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RTD policy approaches in different types of European regions

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Executive Summary

Over the past decade research policy has increasingly focused on regions (in the sense of sub-national geographical entities) and policy-makers generally have had high expectations of the contribution that regions can make to achieving national and European research investment targets.

The modes of coordination of policy actions are critically important in the context of multi-level, multi-actor governance. Ideally, this includes vertical coordination between different administrative levels (i.e. European, national, regional and even local levels) and horizontal coordination between regions to avoid unnecessary duplication of priorities and measures, and to ensure actions carried out by neighbouring regions can complement one another even if they are taking place in different countries.

The complexity of the situation is highlighted by the fact that there are more than two hundred regions in the European Union and that they are very heterogeneous in terms of their techno-economic conditions, such as their knowledge and industrial base and human resources, in particular. Furthermore, regions have varying responsibilities across the Member States in terms of their regional budgetary competences, legal powers and explicit regional research policies.

In this policy note, seven regional types are analysed based on nineteen qualitative regional case study reports. Apart from looking at research investment trends and policy measures in the selected regions, the main objective behind this exercise was to identify similar and different research policy approaches and give some indications of their potential impact among regions of a particular type.

As a result, the qualitative analysis of different research policy approaches in different types of European regions clearly confirms that there is no ideal model that is applicable to all regions. Therefore, one should be very careful with "one-size-fits-all" or uniform policy approaches that cannot deliver the expected results even in the longer term.

Still, it is one of the main messages of this policy note that the most crucial success factor in terms of RTD policy's impact seems to be reinforced by concentrating on existing strengths, promoting excellence and achieving critical mass in certain research activities.

It is worth noting that the concentration of efforts brought about by high level investments in RTD activities has had most impact in those regions that have high absorption capacities and an economic structure whose innovative actors are able to exploit research results. In the light of the cases examined, even increased RTD investments in selected areas might have limited impact on regions' economic performance, especially in less developed regions with more traditional, less knowledge intensive, sectors.

Unless the sectoral composition of the regional economy changes overnight, differentiated RTD policy measures tailored to the regional techno-economic situation seem the most appropriate approach to the design of the RTD policy mix.

1 Introduction

This policy note presents various RTD policy approaches that were identified in qualitative regional case study reports[1] produced for different types of European regions[2]. The purpose is to give useful ideas so policy-makers can see the potential impact of different RTD policy measures. It also aims to present different development possibilities for regions with similar techno-economic characteristics.

The analysis presented here is based on the assumption that increased investment in research can positively contribute to wealth and job creation in regions, but that the level of impact varies according to the type of European region. The level of impact is highly depending on regions' absorption capacity, and this has to do with techno-economic characteristics and economic specialisation.

As long as regions have relatively stable techno-economic characteristics over long time they can be expected to adopt similar research (RTD) policy approaches. However, even similar measures might have different impacts in different regions depending on how they are implemented. The objective of this policy note is to present the results of an analysis of the qualitative regional reports that represent different types of European regions. The analysis took into account the specificities of different regional techno-economic systems and their institutional set up, together with research-related policies and measures.

First, *Section 2* gives a short situation analysis concerning the relevance of research policy at regional level. *Section 3* describes the selection methodology that was applied to choose a sample of European regions with similar techno-economic characteristics out of almost 200 sub-national geographical entities. Based on a sample of nineteen underlying regional case study reports, region-type-specific policy approaches are presented in *Section 4* by highlighting similar and different RTD policy practices that address certain deficiencies of the regional techno-economic system.

Finally, *Section 5* concludes with lessons for policy-making relating to the following issues:

- the extent to which regional techno-economic characteristics are reflected in RTD policy approaches
- the similarity of RTD policy actions among regions of a given type.

[1] The nineteen regional case study reports this analysis draws upon are available at: http://cordis.europa.eu/erawatch/index.cfm?fuseaction=intService.display&topicID=588

[2] The term 'region' in this document refers to the sub-national territorial unit defined according to the EUROSTAT nomenclature, which is based on the NUTS system. This system has several inherent weaknesses but it is the only standardised and reliable form of data collection at the sub-national level for the whole European Union and hence the only one that can be used in the present study.

2 Research policy at the regional level

This section presents the main characteristics of research policy at regional level and is mainly based on the observations made in the examination of the qualitative case study reports.

Regions, in the sense of sub-national geographical entities, are increasingly aware of the importance of research and innovation in economic development.The commitment to giving greater priority and funding to R&D in regional development policies is acknowledged in many regions. However, research and technological development policy (RTD) is a central issue for only a fraction of all the regions in Europe, and the Lisbon Objectives have been explicitly taken into account in only a few regions. In fact, RTD policy in the regions is to a large extent restricted to innovation policy, because most European regions have limited governance autonomy and research policy competencies.

