X	X	X	X
	Private stakeholders	-	-	-	-	-	-	-	-	-
Advisory Commissions	ministry	X	X	X	X	X	X	X	X	X
	Business associations	X	X	X	X	X	X	X	X	X
	Academic/NGOs	X	X	X	X	X	X	X	X	X
EU funds administration	Public structure	X	X	X	X	X	X	X	X	X
	Private structure	-	-	-	-	-	-	-	-	-
Implementing agencies	Public	X	X	X	X	X	X	X	X	X
	Mixed	-	-	-	-	-	-	-	-	-
	Private	-	-	-	-	X	X	X	X	X

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BELGIUM		1997	1998	1999	2000	2001	2002	2003	2004	2005
National strategy	for Lisbon	-	-	-	-	-	-	-	-	-
	for R&D	-	-	-	-	-	-	-	-	-
National target for R&D		-	-	-	-	-	-	X	X	X
Administrative structure	Coordinated by PM	-	-	-	-	-	-	-	-	-
	Coordinated by line ministry	X	X	X	X	X	X	X	X	X
Distinct R&D ministry		X	X	X	X	X	X	X	X	X
National Council	Public stakeholders	-	-	X	X	X	X	X	X	X
	Private stakeholders	-	-	-	-	-	-	-	-	-
Advisory Commissions	ministry	X	X	X	X	X	X	X	X	X
	Business associations	-	-	-	-	-	-	-	X	X
	Academic/NGOs	-	-	-	-	-	-	-	-	-
EU funds administration	Public structure	x	x	x	x	x	x	x	x	X
	Private structure	-	-	-	-	-	-	-	-	-
Implementing agencies	Public	x	x	x	x	x	x	x	x	X
	Mixed	-	-	-	-	-	-	-	-	-
	Private	-	-	-	-	-	-	-	-	-

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BULGARIA		1997	1998	1999	2000	2001	2002	2003	2004	2005
National strategy	for Lisbon	-	-	-	-	-	-	-	-	-
	for R&D	-	-	-	-	-	-	-	X	X
National target for R&D		-	-	-	-	-	-	-	-	-
Administrative structure	Coordinated by PM	-	-	-	-	-	-	-	-	-
	Coordinated by line ministry	X	X	X	X	X	X	X	X	X
Distinct R&D ministry		-	-	-	-	-	-	-	-	-
National Council	Public stakeholders	-	-	-	-	-	-	-	X	X
	Private stakeholders	-	-	-	-	-	-	-	-	-
Advisory Commissions	ministry	-	-	-	X	X	X	X	X	X
	Business associations	-	-	-	-	X	X	X	X	X
	Academic/NGOs	X	X	X	X	X	X	X	X	X
EU funds administration	Public structure	X	X	X	X	X	X	X	X	X
	Private structure	-	-	-	-	-	-	-	-	-
Implementing agencies	Public	-	-	X	X	X	X	X	X	X
	Mixed	-	-	-	-	-	-	-	-	-
	Private	-	-	-	-	-	-	-	X	X

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CZECH REP.		1997	1998	1999	2000	2001	2002	2003	2004	2005
National strategy	for Lisbon	-	-	-	-	-	-	-	-	-
	for R&D	-	-	-	X	X	X	X	X	X
National target for R&D		-	-	-	-	-	-	-	-	-
Administrative structure	Coordinated by PM	-	-	-	-	-	-	-	-	-
	Coordinated by line ministry	-	-	-	-	-	-	-	-	-
Distinct R&D ministry		-	-	-	-	-	-	-	-	-
National Council	Public stakeholders	X	X	X	X	X	X	X	X	X
	Private stakeholders	-	-	-	-	-	-	-	-	-
Advisory Commissions	ministry	X	X	X	X	X	X	X	X	x
	Business associations	-	-	-	-	-	-	-	-	-
	Academic/NGOs	-	-	-	-	-	-	-	-	-
EU funds administration	Public structure	-	-	-	X	X	X	X	X	X
	Private structure	-	-	-	-	-	-	-	-	-
Implementing agencies	Public	x	x	x	x	x	x	x	x	x
	Mixed	-	-	-	-	-	-	-	-	-
	Private	-	-	-	-	-	-	-	-	-