Moreover, regional and national policies are highly complementary. Regional policies generally focus on creating links and on developing diffusion and absorptive capacities; whereas national RTD policies, principally funded by national governments, are still the major sources of funding for research infrastructure and knowledge creation, even in highly decentralised countries such as Germany and Spain.

Regions are usually more concerned with other types of policy challenges than issues related to scientific research and technological development. The majority of them have established economic development policies or programmes within the framework of their operational programmes and national/regional plans. In this context many regions have put in place a variety of innovation strategies aimed at domains or sectors (e.g. information society strategy, tourism development strategy).

This explains why the majority of European regions are not particularly interested in investing in RTD *per se*, but rather in the contribution of RTD to broader development goals. They are concerned with questions such as how to stimulate and support economic growth; how to cope with the impact of industry's relocation abroad; or, how to increase employment and at the same time increase citizens' economic welfare and well being. These are among the most prominent (regional) challenges policy-makers are currently concerned with.

The impact of investment in research depends on the regional techno-economic situation. Regional techno-economic indicators clearly demonstrate that high R&D intensity regions usually have high income per capita, well above the European average. This observation is also true the other way around: poor regions usually have very low levels of R&D expenditures and correspondingly limited knowledge production capacities. However, the reality is more complex than simply expecting that investing more in R&D will automatically generate wealth and transform the region's economy into a knowledge-based one.

On the one hand, there are a relatively small number of top performing regions in R&D terms, compared with the total number of regions that are at the same time among the richest in terms of per capita income. On the other hand, there is a large number of regions in Europe that have a relatively low R&D intensity (i.e. below 1% GERD/regional GDP) although these regions are not poor at all. Regions like Andalusia (ES), Balearic

Islands (ES), Veneto (IT) or Salzburg (AT) are quite prosperous, with high standards of living without a high level of R&D intensity. How can this be explained? In what types of techno-economic situation does investment in research have the highest impact? What are the other factors apart from R&D inputs that contribute to high incomes and citizens' welfare?

In many regional situations increasing R&D investment does not have a significant automatic and immediate impact on growth and job creation because technological change, as an outcome of research, is only one way to generate wealth. Indeed, for the majority of regions it is not the most important one. Wealth, in terms of economic growth is primarily generated by increases in factor inputs such as capital and labour as well as by trade. Only a few regions have reached the limits on growth afforded by these variables and therefore have no option but to rely on research for further shifts in their production possibilities frontier.

Do similar regions have a similar RTD policy mix? If the impact of investment on research is different in different types of regional situations it is to be expected that the RTD policy mix may consist of different measures that are tailored to regions' techno-economic characteristics. This assumption is supported by the fact that European regions (i.e. more than 200 statistical-administrative sub-national geographical entities) are very heterogeneous in terms of their size, socio-economic situation, institutional responsibilities and empowerment in differing national contexts (i.e. regional budgetary competences, legal powers conferred by law and explicit regional RTD policies). It is likely therefore that regions with similar techno-economic characteristics will have a similar RTD policy mix.

Based on this short situation analysis, the aim of the subsequent sections is to shed light on the issues alluded to above with illustrative examples identified in some regions. More specifically, the aim of this policy note is to confirm or refute the following hypotheses:

- RTD policy measures have the highest impact if they match the technological and economic specialisation of the region
- Similar regions have a similar RTD policy mix.

3 Selection methodology: Types of European regions

The main idea behind the classification and clustering of regions is to distinguish groups of regions with similar characteristics and look at their development patterns in perspective. Several classifications of European regions are available in the literature, resulting in different sizes of regional groupings depending on the indicators selected and the parameters of the cluster analysis employed.

The analysis took into account previous attempts to classify the European regions[3] and made use of some of the assumptions and the methodology found in Clarysse and Muldur (2001)[4]. In this study the authors employ an approach associated with the so-called 'convergence club' assumption, found in a number of studies[5]. According to this assumption, which is also adopted here, evidence does not support the hypothesis of a uniform process of convergence among regions or countries towards the state of development of the small group of technological and economic leaders. Instead, it indicates convergence towards several different states of development within clusters of regions or countries with similar technological and economic structures.

In the design phase of the analysis, this fundamental idea was adopted, albeit in a modified context: the underlying idea of our approach is that Europe's regional economies exhibit 'structural' similarities within 'convergence clubs', which we henceforth refer to as 'types'. These types have inherently different socio-economic attributes that remain unchanged over the long term (e.g. population size, education level and industrial structure) and that determine the capacities of their members to produce and absorb technological knowledge and to integrate it in the production process. Compared to existing typologies, the aim of our classification was to identify these regional techno-economic types by producing a categorisation of the regions according to their long-term, structural techno-economic characteristics and then to use this as a selection methodology for producing qualitative case study reports.

First, the availability of regional data was checked and a database was built with a selected set of regional indicators extracted from the EUROSTAT Regio database. For the purposes of the design of the selection methodology, the most appropriate NUTS level was considered to be the national level in the cases of Denmark, Ireland and Luxembourg,[6] the NUTS 1 level in the cases of Belgium, Germany and the UK, and the NUTS 2 level in the cases of Austria, Finland, France, Greece, Italy, the Netherlands, Portugal, Spain, and Sweden.

[3] An inventory of typologies of European regions is presented in the final report "Enlarging of the ERA: Identifying priorities for regional policy focusing on research and technological development in the New Members States and Candidate Countries" produced by Fraunhofer ISI and MERIT, May 2005.

[4] Clarysse, B., and U. Muldur (2001) Regional cohesion in Europe? An analysis of how EU public RTD support influences the techno-economic regional landscape. Research Policy 30: 275–296.

[5] See for instance Verspagen, B. (1997) A global perspective on technology and economic performance. Paper presented at the NATO Workshop, Quantitative Studies for S&T Policy in Economies in Transition, 23-25 October.

[6] In the case of the three smaller member states of Denmark, Ireland and Luxembourg, the national level coincides with the NUTS 1 level and in the cases of Denmark and Luxembourg it also corresponds to the NUTS 2 level. In the Republic of Ireland the NUTS 2 level has been introduced relatively recently and as a result, there is limited data available from past years at this level.

The six smaller new member states, namely Cyprus, Malta, Estonia, Latvia, Lithuania, and Slovenia, are similarly considered at the national level, which in their case also coincides with the NUTS 1 and NUTS 2 levels, while the remaining four new member states, namely the Czech Republic, Hungary, Poland and Slovakia, are considered at the NUTS 2 level. A total number of 189 regions, covering the entire territory of EU25, were included in the classification analysis.

With regard to the selected indicators, the analysis focused on the investigation of the following two dimensions of regional techno-economic systems: i) *knowledge creation and absorption capacities* (as reflected in business R&D intensity, the volume of R&D output, the human resources employed in business R&D, the educational qualifications of the labour force, the human resources devoted to science and technology) and ii) *economic structure and industrial specialisation* (i.e. the level of regional income, the sectoral specialisation of the regional economy, labour market characteristics, and the degree of agglomeration).

It should be noted that the aim of the data analysis was to define different types of regions, therefore it should be considered a selection methodology rather than an analytical tool aiming to provide a comprehensive characterisation of each of the types. Furthermore, the data analysis was restricted to a cross-sectional sample because of shortness and incompleteness of the time-series for certain variables, which means that information contained in the existing time series has not been exhaustively utilised. The latest year of the most complete sets of observations in the EUROSTAT Regio database was 2002 and, consequently, this was selected to be the reference year for the selected cross-sectional sample in this phase of the analysis.

As a result of the factor analysis[7] nine groups of regions were identified. Some of these clusters present significant structural similarities in terms of their economic specialisation and for this reason they were ultimately considered sub-types of a broader typological class. Eventually, seven regional types are identified, three of which have two subtypes each. These types of European regions are the following[8]:

- **Type 1A and 1B: Predominantly agricultural** low-income economies with low human capital resources and relatively limited knowledge creation capacities and **diversified agro-industrial** medium income economies with low-to-medium human capital resources and relatively limited knowledge creation capacities (***25 regions***)
- **Type 2: Tourism-based** previously agricultural medium-to-high-income economies with limited human capital resources and knowledge creation capacities (***8 regions***)
- **Type 3: Re-industrialising** low-to-medium-income economies (industrial 'catchers-up'), benefiting from the re-location of European industry, with substantial human capital resources but yet not fully developed knowledge creation capacities (***20 regions***)

[7] Thirteen indicators corresponding to the dimensions mentioned above were selected and grouped in the three 'axes' according to their thematic affinity and to their degree of correlation in the initial correlation table. A principal factor analysis was subsequently conducted on each of these axes separately and the eight extracted (rotated) factors were used instead of the original variables in the subsequent cluster analysis. The final hierarchical cluster analysis on the eight extracted factors gave satisfactory results and indicated that the number of clusters must be between seven and nine.

[8] Details of the methodology and the classification analysis of European regions are presented in the Interim and Synthesis report of the "Specific analysis on the regional dimensions of the 3% Action Plan".