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CYPRUS		1997	1998	1999	2000	2001	2002	2003	2004	2005
National strategy	for Lisbon	-	-	-	-	X	X	X	X	X
	for R&D	-	-	-	-	-	X	X	X	X
National target for R&D		-	-	-	-	-	-	-	-	-
Administrative structure	Coordinated by PM	X	X	X	X	X	X	X	X	X
	Coordinated by line ministry	-	-	-	X	X	X	X	X	X
Distinct R&D ministry		-	-	-	-	-	-	-	-	-
National Council	Public stakeholders	X	X	X	X	X	X	X	X	X
	Private stakeholders	-	-	-	-	-	-	-	-	-
Advisory Commissions	ministry	-	-	-	X	X	X	X	X	X
	Business associations	X	X	X	X	X	X	X	X	X
	Academic/NGOs	X	X	X	X	X	X	X	X	X
EU funds administration	Public structure	X	X	X	X	X	X	X	X	X
	Private structure	-	-	-	-	-	-	-	-	-
Implementing agencies	Public	X	X	X	X	X	X	X	X	X
	Mixed	-	-	-	-	-	-	-	-	-
	Private	-	-	-	-	-	X	X	X	X

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DENMARK		1997	1998	1999	2000	2001	2002	2003	2004	2005
National strategy	for Lisbon	-	-	-	-	-	-	-	-	-
	for R&D							x	x	X
National target for R&D		-	-	-	-	-	-	-	-	-
Administrative structure	Coordinated by PM	-	-	-	-	-	-	-	-	-
	Coordinated by line ministry	x	x	x	x	x	x	x	x	X
Distinct R&D ministry						x	x	x	x	X
National Council	Public stakeholders	x	x	x	x	x	x	x	x	X
	Private stakeholders	-	-	-	-	-	-	-	-	-
Advisory Commissions	ministry	-	-	-	-	-	-	-	-	-
	Business associations	-	-	-	-	-	-	x	X	X
	Academic/NGOs	-	-	-	-	-	-	x	x	X
EU funds administration	Public structure	-	-	-	-	-	-	-	-	-
	Private structure	-	-	-	-	-	-	-	-	-
Implementing agencies	Public	x	x	x	x	x	x	x	x	X
	Mixed	-	-	-	-	-	-	-	-	-
	Private	-	-	-	-	-	-	-	-	-



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ESTONIA		1997	1998	1999	2000	2001	2002	2003	2004	2005
National strategy	for Lisbon	-	-	-	-	-	-	-	-	-
	for R&D	-	-	-	-	-	X	X	X	X
National target for R&D		-	-	-	-	-	X	X	X	X
Administrative structure	Coordinated by PM	X	X	X	X	X	X	X	X	X
	Coordinated by line ministry	-	-	-	-	-	-	-	-	-
Distinct R&D ministry		-	-	-	-	-	-	-	-	-
National Council	Public stakeholders	-	-	-	-	-	X	X	X	X
	Private stakeholders	-	-	-	-	-	-	-	-	-
Advisory Commissions	ministry	-	-	-	-	-	-	-	-	-
	Business associations	-	-	-	-	-	-	-	-	-
	Academic/NGOs	X	X	X	X	X	X	X	X	X
EU funds administration	Public structure	-	-	-	X	X	X	X	X	X
	Private structure	-	-	-	-	-	-	-	-	-
Implementing agencies	Public	X	X	X	X	X	X	X	X	X
	Mixed	-	-	-	-	-	-	-	-	-
	Private	-	-	-	X	X	X	X	X	X