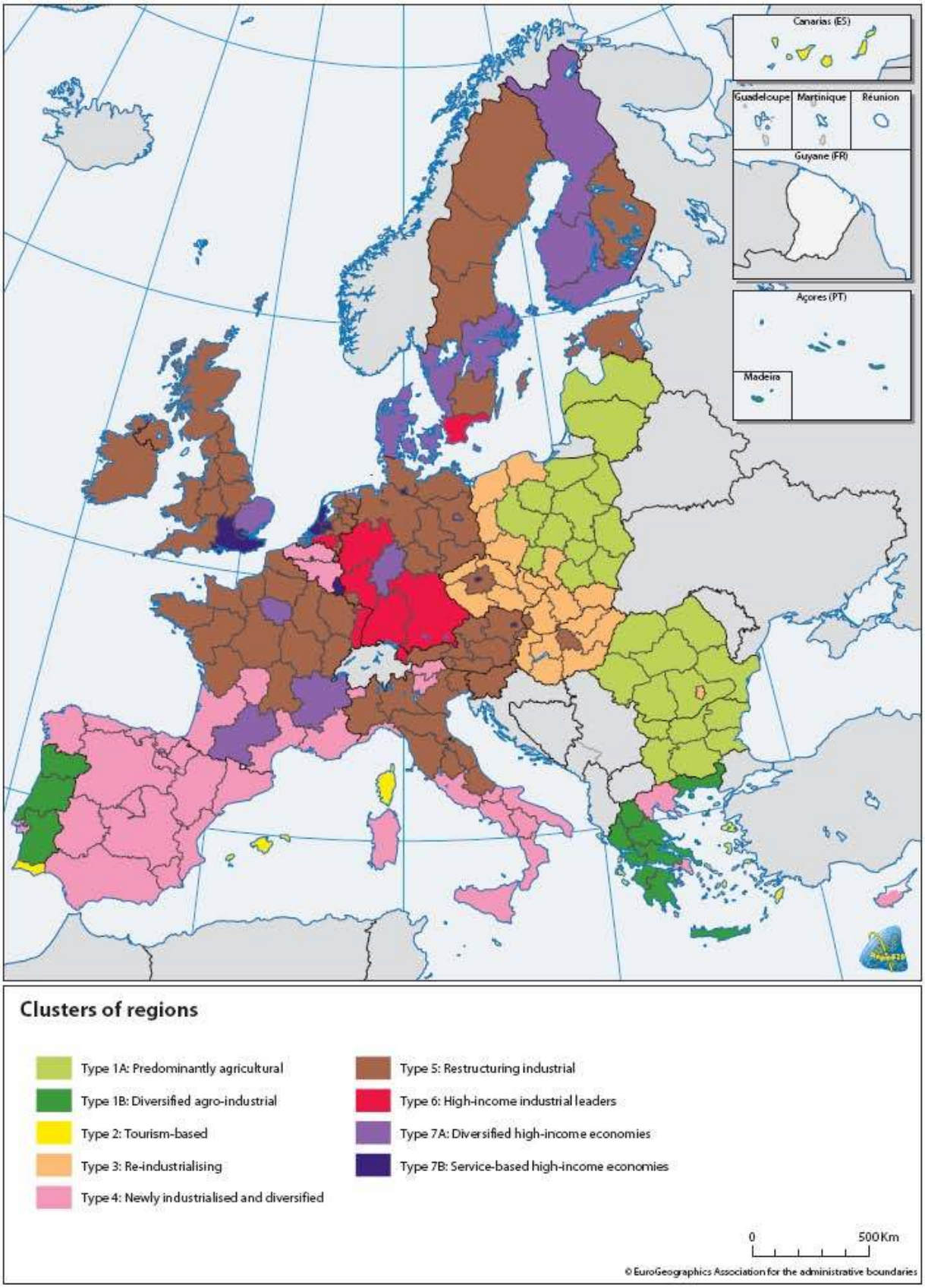
- **Type 4A and 4B: Newly industrialised** medium-income economies with medium-to-high-level human capital resources, low-to-medium-level knowledge creation capacities and **diversified** medium-to-high-income economies with medium-to-high-level human capital resources and medium-level knowledge creation capacities (***39 regions***)
- **Type 5: Restructuring industrial** medium-income economies with medium-level human capital resources and medium-to-high knowledge creation capacities, some of which correspond to the term 'industrial districts' (***66 regions***)
- **Type 6: High-income industrial leaders,** with high-level human capital resources and outstanding knowledge creation capacities (***8 regions***)
- **Type 7A and 7B: Diversified industry-based high-income economies** dominated by an advanced service sector and a science-based industry, with outstanding human capital resources and high knowledge creation capacities and **diversified service-based high-income economies**, with outstanding human capital resources and high knowledge creation capacities (large urban agglomerations, conurbations) (***23 regions***)

The classification of European regions (see Map 1) according to the typology explained above was subsequently applied as a selection methodology for the production of qualitative case study reports. A mix of nineteen regions was selected from each of the seven regional types identified, representing fifteen member states of the European Union (see Annex 1). As an outcome of the activity, nineteen regional case study reports were produced with the support of the ERAWATCH network[9].

The limited number of underlying regional reports, and their level of detail, do not allow a comprehensive comparative analysis of policy approaches but the resulting typology with seven categories would seem to be adequate for a discussion of the key RTD policy issues and approaches adopted in different types of European regions. In this context, even a limited number of cases can highlight relevant issues for RTD policy-making. By taking into account the above limitations, short region type specific summaries are given below, highlighting RTD policy practices that address certain identified deficiencies of the regional techno-economic system concerned.

[9] The regional case study reports used for this analysis are available at: http://cordis.europa.eu/erawatch/index.cfm?fuseaction=intService.display&topicID=588

Map 1 Classification of European regions



Sources: author's calculations based on EUROSTAT data (data from 2002)

Cartography: REGIO-GIS

4 RTD policy practices identified in different types of regions

4.1 Agricultural and diversified agro-industrial regions

The first group (i.e. agro-industrial low-to-medium income economies with relatively limited knowledge creation capacities) mainly comprises regions in the new Member States (**Type 1A**) and Southern-European countries (**Type 1B**). The 25 regions in this group have a GDP per capita below the EU25 average and in several Eastern European regions it is less than half. Gross expenditures on research are even lower, often not reaching half the European average. The public sector is responsible for the majority of research expenditures as companies usually have no R&D department. This group of regions scores very low on patenting performance indicators.

The improvement of R&D governance in this type of region is usually equated with raising awareness about and prioritising R&D issues in regional policy making, especially in the recent regional innovation strategies (e.g. *Wielkopolskie* in Poland). In the last few years, a general awareness has emerged among policy makers that RTD issues should not be neglected and that it is worth developing regional R&D capacity in at least some fields.

Developing the human capital base is one of the central issues of RTD policies in these regions where the regional absorptive capacity is usually insufficiently developed to permit any noteworthy expansion of RTD activity in the business sector. Support for public research is one of the key fields where support for R&D activities has been successful in these regions. Increased funding and incentives for cooperation have led to an increase in HERD and co-operative activities (i.e. *North* region in Portugal).

Generally, these regions have weak links between the R&D sphere and the regional economy. This is mainly due to the sectoral composition of the economy and the degree of specialisation of the R&D institutions. As a consequence, local companies and R&D entities have little experience in cooperating with each other. Networking measures address this issue specifically and are becoming increasingly common, although they have yet to show signs of being successful. Nevertheless, they do play an important role as drivers of a change in the typically co-operation averse mindset prevalent in the business sector, which is one of the central obstacles to a regional innovation system.

4.2 Tourism-based regions

The **second type** (i.e. tourism-based economies with limited human capital resources and knowledge creation capacities) consists of only eight regions. These regions have a GDP per capita fairly close to the European average while their R&D expenditures are usually very small. The public sector dominates their research landscape because the number of companies doing research is very low and the R&D investments of the private sector are often negligible. In addition the innovation capacity of firms is also weak resulting in very low patenting performance.

As in the case of Type 1A and Type 1B regions, a general awareness has developed among policy makers that RTD issues should not be neglected and it is worth developing some regional RTD capacity. However, despite the investment in the public knowledge

production base in recent decades, no major changes are visible in the private sector. Instead, it seems that fluctuations in R&D expenditures and R&D personnel follow the public funding cycle. Research efforts in universities and public research centres are partially linked to the regions' areas of economic specialisation. For example, in the case of *Corsica,* one of the regions looked at here, the public knowledge base is oriented towards issues that are important for the opening up alternatives to tourism (e.g. agro-industry, aquaculture, renewable energy) and supporting sustainable development.

However, the prevailing economic structure around the tourism cluster and the very limited capacity of the region's firms to absorb research results has hindered the development of linkages between research organisations and the business sector. It is not the intention here to make general conclusions for all tourism-dependent regions as a whole based on one example, but it is still worth highlighting the assessment given in the case study report on Corsica, which said that "despite the efforts made to strengthen the links between the public science base and the private sector,… the impact is somewhat low." Still, the focus put on technology transfer seems to be consistent with the economic landscape, provided that companies increase their research efforts.

4.3 Re-industrialising regions

This **third type** of regions (i.e. low-to-medium-income economies, with substantial human capital resources) can be identified as industrial 'catchers-up', benefiting from the re-location of European industry. The 20 regions belonging to this type have a GDP per capita of less than 50% of the European average, while the R&D intensity of the regional economy is even lower. Regions of this type are typically found in Hungary, the Czech Republic, Slovakia and Poland where the RTD governance system is centrally organised and the regional authorities have only limited responsibilities with regards to RTD policy.

The economic structure of this region type is characterised by the important role of manufacturing in low-to-medium technology sectors. Medium-to-high-tech and high-tech sectors have taken on a larger role as a result of multinationals relocating production – and in few cases also some R&D– to these regions. Long-standing industrial traditions, the close match between the region's public knowledge base and the needs of industry, the high absorptive capacity and quality of human resources, appear to be among the factors that differentiate these regions from the previous group.