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FINLAND		1997	1998	1999	2000	2001	2002	2003	2004	2005
National strategy	for Lisbon	-	-	-	-	-	-	-	-	-
	for R&D	-	-	X	X	X	X	X	X	X
National target for R&D		-	-	-	-	-	-	-	-	-
Administrative structure	Coordinated by PM	X	X	X	X	X	X	X	X	X
	Coordinated by line ministry	-	-	-	-	X	X	X	X	X
Distinct R&D ministry		-	-	-	-	-	-	-	-	-
National Council	Public stakeholders	X	X	X	X	X	X	X	X	X
	Private stakeholders	-	-	-	-	-	X	X	X	X
Advisory Commissions	ministry	-	-	X	X	X	X	X	X	X
	Business associations	X	X	X	X	X	X	X	X	X
	Academic/NGOs	X	X	X	X	X	X	X	X	X
EU funds administration	Public structure	X	X	X	X	X	X	X	X	X
	Private structure	-	-	-	-	-	-	-	-	-
Implementing agencies	Public	X	X	X	X	X	X	X	X	X
	Mixed	-	-	-	-	-	X	X	X	X
	Private	X	X	X	X	X	X	X	X	X

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FRANCE		1997	1998	1999	2000	2001	2002	2003	2004	2005
National strategy	for Lisbon	-	-	-	-	-	-	-	-	-
	for R&D	-	-	X	X	X	X	X	X	X
National target for R&D		-	-	-	-	-	-	-	-	-
Administrative structure	Coordinated by PM	-	X	X	X	X	X	X	X	X
	Coordinated by line ministry	-	-	-	-	-	-	-	-	-
Distinct R&D ministry		-	-	-	-	-	-	-	-	
National Council	Public stakeholders	X	x	X	x	x	x	x	x	x
	Private stakeholders	-	-	-	-	-	-	-	-	-
Advisory Commissions	ministry	-	X	X	X	X	X	X	X	X
	Business associations	-	-	-	-	-	-	-	-	-
	Academic/NGOs	-	-	-	-	-	-	-	-	-
EU funds administration	Public structure	X	X	X	X	X	X	X	X	x
	Private structure	-	-	-	-	-	-	-	-	-
Implementing agencies	Public	X	X	X	X	X	X	X	X	X
	Mixed	-	-	-	-	-	-	-	-	-
	Private									

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GERMANY		1997	1998	1999	2000	2001	2002	2003	2004	2005
National strategy	for Lisbon	-	-	-	-	-	-	x	x	x
	for R&D	-	-	-	-	-	-	-	-	-
National target for R&D		-	-	-	-	x	x	x	x	x
Administrative structure	Coordinated by PM	x	x	x	x	x	x	x	x	x
	Coordinated by line ministry	-	-	-	-	-	-	-	-	-
Distinct R&D ministry		-	-	-	-	-	-	-	-	-
National Council	Public stakeholders	x	x	x	X	x	x	x	x	X
	Private stakeholders	x	x	x	X	x	x	x	x	x
Advisory Commissions	ministry	x	x	x	X	x	x	x	x	x
	Business associations	-	-	-	-	-	-	X	x	X
	Academic/NGOs	-	-	-	-	-	-	x	x	X
EU funds administration	Public structure	x	x	x	x	x	x	x	x	X
	Private structure	-	-	-	-	-	-	-	-	-
Implementing agencies	Public	x	x	x	x	x	x	x	x	x
	Mixed	-	-	x	x	x	x	x	x	x
	Private	-	-	-	-	-	-	-	-	-

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GREECE		1997	1998	1999	2000	2001	2002	2003	2004	2005
National strategy	for Lisbon	-	-	-	-	-	-	-	-	-
	for R&D	-	-	-	X	X	X	X	X	X
National target for R&D		-	-	-	X	X	X	X	X	X
Administrative structure	Coordinated by PM	-	-	-	-	-	-	-	-	-
	Coordinated by line ministry	-	-	-	-	-	-	-	-	-
Distinct R&D ministry		X	X	X	X	X	X	X	X	X
National Council	Public stakeholders	X	X	X	x	X	X	X	X	x
	Private stakeholders	-	-	-	-	-	-	-	-	-
Advisory Commissions	ministry	X	X	X	X	X	X	X	X	X
	Business associations	-	-	-	-	-	-	-	-	-
	Academic/NGOs	-	-	-	-	-	-	-	-	-
EU funds administration	Public structure	X	X	X	X	X	X	X	X	X
	Private structure	-	-	-	-	-	-	-	-	-
Implementing agencies	Public	X	X	X	X	X	X	X	X	X
	Mixed	-	-	-	-	-	-	-	-	-
	Private	-	-	-	-	-	-	-	-	-

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IRELAND		1997	1998	1999	2000	2001	2002	2003	2004	2005
National strategy	for Lisbon	-	-	-	-	-	-	-	-	-
	for R&D	x	x	x	x	x	x	x	x	x
National target for R&D		-	-	-	-	x	x	x	x	x
Administrative structure	Coordinated by PM	x	x	x	x	x	x	x	x	x
	Coordinated by line ministry	-	-	-	-	-	-	-	-	-
Distinct R&D ministry		x	x	x	x	x	x	x	x	x
National Council	Public stakeholders	x	x	x	x	x	x	x	x	x
	Private stakeholders	-	-	-	-	-	-	-	-	-
Advisory Commissions	ministry	x	x	x	x	x	x	x	x	x
	Business associations	-	-	-	-	-	-	x	x	x
	Academic/NGOs	-	-	-	-	-	-	x	x	x
EU funds administration	Public structure	x	x	x	x	x	x	x	x	x
	Private structure	-	-	-	-	-	-	-	-	-
Implementing agencies	Public	x	x	x	x	x	x	x	x	x
	Mixed	-	-	-	-	-	-	-	-	-
	Private	-	-	-	-	-	-	x	x	x

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ITALY		1997	1998	1999	2000	2001	2002	2003	2004	2005
National strategy	for Lisbon	-	-	-	-	-	-	-	-	-
	for R&D	-	-	-	-	-	-	X	X	X
National target for R&D		-	-	-	-	-	-	-	-	-
Administrative structure	Coordinated by PM	-	-	-	-	-	-	-	-	-
	Coordinated by line ministry	X	X	X	X	X	X	X	X	X
Distinct R&D ministry		-	-	-	-	X	X	X	X	X
National Council	Public stakeholders	X	X	X	X	X	X	X	X	X
	Private stakeholders	-	-	-	-	-	-	X	X	X
Advisory Commissions	ministry	X	X	X	X	X	X	X	X	X
	Business associations	-	-	-	X	X	X	X	X	X
	Academic/NGOs	-	-	X	X	X	X	X	X	X
EU funds administration	Public structure	X	X	X	X	X	X	X	X	X
	Private structure	-	-	-	-	-	-	-	-	-
Implementing agencies	Public	X	X	X	X	X	X	X	X	X
	Mixed	-	-	-	-	X	X	X	X	X
	Private	-	-	-	-	-	-	-	-	-

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LATVIA		1997	1998	1999	2000	2001	2002	2003	2004	2005
National strategy	for Lisbon	-	-	-	-	-	-	-	-	-
	for R&D							X	X	X
National target for R&D		-	-	-	-	-	-	-	-	-
Administrative structure	Coordinated by PM	-	-	-	-	-	-	-	-	-
	Coordinated by line ministry	X	X	X	X	X	X	X	X	X
Distinct R&D ministry		-	-	-	-	-	-	-	-	-
National Council	Public stakeholders	X	X	X	X	X	X	X	X	X
	Private stakeholders	-	-	-	-	-	-	-	-	-
Advisory Commissions	ministry	X	X	X	X	X	X	X	X	X
	Business associations	-	-	-	-	-	-	X	X	X
	Academic/NGOs	-	-	-	-	-	-	-	-	-
EU funds administration	Public structure	X	X	X	X	X	X	X	X	X
	Private structure	-	-	-	-	-	-	-	-	-
Implementing agencies	Public	X	X	X	X	X	X	X	X	X
	Mixed	-	-	-	-	-	-	-	-	-
	Private	X	X	X	X	X	X	X	X	X