As long as these regions have some strong research facilities, at least in their national context, the RTD policy measures usually aim at upgrading and further developing the existing regional R&D capacities. These capacities can be also exploited by foreign companies relocating into the region. Foreign investors have established some R&D centres and they are developing some links to the regional research community thanks to the networking and cluster initiatives (e.g. *Jihozapad* in the Czech Republic*)*.

Nevertheless, this mode of development is only possible if the regional RTD supply matches the needs of the local industry. This is a major issue for those regions where foreign companies have come to occupy a dominant position in manufacturing but are still heavily reliant on their own technological capabilities, usually brought in from outside the region. Thus, the mismatch between the knowledge base and the needs of the regional economy often hinders spill-overs and exploitation of research results. For instance, a lack of research capacity in science and engineering can be a serious obstacle to the

modernisation of the industrial structure, which is in fact the case of *Dél-Dunántúl* (HU). In this particular region, there is a clear mismatch between the knowledge-production specialisation and the economic structure. Therefore, the networking measures introduced support the inter-regional collaboration between the public and private sector rather than the development of collaborative networks and clusters within the region itself. However, recent policy measures are now aimed at supporting the establishment of spin-off companies, public-sector research and the development of regional knowledge centres that match the specialisation of public research base.

4.4 Newly industrialised and diversified regions

Type four is the second most populous group in the typology set out above, and covers 39 regions. In fact this type can be divided into two sub-categories. The more advanced group includes, among others, regions such as *Catalonia* and *Madrid*. In these regions the GDP per capita is above the EU25 average; however, GERD as a percentage of R&D is still below the EU-25 level. Business R&D seems to play a dominant role, e.g. in *Catalonia* it accounts for 66% of regional GERD. The other sub-category within this type has both a GDP per capita and GERD/GDP below the EU-25 average (e.g. *Andalusia* and *Sicily*). The public R&D expenditures are usually much higher than business R&D expenditure, which is in turn often much lower than the EU25 average.

The policy challenges for this type of region are closely related to the fact that these regions show a considerable mismatch between the public and private sector knowledge bases. Among the Type 4 regions investigated, *Andalusia, Crete* and *Sicily* in particular face the challenge of refocusing the public research system towards the needs of the private sector, which mainly consists of SMEs and low-tech/medium-tech manufacturing. RTD policy seems to be relatively consistent, the public actors are increasingly aware of the regional strengths and shortcomings and they are actively trying to gather intelligence about the "state of play" in their regions.

Where the regional investments in research are generally significant, RTD policy aims at concentrating targeted initiatives on fields selected for their promise. A common focus of policy initiatives in the regions investigated is on agro-foods and aquaculture, which are areas relevant to the regional economy. A degree of specialisation in knowledge production in areas not necessarily matching the economic specialisation of the region can also be observed. Examples include materials technology, electronics and astrophysics in Crete, biomedicine and ICT in both Andalusia and Sicily.

Typically, a wide range of knowledge diffusion infrastructure exists in these regions, such as technology transfer organisations at universities and science parks. However, the networking, co-location and clustering measures have limited impact because the low absorption capacity of local actors hinders the generation of spill-overs through supplier networks to the rest of the regional economy.

4.5 Restructuring industrial regions

This is the largest group among the seven types of regions with 66 regions. In the **fifth type** of regions, the GDP per capita and R&D expenditures are above the EU-25 average and the business sector is usually the major actor of GERD financing and spending. These economies are undergoing a structural change with a focus on medium-tech

manufacturing, although the share of high-tech sectors is also increasing (e.g. Styria, Saxony).

These regions are characterised by a fairly strong public knowledge base with a differentiated research infrastructure comprising a mix of new and old universities with strong traditions and a variety of public research centres and institutes. In contrast to the significant capacity of the public research system, the private knowledge base is not very strong, resulting in R&D expenditure lower than the national and EU aggregates. Although all regions have gone through a period of restructuring, traditional low-tech industries still predominate. These regions have well developed structures for knowledge diffusion and technology transfer, although their scope and efficiency vary considerably across the sample.

RTD policies have been successful in strengthening the science base. The research specialisation of these regions is generally aligned with their economic specialisation and the industrial fabric, although there are areas of excellence especially in universities that do not connect well with the local economy. This is more the case in *Scotland* and *Lorraine* where, due to insufficient local demand, universities have developed strong links with international business outside the region.

Knowledge production specialisation in *Saxony* is very much in line with the region's economic specialisation as a result of the restructuring of both the knowledge production infrastructure and the region's industrial base. RTD policies focus on a limited number of key technology fields that promise future growth. The expansion of the government research sectors was able to draw upon the abundance of highly skilled, well educated technical and R&D personnel, and this was also a factor in attracting the substantial inward investment into the region. Furthermore, the development of the public research infrastructure was directed towards areas of current economic activity with the potential for the future development of clusters.