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LITHUANIA		1997	1998	1999	2000	2001	2002	2003	2004	2005
National strategy	for Lisbon	-	-	-	-	-	-	-	-	-
	for R&D					X	X	X	X	X
National target for R&D		-	-	-	-	-	-	-	-	-
Administrative structure	Coordinated by PM	-	-	-	-	-	-	-	-	-
	Coordinated by line ministry	-	-	-	-	-	-	-	-	-
Distinct R&D ministry		-	-	-	-	-	-	-	-	-
National Council	Public stakeholders	-	-	-	-	-	X	X	X	X
	Private stakeholders	-	-	-	-	-	-	-	-	-
Advisory Commissions	ministry	X	X	X	X	X	X	X	X	X
	Business associations	-	-	-	-	-	-	-	-	-
	Academic/NGOs	X	X	X	X	X	X	X	X	X
EU funds administration	Public structure	X	X	X	X	X	X	X	X	X
	Private structure	-	-	-	-	-	-	-	-	-
Implementing agencies	Public	X	X	X	X	X	X	X	X	X
	Mixed	-	-	-	-	-	-	-	-	-
	Private	-	-	-	-	-	-	-	-	-

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LUXEMBOURG		1997	1998	1999	2000	2001	2002	2003	2004	2005
National strategy	for Lisbon	-	-	-	-	-	-	-	-	-
	for R&D	-	-	-	-	-	-	-	-	-
National target for R&D		-	-	-	-	-	-	-	-	-
Administrative structure	Coordinated by PM	-	-	-	-	-	-	-	-	-
	Coordinated by line ministry	x	x	x	x	x	x	x	x	X
Distinct R&D ministry		-	-	-	-	-	-	-	-	-
National Council	Public stakeholders	-	-	-	-	-	-	-	-	-
	Private stakeholders	-	-	-	-	-	-	-	-	-
Advisory Commissions	ministry	x	x	x	x	x	x	x	x	X
	Business associations	x	x	x	x	x	x	x	x	X
	Academic/NGOs	-	-	-	-	-	-	-	-	-
EU funds administration	Public structure	x	x	x	x	x	x	x	x	X
	Private structure	-	-	-	-	-	-	-	-	-
Implementing agencies	Public	-	-	x	x	x	x	x	x	X
	Mixed	-	-	-	-	-	-	-	-	-
	Private	-	-	-	-	-	-	-	-	-

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MALTA		1997	1998	1999	2000	2001	2002	2003	2004	2005
National strategy	for Lisbon	-	-	-	-	-	-	-	-	-
	for R&D	-	-	-	-	-	-	-	X	X
National target for R&D		-	-	-	-	-	-	-	-	-
Administrative structure	Coordinated by PM	-	-	-	-	-	-	-	-	-
	Coordinated by line ministry	X	X	X	X	X	X	X	X	X
Distinct R&D ministry		-	-	-	-	-	-	-	-	-
National Council	Public stakeholders	X	X	X	X	X	X	X	X	X
	Private stakeholders	-	-	-	-	-	-	-	-	-
Advisory Commissions	ministry	-	-	-	-	-	-	-	-	-
	Business associations	-	-	-	-	X	X	X	X	X
	Academic/NGOs	-	-	X	X	X	X	X	X	X
EU funds administration	Public structure	X	X	X	X	X	X	X	X	X
	Private structure	-	-	-	-	-	-	-	-	-
Implementing agencies	Public	X	X	X	X	X	X	X	X	X
	Mixed	-	-	-	-	-	X	X	X	X
	Private	-	-	-	-	-	-	-	-	-

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UK		1997	1998	1999	2000	2001	2002	2003	2004	2005
National Strategy	for Lisbon	-	-	-	-	-	-	-	-	-
	for R&D	-	-	-	-	-	-	X	X	X
National target for R&D		-	-	-	-	X	X	X	X	X
Administrative structure	Coordinated by PM	-	-	-	-	-	-	-	-	-
	Coordinated by line ministry	-	-	-	-	-	-	X	X	X
Distinct R&D ministry		X	X	X	X	X	X	X	X	X
National Council	Public stakeholders	-	-	-	-	-	-	-	-	-
	Private stakeholders	-	-	-	-	-	-	-	-	-
	Mixed	-	X	X	X	X	X	X	X	X
Advisory Commissions	ministry	X	X	X	X	X	X	X	X	X
	Business associations	-	-	-	-	-	-	-	-	-
	Academic/NGOs	X	X	X	X	X	X	X	X	X
EU funds administration	Public structure	-	-	-	-	-	-	-	-	-
	Private structure	-	-	-	-	-	-	-	-	-
Implementing agencies	Public	X	X	X	X	X	X	X	X	X
	Mixed	-	-	-	-	-	-	-	-	-
	Private	-	-	-	-	-	-	-	-	-

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NETHERLANDS		1997	1998	1999	2000	2001	2002	2003	2004	2005
National strategy	for Lisbon	-	-	-	-	-	-	-	-	-
	for R&D	-	-	-	-	-	-	x	x	x
National target for R&D		-	-	-	-	-	-	-	-	-
Administrative structure	Coordinated by PM	-	-	-	-	-	-	-	-	-
	Coordinated by line ministry	x	x	x	x	x	x	x	x	X
Distinct R&D ministry		-	-	-	-	-	-	-	-	-
National Council	Public stakeholders	x	x	x	x	x	x	x	x	X
	Private stakeholders	-	-	-	-	-	-	-	-	-
Advisory Commissions	ministry	x	x	x	x	x	x	x	x	X
	Business associations	-	-	-	-	-	-	-	-	-
	Academic/NGOs	x	x	x	x	x	x	x	x	X
EU funds administration	Public structure	x	x	x	x	x	x	x	x	X
	Private structure	-	-	-	-	-	-	-	-	-
Implementing agencies	Public	x	x	x	x	x	x	x	x	X
	Mixed	-	-	-	-	-	-	-	-	-
	Private	-	-	-	-	-	-	-	-	-

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		1997	1998	1999	2000	2001	2002	2003	2004	2005
POLAND										
National strategy	for Lisbon	-	-	-	-	-	-	-	X	X
	for R&D	-	-	X	X	X	X	X	X	X
National target for R&D		-	-	-	■	■	■	■	X	X
Administrative structure	Coordinated by PM	-	-	-	-	-	-	-	-	-
	Coordinated by line ministry	-	-	-	-	-	-	x	x	x
Distinct R&D ministry		-	-	-	-	-	-	X	X	X
National Council	Public stakeholders	x	x	x	x	x	X	X	X	X
	Private stakeholders	-	-	-	-	-	-	-	-	-
Advisory Commissions	ministry	x	x	x	x	x	x	x	x	x
	Business associations	-	-	-	-	-	-	-	-	-
	Academic/NGOs	-	-	-	-	-	-	-	-	-
EU funds administration	Public structure	-	-	-	-	-	-	-	-	-
	Private structure	-	-	-	-	-	-	-	-	-
Implementing agencies	Public	x	x	x	x	x	x	x	x	x
	Mixed	-	-	-	-	-	-	-	-	-
	Private	-	-	-	-	-	-	-	-	-