4.6 High-income industrial leaders

This **sixth type** of region is relatively less common than the other types. It includes just eight regions, mainly from Germany such as *Bavaria, Baden-Württemberg, Nordrhein-Westfallen or Noord-Brabant* in the Netherlands. These regions are home to the headquarters of a number of major European companies like Daimler-Chrysler, Siemens, BMW and Philips. The regional GDP per capita is higher than the European average and R&D intensity is also above average. These regions have very strong knowledge creation capacity and outstanding human capital in both the public and private sector. Another important characteristic is that the business sector is the main actor in R&D. However, all these regions also have a well developed public research infrastructure. The knowledge diffusion capacity is also well developed in all the regions in the group, with institutions that offer a wide range of services often going beyond regional boundaries.

In terms of policy-making, these regions have long tradition of RTD policy, combined with a desire for autonomy and the ability to maintain a high degree of freedom. This has enabled them to design measures and programmes that meet regional needs. Traditional manufacturing industries are also supported, as well as high tech activities and knowledge intensive services, since RTD policies do not have a specific sectoral orientation. All in all,

it could be said that in these regions a coherent policy philosophy, i.e. "strengthening the strengths", is combined with a high level of financial support for RTD issues.

4.7 Diversified industry- and service-based high-income economies

This type of region also includes two sub-categories with 11 and 12 regions each. The fundamental difference between them is that **Type 7A** regions have some important manufacturing sectors (e.g. *Midi- Pyrénées, Rhône-Alpes, Västsverige*) while **Type 7B** regions are highly diversified service-based economies, typically including large urban agglomerations or conurbations such as *Ile-de-France, London, Stockholm* or *Berlin*. All the regions belonging to this category have a GDP per capita well above the European average, even among the highest, such as in the case of London. They have high-to-outstanding human capital resources and knowledge creation capacities.

These regions have benefited for a long time from long-term sectoral support policies dating back to at least the 1980s and in some cases as far as the 1950s. Some regions have profited from the policy-driven decentralisation and/or relocation decisions of large corporations as can be seen in the cases of *Midi-Pyrénées* and, to some extent, *Bavaria*. RTD policy also has a long history, and can be characterised by large, well-funded and comprehensive initiatives making use of existing strengths to diversify the regional economy and to develop a regional portfolio of competences. The specialisation of the knowledge production base and the economic specialisation of the regions are closely matched. The science-industry links are well developed, especially in each regions' fields of economic specialisation. The alignment between science and economic specialisation is a result of several factors, including the strong collaboration between public research and industry, especially between HEIs and business at both regional and national level.

These regions can typically be characterised by well-funded and well-organised regional cluster initiatives, network building measures and co-operative technology programmes in both the high-tech and the medium-high-tech sector. In many cases, the success of these clusters is the basis of the regional economy's performance. In some regions, however, successful collaboration and networking is reduced to one or two main clusters on which the region remains dependent. This is particularly the case in *Västsverige* and *Etelä-Soumi*, where national support policies tend to consolidate the existing structures. Even in those regions, however, important policy changes have recently been implemented to support the involvement of SMEs in R&D. Though it is still too early to assess their effect, it appears unlikely that they will be able to bring about structural changes in the short term.

5 Lessons learned for RTD policy-making

The types of regions investigated appear not only to be different in terms of their socio-economic characteristics (i.e. the features that led to the constitution of the groups: level of income, human capital resources and knowledge creation capacities) but also in the way they conceive, organise and perform RTD policies, and the experiences gained over time and the underlying "regional philosophies".

One of the main messages of this report is that policy makers should be clear about the potential impact of research investments and related measures under specific regional techno-economic circumstances and these long term investment decisions should be viewed from a multi-level, multi-actor and multi-sector perspective. This means that research investment in certain regions can have important contributions to national policy goals without making major contributions to regional economic development. Therefore, no uniform ("one-size-fit-all") approach, nor a static alignment of the research system to regional economic needs, is recommended here.

Based on the investigated qualitative regional reports discussed before, the main lessons identified are related to the following two issues: i) the extent of regional techno-economic characteristics reflected in RTD policy approaches and ii) similarity of the RTD policy mix.

5.1. Impact of RTD measures

RTD policy measures are relatively successful in several of the regions looked at – including regions of different types– although it cannot always be clearly established whether the local business sector's success can actually be attributed to policy measures or if dynamic industrial clusters would have been able to achieve similar results unaided. Overall, however, a policy of support is well-established, to the extent that it does not require a general "best practice" approach to be improved, but rather fine-tuning to match somewhat different regional characteristics:

- While in some regions RTD policy has been successful at encouraging and consolidating sectoral diversification (in *Bavaria* and later in *Midi-Pyrénées*), the issue of the dominance of an economic ‘mono-structure’ and the need for diversification remains an open question for instance in *Västsverige* and *Etelä-Soumi*.
- While *Midi-Pyrénées* and, to some extent, *Västsverige* need more high-tech activity, *Etelä-Soumi* could profit from increased policy attention in the field of medium-high-tech production.