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PORTUGAL		1997	1998	1999	2000	2001	2002	2003	2004	2005
National strategy	for Lisbon	-	-	-	-	-	-	-	x	x
	for R&D	-	-	-	-	-	-	X	X	x
National target for R&D		-	-	-	-	-	-	-	x	x
Administrative structure	Coordinated by PM	-	-	-	-	-	X	X	X	X
	Coordinated by line ministry	-	-	-	-	-	-	-	-	-
Distinct R&D ministry		-	-	-	-	-	-	-	-	-
National Council	Public stakeholders	-	-	-	-	-	X	X	X	X
	Private stakeholders	-	-	-	-	-	-	-	-	-
Advisory Commissions	ministry	-	-	-	-	-	-	-	-	-
	Business associations	-	-	-	-	-	-	-	-	-
	Academic/NGOs	-	-	-	-	-	-	-	-	-
EU funds administration	Public structure	x	x	x	x	x	x	x	x	x
	Private structure	-	-	-	-	-	-	-	-	-
Implementing agencies	Public	X	X	X	X	X	X	X	X	X
	Mixed	-	-	-	-	-	-	-	-	-
	Private	-	-	-	-	-	-	-	-	-

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ROMANIA		1997	1998	1999	2000	2001	2002	2003	2004	2005
National strategy	for Lisbon	-	-	-	-	-	-	-	-	-
	for R&D	-	x	x	x	x	x	x	x	x
National target for R&D		-	-	-	-	-	-	-	-	x
Administrative structure	Coordinated by PM	-	-	-	-	-	-	-	-	x
	Coordinated by line ministry	-	-	-	-	x	x	x	x	-
Distinct R&D ministry		-	-	-	-	-	-	-	-	-
National Council	Public stakeholders	-	-	-	-	-	-	x	x	x
	Private stakeholders	-	-	-	-	-	-	-	-	-
Advisory Commissions	ministry	-	-	-	-	x	x	x	x	x
	Business associations	-	-	-	-	-	-	-	-	-
	Academic/NGOs	-	-	-	-	-	-	-	-	-
EU funds administration	Public structure	-	-	-	-	-	x	x	x	x
	Private structure	-	-	-	-	-	-	-	-	-
Implementing agencies	Public	-	x	x	x	x	x	x	x	x
	Mixed	-	-	-	-	-	-	-	-	-
	Private	-	-	-	-	-	-	-	-	-



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SLOVENIA		1997	1998	1999	2000	2001	2002	2003	2004	2005
National strategy	for Lisbon	-	-	-	-	-	-	-	-	X
	for R&D	-	-	-	-	-	-	-	-	-
National target for R&D		-	-	-	-	-	-	-	-	X
Administrative structure	Coordinated by PM	-	-	-	-	-	-	-	-	X
	Coordinated by line ministry	X	X	X	X	X	X	X	X	-
Distinct R&D ministry		X	X	X	-	-	-	-	-	-
National Council	Public stakeholders	X	X	X	X	X	X	X	X	X
	Private stakeholders	-	-	-	-	-	-	-	-	X
Advisory Commissions	ministry	X	X	X	X	X	X	X	X	X
	Business associations	-	-	-	-	-	-	-	-	-
	Academic/NGOs	-	-	-	-	-	-	-	-	-
EU funds administration	Public structure	-	-	-	-	-	-	-	X	X
	Private structure	-	-	-	-	-	-	-	-	-
Implementing agencies	Public	-	-	-	-	-	-	-	X	X
	Mixed	-	-	-	-	-	-	-	-	-
	Private	-	-	-	-	-	-	-	-	-

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SLOVAKIA		1997	1998	1999	2000	2001	2002	2003	2004	2005
National strategy	for Lisbon	-	-	-	-	-	-	-	-	-
	for R&D	-	-	-	X	X	X	X	X	X
National target for R&D		-	-	-	-	-	-	-	-	-
Administrative structure	Coordinated by PM	-	-	-	-	-	-	-	-	-
	Coordinated by line ministry	x	x	x	x	x	x	x	-	-
Distinct R&D ministry		-	-	-	-	-	-	-	-	-
National Council	Public stakeholders	-	-	-	-	-	-	-	-	-
	Private stakeholders	-	-	-	-	-	-	-	X	X
Advisory Commissions	ministry	x	x	x	x	x	x	x	-	-
	Business associations	x	x	x	x	x	x	x	-	-
	Academic/NGOs	-	-	-	-	-	-	-	-	-
EU funds administration	Public structure	-	-	-	-	-	-	-	-	-
	Private structure	-	-	-	-	-	-	-	-	-
Implementing agencies	Public	-	-	-	-	-	-	-	-	-
	Mixed	-	-	-	-	X	X	X	X	X
	Private	-	-	-	-	-	-	-	-	-

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SPAIN		1997	1998	1999	2000	2001	2002	2003	2004	2005
National strategy	for Lisbon	-	-	-	-	-	-	-	-	-
	for R&D	x	x	x	x	x	x	x	x	x
National target for R&D		-	-	-	-	-	-	x	x	x
Administrative structure	Coordinated by PM	x	x	x	x	x	x	x	x	x
	Coordinated by line ministry	-	-	-	-	-	-	-	-	-
Distinct R&D ministry		-	-	-	x	x	x	x	-	-
National Council	Public stakeholders	x	x	x	x	x	x	x	x	x
	Private stakeholders	-	-	-	-	-	-	-	-	-
Advisory Commissions	ministry	x	x	x	x	x	x	x	x	x
	Business associations	-	-	-	-	-	-	-	-	-
	Academic/NGOs	-	-	-	-	-	-	-	-	-
EU funds administration	Public structure	x	x	x	x	x	x	x	x	x
	Private structure	-	-	-	-	-	-	-	-	-
Implementing agencies	Public	x	x	x	x	x	x	x	x	x
	Mixed	-	-	-	-	-	-	-	-	-
	Private	-	-	-	-	-	-	-	-	-

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SWEDEN		1997	1998	1999	2000	2001	2002	2003	2004	2005
National strategy	for Lisbon	-	-	-	-	X	X	X	X	X
	for R&D	-	-	-	-	-	-	-	X	X
National target for R&D		-	-	-	-	-	-	-	-	-
Administrative structure	Coordinated by PM	-	-	-	-	-	-	-	-	-
	Coordinated by line ministry	X	X	X	X	X	X	X	X	X
Distinct R&D ministry		-	-	-	-	-	-	-	-	-
National Council	Public stakeholders	X	X	X	X	X	X	X	X	X
	Private stakeholders	-	-	-	-	-	-	-	-	-
Advisory Commissions	ministry	X	X	X	X	X	X	X	X	X
	Business associations	X	X	X	X	X	X	X	X	X
	Academic/NGOs	X	X	X	X	X	X	X	X	X
EU funds administration	Public structure	X	X	X	X	X	X	X	X	X
	Private structure	-	-	-	X	X	X	X	X	X
Implementing agencies	Public	X	X	X	X	X	X	X	X	X
	Mixed	-	-	-	-	-	-	-	-	-
	Private	X	X	X	X	X	X	X	X	X

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HUNGARY		1997	1998	1999	2000	2001	2002	2003	2004	2005
National strategy	for Lisbon	-	-	-	-	-	-	-	-	-
	for R&D	-	-	-	X	X	X	X	X	X
National target for R&D		-	-	-	-	-	-	-	-	-
Administrative structure	Coordinated by PM	-	-	-	-	-	-	X	X	X
	Coordinated by line ministry	-	-	-	-	-	-	-	-	-
Distinct R&D ministry		-	-	-	-	-	-	-	-	-
National Council	Public stakeholders	-	-	-	X	X	X	X	-	-
	Private stakeholders	X	X	X	-	-	-	-	X	X
Advisory Commissions	ministry	-	-	-	X	X	X	X	-	-
	Business associations	X	X	X	-	-	-	-	X	X
	Academic/NGOs	X	X	X	-	-	-	-	X	X
EU funds administration	Public structure	-	-	-	X	X	X	X	X	X
	Private structure	-	-	-	-	-	-	-	X	X
Implementing agencies	Public	-	-	-	-	-	-	X	X	X
	Mixed	-	-	-	-	-	-	-	-	-
	Private	-	-	-	-	-	-	-	-	-