The most crucial factor for success in terms of RTD policy's regional impact seems to be to *concentrate on strengths*. In other words, diffuse RTD efforts may not have a real influence on a region's innovation capacities. To concentrate on endogenous strengths concerning RTD activities appears to be much more difficult for some regions than for others, depending on the initial resources and capacities. Concentration of efforts seems to be a factor enabling RTD activities to have significant impacts on the regional economy.

In addition, and in the light of the cases examined, this approach should be associated with a high level of investments in RTD activities (at least relative to the region's

resources) in order to reach a critical mass at regional level. *Etelä-Suomi* and *Västsverige*, for instance, clearly benefited from such an approach, allowing these regions to gain a position of international excellence in their respective selected technology fields.

Less developed regions with traditional, less knowledge intensive, sectors (e.g. agriculture, food processing or tourism) need to be aware that RTD investments might have only a limited impact on their economic performance, at least in the short to medium term. It should be accepted that these regions are specialised in activities that are not highly research intensive, therefore increased R&D expenditures cannot be easily absorbed by regional actors. In these situations, setting up of new research centres that are not linked to the needs of the regional economy could be like building "*cathedrals in the desert*" as they are unlikely to be able to develop the hoped-for synergies with local economic actors.

Among the cases looked at, the most prominent example of this is the creation of the Foundation for Research and Technology Hellas (FORTH) in *Crete* in the 1980s, as a part of the Greek central government's push for decentralisation. FORTH became the largest public research institute in Greece, but it has limited links to the regional economy. FORTH's world-class scientists are collaborate with their counterparts all over the world but no strong synergies have been developed with the private sector in areas of scientific excellence (i.e. biotechnology, laser astrophysics and materials technology) over the more than two decades since the institute's creation.

5.2 Similarity of the RTD policy mix

As already discussed, regional techno-economic systems have a variety of strengths, weaknesses and deficiencies as well as differing levels of autonomy. It is therefore not surprising that the composition of the RTD policy mix varies greatly between different types of regions. Based on our analysis of the regional samples belonging to different types, it cannot be concluded that RTD policy approaches in particular types are similar. Often, regions with a similar techno-economic situation opt for different policy goals and implement corresponding measures, but this does not really explain why some regions perform better than the others with a similar mix of measures. This perhaps depends more on the local techno-economic situation, the available resources for RTD, and the national and historical context.

Our analysis of the regional reports has shown the importance that policy making should be clear not only about the heterogeneity of regional techno-economic situations which reflect strongly diverse situations in terms of RTD-related policy making but also about different possible development paths. Moreover, it cannot be ignored that there are relatively a few regions in Europe with several decades of experience in designing and implementing regional RTD policies, while the majority of European regions are clearly at the other end of the spectrum.

Southern European regions and almost all the regions in the new Member States have only very recently identified science, technology and innovation as an important policy issue. This recognition can be mainly attributed to the initiatives of the European Commission (e.g. RITTS/RIS/RIS+ from the mid-1990s and recently the orientation of the Structural Funds to RTD priority areas).

Therefore, the regional techno-economic system in question needs to achieve a certain degree of maturity in order to be able to determine the focus (or foci) of a research and innovation-based regional development. As long as the issue of regional catch-up stays at the top of the policy agenda, it may be more important to reach a minimal critical mass of activities at regional level rather than to take the risk of a selective approach which may subsequently prove to have been too narrow.

In conclusion, "one-size-fits-all" solutions often fail to yield the anticipated results, as has been shown by the regional reports and the literature[10]. Therefore, it is to be hoped that European and national RTD policy-makers will take into account the variety of regional techno-economic situations and develop differentiated approaches tailored to the specific type of region concerned.

[10] See e.g. Tödtling, F.-Trippl, M. (2005) One size fits all? Towards a Differentiated Regional Innovation Policy Approach. *Research Policy*. **34**, 1203–1219.

Annex 1 List of the analysed regions by type

Type of regions	Name of regions
Type 1A	Wielkopolskie (PL)
Type 1B	Norte (PT)
Type 2	Corsica (FR)
Type 3	Jihozápad (CZ) Dél-Dunántúl (HU)
Type 4A	Kriti (EL) Sicily (IT) Andalusia (ES)
Type 4B	Catalonia (ES)
Type 5	Kärnten (AT) Steiermark (AT) Saxony (DE) Lorraine (FR) Emilia-Romagna (IT) Scotland (UK)
Type 6	Bavaria (DE)
Type 7A	Etelä-Suomi (FI) Västsverige (SE) Midi-Pyrénées (FR)
Type 7B	-

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Abstract

This policy note presents different RTD policy approaches that were identified in qualitative regional case study reports produced for different types of European regions. Its purpose is to give useful ideas for policy-makers to see the potential impact of different RTD policy measures and to present different development possibilities for regions with similar techno-economic characteristics.